# ADHERENCE TO ANTIHYPERTENSIVE MEDICATION IN THE UAE

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Thesis submitted in accordance with the requirement of the University of London for the degree of Doctor of Philosophy by


Ayesha Ahmad Rashid AlQasem
Department of Practice and Policy
The School of Pharmacy
University of London
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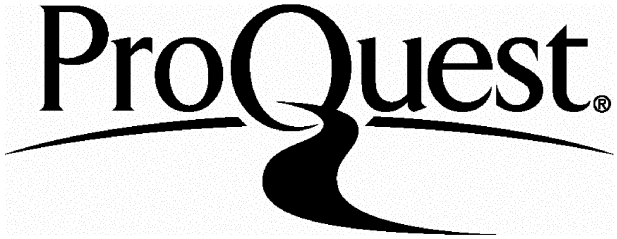
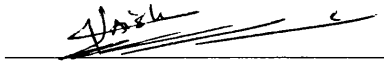


This thesis describes research conducted in the School of Pharmacy, University of London between October 2008 and September 2011 under the supervision of Prof. Felicity Smith and Dr. Sarah Clifford. I certify that the research described is original and that any parts of the work that have been conducted by collaboration are clearly indicated. I also certify that I have written all the text herein and have clearly indicated by suitable citation any part of this dissertation that has already appeared in publication.



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## Abstract

**Background:**

Poor adherence to medication is a major problem in healthcare services, particularly with chronic illness. In the United Arab Emirates, non-adherence to medication among hypertensive patients is believed to be a major barrier to the appropriate management of the disease. However, there are gaps in our understanding about the extent of non-adherence and reasons for not taking medication as prescribed in this population

**Aims:**

1) To explore barriers to adherence to medications and other self-care behaviours among Emirati hypertensive participants.

2) To assess the extent and predictive factors of non-adherence to antihypertensive medications in the UAE in order to recommend potential interventions needed for improving adherence.

**Methods:**

A qualitative exploratory study using semi-structured interviews with 20 patients and a cross-sectional quantitative survey with 391 patients randomly selected from all seven Emirates of the UAE.

**Results:**

Qualitative interviews revealed issues that may affect antihypertensive medication adherence among Emirati patients, including: a) Beliefs about illness and medicines, b) Social support, c) Healthcare providers and system issues, and d) Perceptions of herbal medicines. Most of the participants reported non-adherence to medication, but adherence to exercise and diet was often even lower.

The quantitative survey showed that approximately 66% of Emirati hypertensive patients were non-adherent to their medications. Four variables significantly predicted

patients' non-adherence to medications in the logistic regression model. The model suggested that hypertensive patients with uncontrolled blood pressure who live in rural areas and who doubted the ability of the treatment to control their hypertension and had more concerns about their medicines were more likely to be non-adherent to their medication.

**Conclusion:**

This thesis showed that barriers to medication adherence in the UAE were complex and often interlinked, suggesting that multiple, tailored interventions may be needed to improve antihypertensive medication adherence and patient outcomes.

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## LIST OF ABBREVIATIONS

| | |
|---|---|
| ACE inhibitors | Angiotensin-converting enzyme inhibitors |
| ANOVA | Analysis of Variance |
| BMQ | Beliefs about Medicines Questionnaire |
| BP | Blood pressure |
| Brief IPQ | Brief Illness Perception Questionnaire |
| CI | Confidence Interval |
| CIRS | Chronic Illness Resources Survey |
| DOT | Direct Observable Therapy |
| EM | Electronic Monitoring |
| EMRO | Eastern Mediterranean Regional Office (World Health Organization) |
| HAART | Highly Active Antiretroviral Therapy |
| HBM | Health Belief Model |
| HCP | Healthcare providers |
| HIV | Human Immunodeficiency Virus |
| HLC | Health Locus of Control |
| IPQ | Illness Perception Questionnaire |
| IPQ-R | Revised Illness Perception Questionnaire |
| ISH | International Society of Hypertension |
| LC | Locus of Control |
| LSHTM | London School of Hygiene and Tropical Medicine |
| MAXQDA | MAX Software for Qualitative Data Analysis |
| MEMS | Microelectromechanical systems |
| MHLC | Multidimensional Health Locus of Control |
| MI | Myocardial Infarction |
| MMAS | Morisky Medications Adherence Scale |
| MOH | Ministry of Health |
| MPR | Medication Possession Ratio |
| NCCSDO | National Coordinating Centre for Service Delivery and Organisation |
| NHS | National Health Service |
| NICE | National Institute for Health and Clinical Excellence |
| OR | Odd Ratio |

| | |
|---|---|
| P | Probability value |
| PBC | Perceived Behavioural Control |
| PMT | Protection Motivation Theory |
| RCT | Randomised controlled trial |
| SCM | Social Cognitive Models |
| SD | Standard deviation |
| SE | Self-Efficacy Model |
| SOAS | School of Oriental and African Studies |
| SPSS | Statistical Package for the Social Sciences |
| SRM | Self-Regulatory Model |
| TB | Tuberculosis |
| TMC | Transtheoretical Model of Change |
| TPB | Theory of Planned Behaviour |
| TRA | Theory of Reasoned Action |
| UAE | United Arab Emirates |
| WHO | World Health Organisation |

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# Section 1- Introduction

## BACKGROUND TO THE THESIS

The United Arab Emirates is the setting in which this PhD research is based. Therefore, this introductory section will briefly give an overview on the health care services and health care system in the UAE as well as highlighting the reasons why this particular area was of interest in the current research.

The UAE was formed on the second of December 1971. Administratively, it comprises seven emirates, which are Abu Dhabi, Dubai, Sharjah, Ras al-khaimah, Ajman, Fujairah and Umm al-Quwain. The estimated population in year 2004 was 4,320,000 (Ministry of Health of the UAE, 2004). The average life expectancy is 73 years; female 75.1 and males 71.3. Around 68.8% of the total population are between the ages of 15-49 years (WHO, 2006).

Health care currently is free only for UAE citizens, whereas the noncitizens are covered by a health insurance program where the costs are shared between employers and employees. Health service is provided by six different authorities in the country in which five are governmental and the sixth is provided by the private sector. Each of these authorities has its own staff and system. According to the Ministry of Health of the UAE (MOH) annual statistical report 2004, there is a total of 28 hospitals in the UAE, 16 in urban areas and 12 in rural areas. In addition, there are a total of 108 primary health care centres in the UAE, which are distributed between urban and rural areas (MOH, 2004).

In the UAE, health care services are provided by primary health care centres, hospitals and tertiary hospitals. Primary health care centres are mainly used for health consultations and simple treatment. They do not provide emergency services but

provide first aid services. Hospitals have a higher level of health care management in different fields of medicine and surgery and have ancillary services such as radiology, clinical laboratory and pharmacy. Hospitals provide inpatient services for 24 hours and also provide outpatient services for patients in the treatment of diseases, injuries, deformities, abnormal physical or mental status, maternity cases, nurseries and dispensaries. Tertiary hospitals provide more specialised services including rehabilitation programmes. Patients are usually seen by the primary healthcare physicians and if found to have any signs or symptoms for any chronic diseases then referred to specialists in the hospitals. All chronic patients are treated in outpatient clinics in hospitals in the UAE. Patients are usually seen every two to six months for a follow up by their hospital doctors and to refill their medication.

The national data of the UAE strongly indicates that cardiovascular diseases are the leading cause of death as they contribute to almost 28.7% of total mortality rate with hypertension contributing to 13% of the total cardiovascular mortality rate (WHO, 2006).

El-Shahat et al (1999) conducted as part of the national epidemiological study, a study of hypertension in the UAE (NESH-UAE).The preliminary results of phase I report the prevalence, awareness, treatment and control of hypertension among UAE citizens aged between 18-75 years in the region of Sharjah district. The results reported the prevalence of hypertension as 36.6%. Overall, 26% of the participants were aware that they had a high blood pressure. Almost 41% of those who were aware of their high blood pressure were receiving regular treatment and only 19% had controlled blood pressure level. Others have found similar high prevalence rates for hypertension ranging from 19% to 26% (El Mugamer et al., 1995; Badrinath et al., 2002).

Another study reported a positive association between hypertension and poorer socioeconomic factors and more sedentary lifestyle in the UAE (Sabri et al., 2004). It also suggested a positive association between hypertension and physical inactivity, obesity and smoking. Therefore, socioeconomic factors, family history and lifestyle were found to be important factors in shaping risk for hypertension in the U.A.E (Sabri et al., 2004).

In addition, Abdulle et al (2006) examined the under-diagnosis and under-treatment of hypertension in the UAE. The results of this study showed that both under-diagnosis (33%) and under-treatment (76%) of hypertension is high in the UAE, as a large percentage of the self-reporting normotensives and the self-reporting hypertensive actually had blood pressure in the hypertensive range. Furthermore, self-reporting hypertensive patients were aware of their condition but still over half of them did not have their blood pressure adequately controlled; the reason for this was unclear in this study. The authors suggest that this could be due to either inadequate treatment regimens or lack of patients' compliance to their medication due to side effects or the asymptomatic nature of the disease.

In the UAE, hypertension is a major public health concern as its burden is continuing to increase which will lead to the development of complications such as stroke, cardiovascular diseases, renal failure etc. For adults aged 40-70 years, the risk of cardiovascular disease doubles for each increment of 20 mmHg in systolic blood pressure or 10 mmHg in diastolic blood pressure (WHO/EMRO, 2005). Therefore, there is a need for greater emphasis on public awareness of the problem of hypertension and for an aggressive approach to antihypertensive treatment. In addition, failure to take the

prescribed medicines can result in relative therapeutic failure, disease progression and even premature death (WHO/EMRO, 2005).

Apart from the fact that hypertension is one of the most common types of disease and a major public health problem in the UAE, my choice also originated from a personal interest, as I have a strong family history of hypertension which leads to long term cardiovascular disease. Also, I worked as a pharmacist in a cardiology ward for a few years in the UAE and I have a clinician colleague who is a consultant cardiologist and interested in knowing the reason why Emirati patients with high blood pressure do not have adequate blood pressure control and whether this is related to non-adherence to treatment. As there is a gap in the literature on non-adherence in the UAE, I have been sponsored by the hospital I work at in the UAE to carry out this research to find out whether non-adherence is an issue in this particular population, what are the barriers for non-adherence and what kind of interventions do we need to use in order to improve patients' adherence to medications and therefore their health outcome.

"Data available from several Eastern Mediterranean countries indicate that hypertension is emerging as a major cause of morbidity and mortality" (Sabri et al., 2004), suggesting that non-adherence to antihypertensive medicines is a likely problem. This could be due to the fact that many hypertensive patients in the Middle East region are characterised as not being adherent to their medication due to their partial mistrust of healthcare provider or misconceptions of the potential complication of the condition (Abdulle et al., 2006). However, the prevalence of non-adherence to antihypertensive medications in the UAE is still unknown, obscuring the size of the problem. This problem is further complicated by a lack of studies investigating specific variations in beliefs about illness and medications in Emirati hypertensive patients, which is a major

obstacle towards improving hypertension care in the UAE. As the absence of the patients' perspective was shown to be one of the main reasons for the lack of progress in the adherence research (Donovan, 1995), there is a need to explore these issues when addressing adherence to medication. It is hypothesised that Emirati people may have specific lifestyles, attitudes and cultural factors that could influence their medication adherence behaviour (Abdulle et al., 2006). If specific barriers and factors interfering with adherence to medication are identified, then targeted interventions can be designed to improve medication adherence among hypertensive Emirati patients, and thus improve the therapeutic outcomes for this particular group of patients.

Following this background, section 1 of the thesis will include three chapters. Chapter 1 will give a general overview of adherence to treatment, including the definitions of adherence as well as types, extent and consequences of non-adherence. It will also include the methods for measurement of adherence to medication, factors affecting patients' adherence and explanatory models applied to understanding medication adherence. In chapter 2, non-adherence to medications in hypertension will be discussed in terms of the prevalence of the problem, its significance and consequences. This will be followed by reviewing studies drawn from the Western literature focusing on barriers to medications adherence in hypertension. Chapter 3 will include a systematic review of adherence studies among chronic illness in the Middle Eastern literature, which might provides evidence for the necessity of conducting antihypertensive medication adherence research in the UAE.

# CHAPTER 1 NON-ADHERENCE: AN OVERVIEW OF THE PROBLEM AND RELEVANT EXPLANATORY MODELS

Non-adherence to medication regimens is a major problem that remains unsolved despite the large number of research studies, which have been conducted in this area for decades. Patients' poor adherence to their medication is a major and complex problem in healthcare services especially with chronic illness. In chronic illness, the right diagnosis and treatment are both very important for a patient's quality of life and survival rate. Therefore, patients not being well adherent to their recommended therapy could be a significant barrier for achieving the best health outcomes (Vermeire et al., 2001; DiMatteo, 2004a; Martin et al., 2005).

## 1.1 Definition of adherence

Compliance has been defined by Sackett (1976a) as "the extent to which patient's behaviour (in terms of taking medications following diets or executing other life-style changes) coincides with the clinical prescription". However, the term compliance has been criticised as it gives an image of the relationship between the patient and the healthcare provider that suggests "doctors know best" and the patient is expected just to follow the doctors instructions and orders (Royal Pharmaceutical Society of Great Britain, 1997; Horne, 2006).

Some studies use the term persistence, which is different from compliance. Medication persistence refers to the act of continuing the treatment for the prescribed duration. It may be defined as "the duration of time from initiation to discontinuation of therapy" (Cramer et al., 2008). However, compliance refers to the degree or extent of conformity to the recommendations about day-to-day treatment by the provider with respect to the timing, dosage, and frequency (Cramer et al., 2008).

The Royal Pharmaceutical Society introduced the term 'concordance' in 1997. It focuses on the consultation process in which the patient and the healthcare provider agree on the therapeutic decisions incorporating their respective views, and the extent to which patients are supported in their medicines taking (Royal Pharmaceutical Society of Great Britain, 1997). Although the term concordance has gained much appeal, it has been criticised for various moral, conceptual and ethical issues. Horne et al (2005) identified some of these conceptual criticisms such as: concordance deals with the prescribing related consultation but not with medication taking behaviour and it does not address the balance between the individual rights and individual responsibilities. An ethical issue may arise from concordance: this might occur when a patient misinterprets the likely benefits or risks of the treatment, or when a patient develops false beliefs based on erroneous information. For example, a patient may refuse to take a lifesaving treatment or could choose treatment, which could result in harm to themselves or others (Horne et al., 2005).

The term adherence is used as an alternative to compliance: it is preferred over the term compliance and used more frequently in recent research. This is because the term adherence recognises that patients have the right to choose, exercise this right and should not be blamed for any treatment failure. The term adherence respects the role that the patient plays in his/her treatment and suggests that the prescriber should be engaged in a negotiation with the patient rather than issuing instructions and orders (Royal Pharmaceutical Society of Great Britain, 1997; Horne, 2001; Horne, 2006). The World Health Organisation (WHO) adopted a definition of adherence, which is "the extent to which a person's behaviour- taking medication, following a diet and/or executing lifestyle changes, corresponds with agreed recommendations from a healthcare provider" (WHO, 2003). This definition recognises the patient as being an

active partner in his/her care process and implying a requirement for their agreement to their treatment recommendation. It is also the preferred term and therefore will be used throughout this thesis.

## 1.2 Types of non-adherence

Non-adherence can occur in different forms, for example, not collecting the prescribed medicine, not taking the right dose, taking the medication at the wrong time, or forgetting a dose. Therefore, non-adherence can be usefully understood by classifying into different categories, as follows:

### 1.2.1 Primary vs. Secondary

Primary non-adherence occurs when a patient does not fill the original prescription of the medicine(s) for some reason, for example, patients do not have access to a pharmacy, are not satisfied with the diagnosis or might not have the cost of the medicine (Royal Pharmaceutical Society of Great Britain, 1997). It has been reported in Sweden and the UK that the prevalence of primary non-adherence is between 2.4% to 20% (Rashid, 1982; Ekedahl and Mansoon, 2004).

Secondary non-adherence occurs when the prescribed medications are not taken as intended, for example, when patients take the wrong dose or at the wrong time (Royal Pharmaceutical Society of Great Britain, 1997).

### 1.2.2 Intentional vs. Unintentional

Unintentional non-adherence occurs when patients have the intention to follow their treatment instructions but some barriers prevent that from happening. These barriers could be that patients have difficulties in administering the treatment, or

misunderstanding the prescriber's instruction, or impaired manual dexterity or simply patients may forget to take their medication (Royal Pharmaceutical Society of Great Britain, 1997; Wroe, 2002; Horne et al., 2005).

On the other hand, intentional non-adherence occurs when patients decide not to take their medication as instructed by their prescriber. This could be associated with the patient's beliefs about the disease and/or its treatment (Horne et al, 2005). Previously reported reasons for intentional non-adherence include: patients feel better so decide to stop taking the medicine, cost of the prescribed medicines, taking the medicine at the wrong time and having a 'drug holiday' (e.g. taking their medicine as directed during the week and stopping it on the weekend or during their holidays) (Horne et al., 2005; Bosworth, 2006).

Barber et al (2004) prospectively investigated intentional and unintentional non-adherence amongst 258 patients with chronic conditions who started new medication. The results showed that the rates of non-adherence were 30% at 10 days follow up and 25% at 4 weeks follow up, of which 45% was intentional non-adherence. Also, 60% of intentional non-adherers stopped taking their medicines completely, whereas no patients classed as unintentional non-adherers did. Moreover, a greater proportion of patients who were intentionally non-adherent reported problems with their medicines. This study suggested the differences in the behaviour between patients with intentional and unintentional non-adherence warrants their distinction.

Although, non-adherence has been classified according to this dichotomy of intentional or unintentional, there is a degree of overlap between these two categories of non-adherence. For example, patient's poor ability (unintentional non-adherence) to

take medication can reduce their motivation, but in some cases the motivation of starting and continuing the medical treatment could influence the intentional non-adherence and help to overcome the poor ability to take medication (Horne et al., 2005).

## 1.3 Extent of non-adherence

Non-adherence to the prescribed health recommendations is a common problem in all chronic diseases, with typical rates of around 20-50% (Sackett, 1976b). As for medication adherence in particular, a report from a scoping exercise commissioned by the NHS National Coordinating Centre for Service Delivery and Organisation (NCCSDO) highlighted that reviews undertaken across different disease conditions and from different countries showed an estimated rate of 30-50% non-adherence (Horne et al., 2005). A report by the World Health Organisation (WHO, 2003) highlighted that the rate of non-adherence is 50% among patients suffering from chronic disease in developed countries, and suggested that the rate must be much higher in the developing countries due to lack of health resources and inequities in access to health care (WHO, 2003). The same report highlighted that the impact of poor adherence is growing even more as the burden of patients suffering from chronic disease is growing worldwide.

## 1.4 Consequences of non-adherence

The WHO (2003) highlighted that poor adherence in chronic illness compromises the effectiveness of the therapeutic treatment. It also described it as a critical issue in population health as it affects quality of life and health care costs. It was suggested that a big portion of healthcare resources are directed to the management of chronic illness. Therefore, any failure to take the appropriate drug regimen as recommended is considered a waste of both patient's health outcome and healthcare resources. However, this statement is only applicable if the medication prescribed for a

particular patient is the best optimal drug therapy for his/her medical condition (Horne and Weinman, 1999; Horne, 2003).

Non-adherence imposes a considerable economic burden. In the USA, it has been estimated to cost 100 billion dollars per year including 10% hospitalisation cost and 23% admission to nursing homes (Vermeire et al., 2001). Health consequences as a result of non-adherence can be quite severe, especially in patients who use medication which help them in controlling their illness or even cure it (Martin et al., 2005). Burman et al (1997) in a study of non-adherence with therapy for tuberculosis found that non-adherence was associated with a 10 fold increase of the risk of poor outcomes from the treatment. Non-adherent patients also caused a community-transmission of tuberculosis to contacts during the time of non-adherence to their medication. Therefore, this study showed that non-adherent patients with their tuberculosis medication not only harmed themselves by causing microbiological failure and relapse but also the community by spreading the disease. Catz et al (2000) studied non-adherence in HIV patients and concluded that non-adherence to HAART regimen caused viral replication and as a result disease progression and failure to treatment.

Other consequences of non-adherence to treatment include the risk of new illness. Lutfey et al (1996) suggested that poor adherence of HIV patients suffering from tuberculosis with their anti-tuberculosis medications could have been one of the driving forces in the origin of mono-rifampin-resistant M tuberculosis strains. Furthermore, Rao (1998) highlighted in his article on the risk factors for the spread of antibiotic-resistant bacteria, that non-adherence and insufficient dosage or duration of antibiotic treatment may promote bacterial resistance to an antibiotic.

Non-adherence could lead the prescriber to make an inappropriate change in the dose or the medicine for a patient, assuming that the patients are taking their medication but not getting better. This could cause not only a failure to achieve the health outcomes but also harm to the patients, for example, giving the patients a higher dose which could increase the risk of side effects (Martin et al., 2005).

## 1.5 Methods for measurement of adherence/non-adherence to medication

The extent of patient adherence to medication has been estimated using various methods, which fall into two main categories; direct and indirect measures. Direct measures are only applicable where medicines are consumed, whereas indirect measures only imply that medicines have been taken by the patients, although this cannot be ascertained. There is no single measure of medication adherence that is appropriate for all settings or outcomes (Vitolins et al., 2000). In order to employ assessment strategies for adherence, the reliability and validity of the measuring methods should be demonstrated (Vitolins et al., 2000), as all methods present their own problems of validity and reliability (Smith, 2002). Measuring adherence is a complex topic and researchers should be aware of the complexities of achieving valid and reliable assessments in whatever approaches and methods they select (Smith, 2002). Advantages and limitations of various adherence measures are discussed below.

### 1.5.1 Direct measures

#### 1.5.1.1 Objective physiological/biomedical measures

In this method, direct assays of the drug or its metabolite in the urine, blood, or other bodily excretions are compared with what is expected from strict adherence to a given regimen. The clinical examination could indicate that patients have been taking their medication (Boudes, 1998), for example: normalisation of the patient's blood

pressure with antihypertensive treatment (Schroeder et al., 2004) and disappearance of fever with antibiotic regimen (Gordis et al., 1969). When the clinical examinations do not show such an improvement in the patients' condition then non-adherence is suspected. Moreover, there could be some drug related effects, which give indications of medication adherence including bradycardia with beta-blockers, coloured urine with rifampin/rifabutin and increased micturition frequency with diuretics (Boudes, 1998).

This method may also involve the use of drug markers with the target medicines. These markers are chemically stable and nontoxic, which can be detected in biological medicine materials such as urine and blood (Boudes, 1998; Farmer, 1999). This method is accurate and objective (Boudes, 1998) but has some limitations such as the need for sophisticated formulation also data are limited to assessing only recent medication use and patients specific pharmacokinetic variation (Farmer, 1999).

This method could be useful especially for drugs with long half-lives, as it will indicate the administration of the medicine during the previous day or so. However, it has limitations such as being costly and invasive with the need for repeated blood collection from the patients. In addition, accuracy of the method is dependent on dose and timing, which can be sometimes misleading if patients take the medicine only just before clinic visits and are non-adherent at other, non-assessed, times (Boudes, 1998; Farmer, 1999; Haynes et al., 2002).

#### 1.5.1.2 Direct observable behaviour

Direct observable therapy (DOT) means that patients are directly observed receiving their medication, for example, intravenous infusion or injection. However, this method is intrusive, time consuming, labour intensive, and not accurate for measuring adherence to self-administered medicines where there is no supervision of patients (e.g. outpatient setting). Another limitation of this method is that patients could feign swallowing the medication and remove it from their mouth when they are no longer observed (Farmer, 1999).

Despite the limitations, DOT can be useful in certain situations when poor adherence creates major medical and social concern, for example, patients who are at high risk of being non-adherent to their tuberculosis medication which might be associated with the emergence of drug resistant bacterial strains (Boudes, 1998).

### 1.5.2 Indirect measures

#### 1.5.2.1 Health outcome

Health outcomes could be used to measure adherence, but it is considered an inaccurate measure. This method of measuring adherence is limited as there is no straightforward link between adherence and health outcome (DiMatteo et al., 2002). Clinical outcomes may be influenced by factors other than adherence to medication so therapeutic response alone should not be used to conclude that patients are taking their medication as recommended. For example, Becker (1985) explained that hypertensive patients may obtain lower blood pressure levels because of exercising, weight loss, or even reassurance from physician. Therefore, focusing on the outcomes might result in an incorrect evaluation of adherence to recommended regimen. On the other hand,

health outcome measures could be useful in identifying individuals who fail to achieve the treatment goals.

### 1.5.2.2 Pill count

Adherence can be measured using pill count method by counting the remaining pills in the medication containers and comparing that to what is expected if the patient had been taking the drug according to instructions (Smith, 2002). Although this method is useful in everyday practice and cheap, it has a number of limitations. For example, patients may not always return the medication bottles on request (Claxton et al., 2001) and they may not always keep their medicines in their original containers. Furthermore, the pill count method is intrusive and does not give an indication of whether the medication was taken or thrown away (pill dumping) and therefore the result may overestimate the adherence rate (Becker, 1985; Bosworth, 2006).

### 1.5.2.3 Electronic monitoring (EM) devices

Several types of electronic devices are available. The medication event monitoring system (MEMS$^{TM}$) is an electronic monitor that consists of a microprocessor located in the medication bottle cap with a switch that can be activated by the interruption of an electrical current. The microprocessor, when activated, records the time and the date the container was opened. These units can store several months of data before the need to be downloaded on to a computer. The MEMS$^{TM}$ provides information about the pattern of medication intake including the timing and frequency of medication dosing over a fairly long period of time (Bosworth, 2006).

Other electronic monitors, which have been used to measure medication adherence, are pill rings, aerosol spray nebulizers, tablet blister packs and eye drop

solution bottles (Farmer, 1999). Electronic monitoring devices have been further developed, for example, sending the medication patterns report to a provider via telephone and having devices not only record when a pill cap is open but are programmed to inform the patients that medication dosage is due through different methods (i.e. flashing light or noise) (Bosworth, 2006).

To date, medication adherence assessed by the electronic monitoring (EM) devices is the most accurate way of measuring adherence as both the date and time of actual dosing events is recorded (Claxton et al., 2001; Wetzels et al., 2006). For example, the information provided by electronic monitoring devices can determine whether the patient misses one dose of the daily recommended regimen or the patient misses doses sporadically (Farmer, 1999). The electronic devices detect poor adherence preceding the occurrence of a clinical endpoint and they also detect "white coat compliance", which is the increasing of adherence just before and after the patient's appointment with the health care provider (Boudes, 1998). Nevertheless, the method is not free of limitations, one of the limitations is that opening the electronic monitoring unit to remove a pill or release a spray does not mean that the dose was taken by the patient (Claxton et al., 2001; Partridge et al., 2002; Van Der Wal et al., 2005). In addition, these devices are relatively expensive and are not widely available (Bosworth, 2006).

#### 1.5.2.4 Prescription refills

Measuring adherence using pharmacy refills can be done by examining individual patient's pharmacy refill data after a period of follow up from a centralized pharmacy (Bosworth, 2006). This approach is practical and useful if the patients do not give their medicines to other people or stockpile them. Patients' refill reports contain

the date in which the medication stock will be finished and the patient is supposed to refill and collect the medicines: if the patient refills her/his medications irregularly, non-adherence is suspected (Bosworth, 2006). Non-adherence can then be estimated by calculating the number of days that the patient remained without medication supply. Adherence rates can be measured using this method without the patient's awareness, which increases the accuracy of the assessment by eliminating any Hawthorne effect (Partridge et al., 2002).

Assessing patients' adherence using prescription refill has some limitations. This method cannot confirm the patient's consumption of the drug as patients may refill on time but not take the medicines as recommended (Partridge et al., 2002; Bosworth, 2006). Also, pharmacy refill data have been used primarily to measure adherence in patients with chronic illness and may not provide an accurate assessment of medication adherence for a short period regimen such as TB (Bosworth, 2006). Furthermore, the patient's prescription record must be complete and included in the pharmacy in order to be used (Farmer, 1999).

#### 1.5.2.5 Self report

Self-report methods have been used to measure adherence to medications simply by asking the patients through patient-kept diaries, interviews or by using questionnaires that are completed by patients themselves or their providers (Farmer, 1999).

Patients' interviews have the advantages of the interviewer being able to clarify any ambiguities during the interview, more information can be collected, more complicated and detailed questions can be asked, response rate is higher with a friendly

interview than questionnaire and misinterpretations and inconsistencies can be checked. However, several studies reported that the patient interview method is unreliable for accurately measuring adherence (Inui et al., 1981; Straka et al., 1997). Furthermore, this method has limitations such as being expensive, time consuming, and a high potential for interviewer desirability bias with patients trying to provide favourable responses to impress the interviewers. In addition, it is inconvenient to be used for research involving a large number of patients.

Patient diaries require the patients to record how and when they take their medicines; therefore, it has the advantage of recording the events rather than asking them to recall their adherence retrospectively (Smith, 2002). Smith (2002) highlighted some of the limitations of this method as patients may not record events in certain cases such as when the events are so routine that actions go unnoticed, when the events are so rare that regular use of the diary is not established and when the event occurs at a busy time of the day. Other limitations include:

- It requires training and cooperation of the patients, as they must return the diaries (Farmer, 1999).
- It is not suitable for studies requiring large sample sizes (it will be difficult to follow, collect and analyse the diaries).

Self-report questionnaires have been used in many studies to measure medication adherence, as these are efficient and inexpensive. Self-report questionnaires are also quick and easy to administer, and can readily explain patients' behaviour (Farmer, 1999). They are also suitable for use in studies requiring a large sample. In the literature, there are various validated questionnaires used to measure patients' medications adherence with different medical conditions. Therefore, it might be more

useful to adapt a suitable questionnaire from the literature rather than developing one as developing, validating and norming of a new test or personal measure can take several years and needs a substantial amount of money for field testing and compiling technical information and norms. Also, adapting a test is usually cheaper and faster (Hambleton and Patsula, 1998). Smith (2002) argued that using validated questionnaires developed by others is time and resource saving, and allows comparisons among different populations. Nevertheless, questionnaires developed by others may require modification or additions in order to be used in a new setting and among different populations. This could affect the validity and reliability of an instrument, as they cannot be assured after the modification (Smith, 2002). Therefore, these issues must carefully be addressed to avoid any doubt in the value of the research.

Assessing adherence by using self-report methods is simple, the least equipment intensive and most useful in daily clinical practice, however it is limited by patients' memory. In addition, it is limited by several other problems, which were highlighted by Horne et al (2005), and these include:

1. The wording of the questions may present problems. For example, one item in Morisky 4-item questionnaire (Morisky et al., 1986) described non-adherence as "careless" behaviour, which could be perceived as judgmental and patient may be more reluctant to admit non-adherence behaviour.
2. Patients may exaggerate their adherence if they believe that reporting non-adherence will affect the delivery of their healthcare by their healthcare providers.

Although self-report method was criticised for overestimating the levels of adherence (Dodds et al., 2000), it is believed that patients who report poor adherence to treatment are more likely to be telling the truth (Farmer, 1999; Haynes et al., 2002). This suggests that self-report might be helpful in detecting non-adherence. Despite self-report methods limitations, it continues to be the most common adherence used measures (Hamilton, 2003).

## 1.6 Factors affecting patient's adherence to medication

A review by Haynes (1976) suggested that more than 200 variables have been studied in relation to adherence, although none of them consistently predicted non-adherence. These variables will be discussed in more detail in this section and will be categorised into: patient related factors, treatment related factors, healthcare provider related factors and health system related factors.

### 1.6.1 Patient related factors

#### 1.6.1.1 Demographic factors

This includes variables such as socioeconomic status, age, marital status, gender, education, number in the family household and ethnicity. Studies suggested that these variables have a poor indication on the level of patient's adherence (Vermeire et al., 2001). Many other studies have attempted to investigate the correlations between demographic factors and non-adherence to treatment; however, findings are too inconsistent to allow accurate conclusions to be made. An earlier review by Haynes (1976) concluded that there was no association between these factors and adherence to treatment.

### 1.6.1.2 Economic factors

This is most applicable for patients with low income and limited resources in less developed countries. It is also an issue in developed countries – particularly the USA where a large proportion of non-adherence is due to cost. People with health insurance may be underinsured and cannot afford to pay for prescription medications. Many others do not have any health insurance and cannot afford the entire out-of-pocket costs for prescription medications (WHO, 2003; Bosworth, 2006). A study by Elzubier et al (2000) showed that inability to buy drugs was one of the main reasons for non-adherence to antihypertensive medication in Sudan. In addition, direct medication cost has been related to non-adherence to medication in patients with diabetes (Piette et al., 2004) despite their apparent ability to afford treatment. Although, these findings do not explain a cause-effect relationship between cost and non-adherence, it is indicative of a link.

### 1.6.1.3 Medical Condition

The medical related factors, which have been studied in relation to adherence to medication, are the level of disability, severity of the symptoms, diagnosis, progression of the disease, previous hospitalisation, length of stay in the hospital and recency of the last attack (Haynes, 1976; WHO, 2003). In a review of studies, Haynes (1976) suggested that the findings of studies focusing on these variables were inconclusive. However, there were two exceptions including disease severity and diagnosis. In Zambia, a study by Kaona et al 2004 found that the most significant factor contributing to non-adherence was patients feeling better before completing treatment. This might be due to the reduction of symptoms acting as cues of illness (Sumartojo, 1993). As per diagnosis, adherence was lower among patients with psychiatric diagnosis than patients suffering from organic diseases (Haynes, 1976; Vermeire et al., 2001). Diagnosis of

depression has been shown as a serious risk factor on patient adherence (DiMatteo et al., 2000). The risk of non-adherence is 27% higher if a medical (chronic) patient is depressed (Martin et al., 2005). This could be due to the fact that depression often causes withdrawal from social support and cognitive impairment, which might result in reducing the ability and willingness to follow the recommended treatment (Martin et al., 2005).

#### 1.6.1.4 Social Factors

Social support, from family members, friends and other significant people, has an established role in improving patients' treatment adherence. Results from a meta-analysis of 122 studies provided evidence that social support had a positive impact on patients' adherence to their treatment (DiMatteo, 2004b). This substantial effect was shown particularly with functional support (e.g. emotional, practical/instrumental and family cohesion) as adherence was 1.74 times higher in patients coming from cohesive families, compared to 1.53 times lower rate of adherence in patients who had conflict families. Structural support (e.g. living arrangement and marital status) had a lower impact on adherence than functional support. Despite the direct and indirect positive effect of social support on patients' adherence to their treatment the mechanisms by which it occurs is quite complicated and not fully clear (DiMatteo, 2004b).

#### 1.6.1.5 Cognitive Factors

One of the factors, which has been shown to have an impact on patients' adherence, is their ability to understand or read the medical information (Martin et al., 2005). Language barriers also reduce patients' understanding of the medical information: many patients may understand the language but still not comprehend the medical instructions (Martin et al., 2005). A study of 3260 elderly patients in the USA

(65 or older); of which 2956 spoke English and 304 spoke Spanish as their native language, showed that 34% of English-speaking and 54% of Spanish-speaking respondents had inadequate or marginal health literacy (Gazmararian et al., 1999). The same study showed that respondents with inadequate functional health literacy often misread information regarding the results of blood sugar tests, simple prescription instructions and the simplest reading comprehension passage with instructions for upper gastrointestinal tract radiographic procedure preparation. Respondents with marginal health literacy performed better but showed poor understanding of instructions for taking medication on an empty stomach, poor comprehension of blood glucose tests and poor Medicaid rights and responsibilities reading a comprehension passage.

Another factor influencing adherence is the ability of the patient to remember the details of the medical recommendations given to him/her by the health care provider (Shemesh et al., 2004; Zaghloul and Goodfield, 2004). It has been shown that some patients forget 56% of the information after leaving the clinic visit (Martin et al., 2005). Anxiety also has been shown to lower the patient's level of medical information recall, which increases the risk of non-adherence (Martin et al., 2005).

### 1.6.2 Treatment Related Factors

Factors related to treatment include: type of medication, dosage, use of safety dispenser, degree of behavioural change required, duration, cost, complexity, side effects, formulation and packaging of the medicine and intrusiveness are features of treatment regimen that have been studied in relation to non-adherence (Haynes, 1976; Meichenbaum and Turk, 1987; Horne, 2001), with degree of behavioural change required, complexity and duration of treatment being the most widely assessed. More details will be provided in the following subsections.

### 1.6.2.1 Degree of behavioural change required

Studies showed that there is a problem with adherence when the patient is required to adopt a new habit such as taking medication, but highest levels of non-adherence are found when people are asked to change a dietary or personal habit such as smoking or drinking alcohol (Haynes, 1976; Martin et al., 2005). For example, Dishman (1982) showed that participants' dropout rate in clinical exercise settings exceeded 50% within the first six months of the initial program. In addition, in the treatment of diabetes, adherence to diet and exercise was found to be more difficult than adherence to medicines (Vermeire et al., 2003).

### 1.6.2.2 Duration of therapy

Studies reported inconsistencies in findings regarding the impact of duration of therapy on adherence to medication. Rizzo and Simons (1997) studied adherence among hypertensive patients to different classes of drug. This study found that adherence was strongly affected by the duration of antihypertensive therapy. Haynes (1976) reviewed 11 studies, which assessed the association between adherence to medication and duration of therapy. Six studies found a negative association whereas five found no relation. However, Haynes argued that this lack of association in the five studies could have been due to a bias in the sampling strategies because only patients with on-going treatment were sampled.

### 1.6.2.3 Complexity of the medical regimen

Many studies have shown that the complexity of the medication regimen has a negative influence on the rate of patients' adherence to their recommended medication. This is unsurprising, as one would expect that the harder the treatment regimen gets, the more difficult it is for the patients to adhere to it. Cramer (1999) reported that increasing

the frequency of the daily dose results in a decrease in the rate of patient's adherence to the medication. In addition to the frequency of medications, the number of medications was also associated with an increased rate of non-adherence. A review of 76 studies investigated adherence in a variety of disorders and the result showed that the rate of adherence decreased as the number of daily doses increased (Claxton et al., 2001). Adherence was 79% to once daily dose, 69% to twice daily doses, 65% to three time a day doses, and 51% to four times a day doses. This suggests that more care should be given to elderly people as they might be at higher risk of non-adherence because many of them have multiple comorbidities and are on multi-medications (WHO, 2003; Bosworth, 2006).

### 1.6.3 Health Care provider related Factors

Patients' treatment adherence can be influenced by their relationship with the treating physicians. It has been argued that four aspects of physicians' behaviours could have an impact on patients' treatment adherence including: communication, sharing responsibilities with patients, activating patient self-motivation and compassion (Coleman, 1985). However, communication between physicians and patients appears to be the most studied aspect in relation to patients' medication adherence. Patients' level of trust in their physicians and good communication between them has been shown to increase patient satisfaction and lead to a positive health outcome (Martin et al., 2005). Stevenson et al (2004) reported that communication between health care professionals and patients could impede as well as enhance patient involvement.

Adopting a style of patient centred communication appears to improve patients' treatment adherence. Michie et al (2003) in a review of studies reported a positive association between a patient-centred approach in consultation and treatment adherence

in 11 of 15 studies. Also, a study by Clifford et al (2006) showed that patient-centred advice delivered by pharmacists to patients who were starting new medicines for chronic conditions was significantly associated with improvement in patients' adherence to their medication. Alexander et al (2006) argued that it is likely that improving communication with patients will lead to change in patients' beliefs and attitudes, an increase in their understanding, knowledge and motivation, which helps in encouraging them to be actively engaged in their healthcare including adherence to their medicines.

### 1.6.4 Health System Related Factors

Little research has studied the effect of organisational factors on adherence to treatment. There are many factors that have a negative effect on adherence, these include: poor medication distribution systems, poorly developed health services with inadequate or non-existent reimbursement by health insurance plans, overworked health care providers, inability to establish community support for the patients, short consultation time, weak capacity of the system to educate patients and provide follow-up, lack of knowledge on adherence and effective interventions for improving it, lack of knowledge and training for health care providers on managing chronic diseases and lack of incentives and feedback on performance (WHO, 2003).

Munro et al (2007) in a review of 44 qualitative studies on adherence to tuberculosis treatment found that factors related to the provision of health care services emerged strongly in the studies. Flexibility and choice in treatment, and options that maintain patient autonomy in treatment taking, appeared to run contrary to the traditional organisation of many TB services. These problems were exacerbated by program failures, such as inadequate supplies of drugs reported in four studies and

difficulties in consulting providers, which was reported in six studies. In two studies, DOT at a health care facility often meant that patients had to give up part of their working day to attend the clinic. However, responsibilities in providing for their family may be given priority over treatment adherence by patients. Other health care service factors, such as long waiting times and inconvenient opening times in clinics, add to economic discomfort and social disruption for patients, and negatively influence adherence (Munro et al., 2007).

## 1.7 Explanatory models applied to adherence/non-adherence

This section includes the review of the models or theoretical approaches that have been most widely used to explain and predict patient's adherence behaviours. This section will describe each of these models, review empirical evidence for the model and review their application to treatment adherence.

### 1.7.1 Social cognitive models (SCM)

Social cognition is concerned about how individuals can make sense of their social situations. It focuses on individual thoughts or cognitions as processes, which intervene between responses in particular real world situations and observable stimuli. The social cognition models give a basis for understanding the determinants and the process of behaviour change. These models also provide important targets, which interventions designed to change behaviour might focus upon if they are to be successful. The health behaviours are assumed to be the end result of a rational decision making process based on the systematic, and deliberative processing of the available information (Conner and Norman, 2005).

Most of these models assume that decisions and behaviours are both based upon elaborate, but also subjective, cost-benefit analysis of the likely outcomes of the specific action (Conner and Norman, 2005). For example, patients take medication based on their belief that this will improve their health and result in particular outcomes, which are important to them (Horne and Weinman, 1998). Social learning theory (Rotter, 1954) suggests that individuals undergo several mental processes in order to form a particular behaviour; these mental processes include problem solving and decision making. Most of the theories, which have been applied to treatment adherence, have social cognitive (learning) theory roots (Bosworth and Voils, 2006).

There are different social cognitive models; the five most commonly used models to predict health behaviours include the health belief model, locus of control, self-efficacy theory, the theory of reasoned action/planned behaviour, and protection motivation theory (Conner and Norman, 2005; Bosworth and Voils, 2006).

#### 1.7.1.1 The health belief model (HBM)

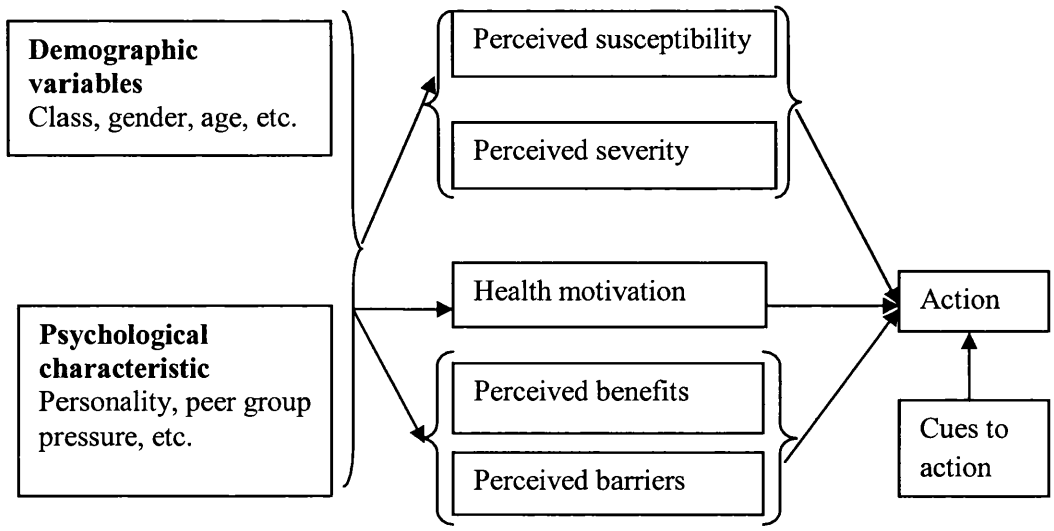
The health belief model was one of the earliest SCMs, developed by Rosenstock (1966) and was originally developed to explain the individual's failure to participate in disease prevention or screening tests before the onset of symptoms (Bosworth and Voils, 2006). The original model proposed that the likelihood of one engaging in a particular health behaviour (e.g. attending a specific screening test) was a function of the belief about the perceived threat of the illness and the risk/benefit assessment of the recommended course of action. Perceived threat is a combination of perceived severity of the disease and susceptibility to it. Becker and Maiman (1975) further modified the model to include components based on the assumption that stimulus or cues to action must occur to trigger the behaviour. The model has been revised several times and more

variables were included such as motivation towards health (Becker et al., 1977; Horne and Weinman, 1998) (See Figure1.1).

The HBM has been applied to investigate adherence to recommended treatment. This included adherence to diet, dental health behaviour, breast self-examination as well as adherence to medicines (Horne and Weinman, 1998). Adherence to medication has been studied using this model across a range of conditions such as psychiatric disorders (Kelly et al., 1987), diabetes (Daniel and Messer, 2002) and hypertension (Kirscht and Rosenstock, 1977).

Although, the value of the HBM has been demonstrated in many studies, there have been several limitations of this model (Sheeran and Abraham, 1996; Horne and Weinman, 1998). One of the limitations is that the HBM simplifies the health related cognitions into broad constructs like "barriers" and "benefits" without specifying the underlying beliefs of these constructs. Another limitation is that the model does not include an intention stage between the individual's beliefs and their behaviour, and it does not specify the relationship between different social factors (group norms and social support) on the individual's health related behaviour. In addition, the HBM suggests that health behaviours arise from a single decision made by patients based on a cost benefit analysis, however health behaviours are likely to be more complex than a one-off decision. Moreover, the definitions of the main constructs of the model were left open to debate, leading to large inconsistencies in the operationalisation and conceptualisation of the HBM model across different studies.

***Figure 1.1: The Health Belief Model (taken from Sheeran and Abraham, 1996)***




### 1.7.1.2 Locus of Control (LC)

Locus of control theory was developed by Rotter (1966) to denote the extent to which individuals have expectancy beliefs for particular situations and also generalised expectancies, which cut across situations. That is why, the locus of control was introduced as a generalised expectancy that relates to the perceived relationship between individuals' actions and experienced outcomes. The construct of locus of control has two dimensions: internal and external. Internal locus of control is where the individual believes that the events occurred as a result of their own action and that they had personal control over it, whereas external locus of control is when the individual believes that the events are determined by other factors, which are beyond their personal control such as chance, fate and luck.

Wallston et al (1976) used the concept of locus of control and applied it to health; this was done by developing a scale of health locus of control (HLC) which still had two dimensions (internal vs. external). This measure was revised later and further extended to form the multidimensional health locus of control scale (MHLC). Control

beliefs are divided into three different scales: an internal scale, and two external scales. The two external scales are: a) the influence of fate or chance and b) the external control which is exerted by powerful others (Levenson, 1973). A later revision of MHLC was developed by Wallston et al (1994) which further divided the powerful others into two independent scales: doctors and powerful others. Similar to HLC, both versions of MHLC assumed that internals should be more likely to engage in health promoting activities. Studies of LC and adherence have produced mixed findings; some observed no relation between the HLC constructs and adherence (Christensen et al., 1997; Bane et al., 2006; Lynam et al., 2009), whereas others that have used the MHLC have observed significant associations between high internal LC and adherence (Stanton, 1987; Hong et al., 2006). Moreover, in some cases high powerful others scale has been shown to be independently related to better adherence (Myers and Myers, 1999).

Overall, it was found that HLC is relatively weak in predicting health behaviour including adherence to medication, accounting for a small number of variance explained by the HLC construct (Norman and Bennett, 1996).

#### 1.7.1.3 Self-efficacy model (SE)

The concept of perceived self-efficacy was introduced by Bandura (1977). It refers to one's confidence in the ability to perform a behaviour, therefore, it is not sufficient to know what to do but an individual should be confident in being capable of performing a particular behaviour. This model suggests that individuals with a strong sense of personal efficacy have better health, higher achievement and more social engagement and integration. Self-efficacy consists of two components: self-efficacy (individual perception of their ability to reach a specific level of performance) and outcome efficacy (individual's evaluation of the predicted outcome of a particular

behaviour). Bandura's theory suggests that both self and outcome efficacy beliefs are important in modifying health behaviour, in which individuals with high self and outcome efficacies are more likely to perform health related behaviours.

The relationship between perceived self-efficacy and adherence to recommended health related behaviours were demonstrated in some studies. Some studies found that greater self-efficacy predicted better adherence to medication (Skelly et al., 1995; Aljasem et al., 2001; Van Es et al., 2002; Molassiotis et al., 2002), whereas others found no association between self-efficacy and adherence to medication (Chlebowy and Garvin, 2006).

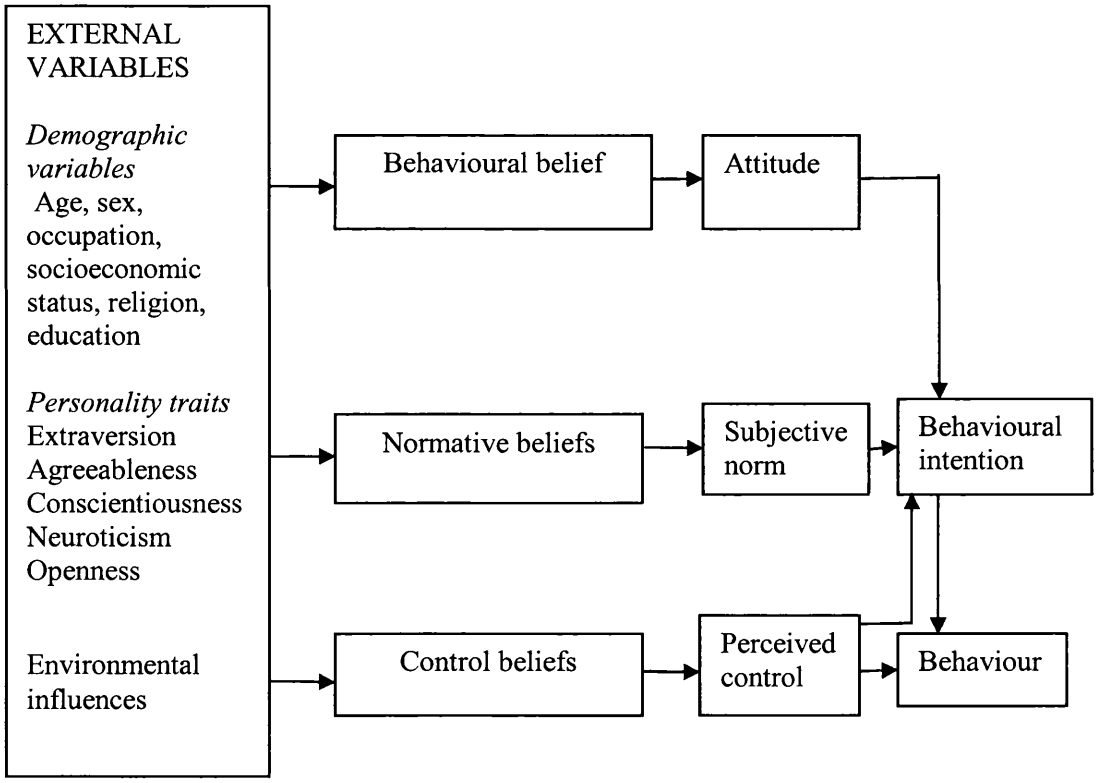
In general, self-efficacy was originally developed within Bandura's social cognitive theory, but it became highly appealing to health psychologists and was later incorporated into most theories of health behaviour such as protection motivation theory, health belief model and theory of reasoned action, but under different named constructs. The inclusion of a self-efficacy type construct has been shown to enhance the ability to predict different preventive health behaviours (Schwarzer and Fuchs, 1996).

### 1.7.1.4 Theory of Reasoned action (TRA)/Theory of Planned Behaviour (TPB)

The theory of reasoned action (TRA) was developed by Fishbein and Ajzen in 1975. It suggested that behaviour depends on people's intention to be engaged in such behaviour. Intention is determined by attitude towards the behaviour (individual's belief about the likely outcomes and the value of these outcomes) and subjective norm concerning the behaviour (individual belief of how others feel about the behaviour and the motivation to support these views) (Fishbein and Ajzen, 1975).

The theory of planned behaviour is an extension of the theory of reasoned action (Ajzen, 1991). Two behaviours were added to the TRA to form the TPB: perceived behavioural control (PBC) and perceived barriers. PBC is described as the extent to which individuals feel that their behaviour is within their control. This depends on individual control beliefs such as perception of external resources (such as perceived barriers) and internal resources (such as information or skills) as seen in Figure 1.2 (Ajzen, 1991; Conner and Sparks, 2005).

***Figure 1.2: Theory of Planned Behaviour (taken from Conner and Sparks, 2005)***




In the TPB, the influence on behaviour is exerted indirectly by attitude and subjective norms via their effect on intention, whereas PBC has a direct effect on behaviour and also an effect on intention (Horne and Weinman, 1998). The theory of planned behaviour suggests that if individuals have a positive attitude and subjective norms towards their behaviour, they perceive better behavioural control and therefore,

have stronger intentions to perform their behaviour. Moreover, individuals with stronger intentions have greater perceived behavioural control and are more likely to perform that behaviour.

Studies applied TRA and TPB to a range of health related behaviours including adherence to medication. Some of these studies proved that components of TRA and TPB have been useful in predicting patient's adherence to their medication in hypertension (Reid et al., 1985), urinary tract infections (Reid and Christensen, 1988) and malaria (Abraham et al., 1999). Although TRA/TPB has the advantage of incorporating an intention stage between cognitions and behaviour and accounting for the social factors role in predicting behaviour, it has been faced with many criticisms. One of the criticisms is that it explains only rational thoughts and does not account for irrational thoughts or fears. Furthermore, it does not consider personality-related factors and also does not incorporate the influence of individuals' past behaviour on their future behaviour (Conner and Armitage, 1998; Conner and Sparks, 2005).

#### 1.7.1.5 Protection Motivation Theory (PMT)

Protection motivation theory was developed by Rogers (1975); it was developed as a framework to understand the impact of fear appeals (messages that use fear to persuade) on behaviour (Rogers, 1975). The theory initially consisted of three components including the extent of noxiousness of a depicted event, the probability of that event to reoccur and the extent of the efficacy of a protective response against the events. It was suggested that each of these components initiates corresponding cognitive appraisal processes, which mediate the behaviour change.

Rogers later revised this model and extended the model to a more general theory of cognitive change, which could be used to understand the decision-making process in relation to health threats. PMT described adaptive and maladaptive coping with a health threat as a result of two different appraisal processes which are threat and coping appraisal, in which the behavioural choices to overcome the threat are evaluated (Boer and Seydel, 1996).

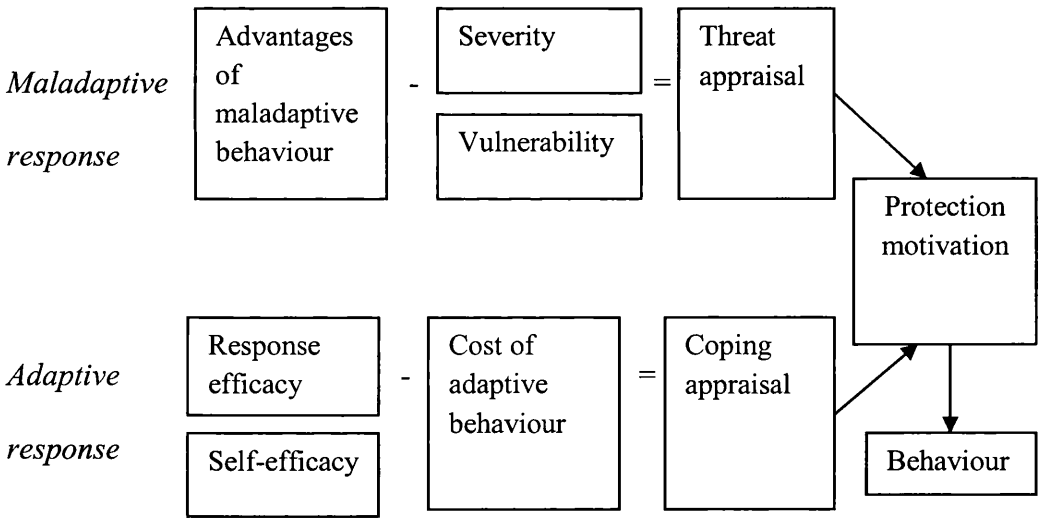
Threat appraisal involves perceived vulnerability, severity and fear of the threat. Therefore, individuals are more likely to have an intention to perform a recommended behaviour if they believe they are susceptible to the threat, the threat is severe, and they are fearful of the threat (Bosworth and Voils, 2006). However, coping appraisal also involves self-efficacy, response efficacy and response costs. Self-efficacy refers to how capable the individual feels to perform a recommended behaviour; response efficacy is a person's belief about the efficacy of the behaviour in reducing the health threat; and response costs refer to one's beliefs about how costly the recommended response will be. According to the theory, an individual will be more likely to adopt a behaviour if she/he believes that she/he is capable of performing the behaviour, the behaviour will effectively reduce the health threat, and the recommended response is not costly (Bosworth and Voils, 2006).

The PMT can be considered a hybrid theory as three of its components originate from the health belief model (i.e., vulnerability, severity and response efficacy), while other components originate from the social learning theory (i.e., self-efficacy, outcome efficacy) (Boer and Seydel, 1996). PMT incorporates the view that threat and coping appraisal both influence intentions to perform behaviour. However, they may also lead to maladaptive coping responses, which may influence behavioural intentions. These

responses occur when following the recommended behaviour does not reduce fear, or when a person receives a fear-arousing message but there is no suggestion of any recommended behaviour to reduce this fear (Bosworth and Voils, 2006). See Figure 1.3.

Although PMT has been applied to a number of health related behaviours such as smoking, reducing dietary fat, decreasing substance use, use of condoms and breast self-examination, its applications to adherence to medications has been limited (Bosworth and Voils, 2006). Nevertheless, it has been used to predict medication adherence in asthma (Bennett et al., 1998) and diabetes (Palardy et al., 1998).

***Figure 1.3: The Protection Motivation Theory (taken from Boer and Seydel, 1996)***

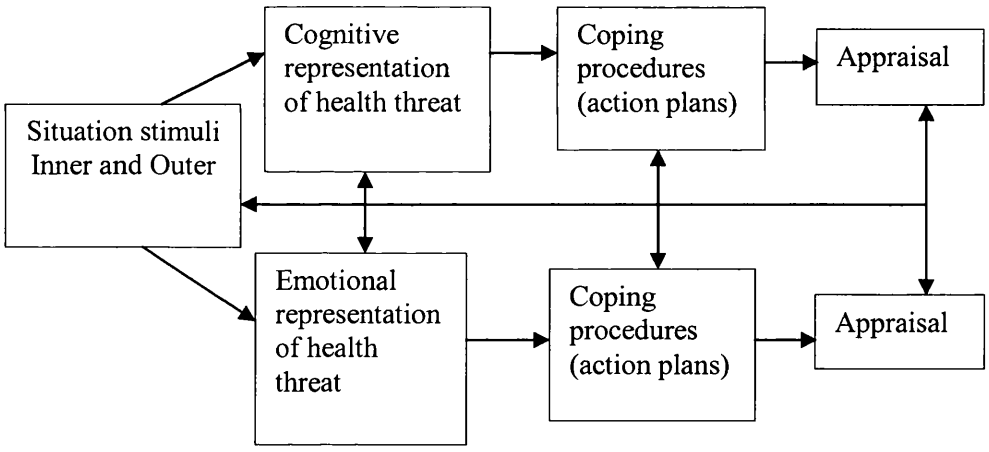



### 1.7.2 Self Regulatory Model (SRM)

The Self Regulatory Model of illness was developed by Leventhal and his colleagues (Leventhal et al., 1992). The SRM is shown in Figure 1.4. Leventhal and colleagues have developed a framework for understanding the self-regulation processes by which people make sense of their illness experience. The self-regulation processes are dynamic as feedback from appraisals of coping efforts influence cognitive

representations, emotional responses, and further coping efforts (Leventhal et al., 1992). This model assumes that patients use their common sense (cognitive) representations and emotional representations for developing coping procedures to manage health threats (Leventhal et al., 1998). The model suggests that illness representations are structured around five components, which include: identity (the label and perceived symptoms of the illness); the perceived cause of the illness; the timeline or whether the illness is expected to be chronic, episodic or acute; the perceived consequences of the illness for the person's life (e.g. loss of independence) and the beliefs about the controllability/curability of the illness (Leventhal et al., 1992).

***Figure 1.4: The Self Regulatory Model (taken from Leventhal, 1993)***




Non-adherence to medication can be understood using SRM, as the decision about whether to adhere could be considered one of many possible ways of coping with a disease or illness threat. For example, if patients recognise that they have a headache (representation), the patient may decide to ignore it (cope), they might realise that it is not going away (evaluate), then the patient takes a painkiller (re-enter coping stage), and finally feel better (re-evaluate). One of the advantages of this model is that it does not describe the interaction between cognition and behaviour as a single 'one-off' decision

but as a dynamic process, where patients analyse the cost-benefit of taking the medicine and adjust their beliefs and behaviour according to this analysis (Horne and Weinman, 1998).

Leventhal et al (1992) argued, "The self regulative perspective of the common-sense model gives a deeper understanding of adherence problems and that it's more suitable for practical applications than other models". A number of studies have based their research on the theoretical construct of the self-regulatory model across a range of illnesses including rheumatic disease (Pimm and Weinman, 1998), asthma (Clark et al., 2001), hypertension (Meyer et al., 1985) and myocardial infarction (Walsh et al., 2004).

The Illness Perception Questionnaire (IPQ) (Weinman et al., 1996) was developed to operationalise the five components of the representation of health threat element of the SRM (identity, cause, consequences, timeline and cure/control). A number of issues emerged after using the IPQ, which were addressed in the creation of the Revised Illness Perception Questionnaire (IPQ-R) (Moss-Morris et al., 2002). Mainly, it was hoped that the IPQ-R would improve internal consistency of certain scales, namely cure/control and timeline. Therefore, a cyclical timeline component was added, distinct from the acute/chronic timeline component. The cure/control scale was divided into two components, personal control and external control, or outcome expectancies. In addition, IPQ-R included emotional representations measured in the same manner as the other components; this was not operationalised in the original IPQ. In addition, a further component of illness coherence scale was added to identify whether the patient can make sense of their illness. The IPQ-R has demonstrated good internal reliability with Cronbach alpha values ranging from 0.79 to 0.89 (Moss-Morris et al., 2002). However, the IPQ-R is a long questionnaire as it has over 80 items and

makes it of limited use in some situations, for example, when patients are very ill or when there is limited time for the study (Broadbent et al., 2006).

The IPQ and IPQ-R were used by researchers to operationalise the SRM. In regards to adherence research, adherence to a specific activity such as adherence to medication was assessed using the SRM. This was done by assuming that medication adherence is a form of coping or an outcome and that the SRM may be operationalised using these measures. Studies across a range of illnesses assessed medication adherence in relation to illness perceptions using the IPQ or IPQ-R including asthma (Horne and Weinman, 2002; IPQ), diabetes mellitus (Law et al., 2002; IPQ-R), HIV (Johnson and Folkman, 2004; IPQ-R) and hypertension (Ross et al., 2004; IPQ-R).

In addition, a shorter questionnaire was developed which is the brief IPQ scale (Broadbent et al., 2006). This is more useful for patients who are elderly or very ill because it would be less taxing and much quicker to complete. In addition, it will be more useful to those who are limited in their writing and reading ability. Furthermore, the brief IPQ could be especially useful when illness perceptions are measured as one part of a larger set of psychological constructs and in large population based studies (Broadbent et al., 2006).

The SRM was criticised for being of little use when the cognitive representation of a threat is low (Bosworth and Voils, 2006), for example, in an asymptomatic chronic disease like hypertension where there is a silent impact on health and therefore the perceived illness threat is low. However, studies have shown that hypertensive patients believe that they can tell when their blood pressure is high and that these beliefs are strongly associated with their reported symptoms (Baumann and Leventhal, 1985). In

addition, some studies used the SRM and reported an associations between identity and adherence as hypertensive patients did perceive symptoms of their illness (Meyer et al., 1985; Theunissen et al., 2003). This could be explained as that the SRM does not seek to measure actual symptoms necessarily but symptom perceptions.

### 1.7.3 Beliefs about medicines

Horne and Weinman (1999) suggested that the strength of the SRM to explain adherence could be improved by extending it to include beliefs about prescribed medication. Horne (1997) suggested that decisions about taking medicines are likely to be informed by beliefs about the medication as well as beliefs about the illness they are intended to treat or prevent. The beliefs about medicines questionnaire (BMQ) was developed as an aid to understanding patient's perceptions about their medicines (Horne et al., 1999). The BMQ has a general and a specific subscale. The general BMQ measures the beliefs people have about medicines in general, whereas the specific BMQ measures the beliefs people have about their prescribed medicines. The general BMQ consists of twelve statements and divided into three separate subscales including: General-Harm, General-Overuse and General-Benefit. The specific BMQ is divided into Specific-Concerns and Specific-Necessity subscales.

The use of the necessity-concern framework in explaining adherence to treatment has been shown across different chronic illness conditions such as hypertension (Horne et al., 2001; Ross et al., 2004), asthma (Horne and Weinman, 2002), haemophilia (Llewellyn et al., 2003) and HIV (Gonzalez et al., 2007; Horne et al., 2007).

A study by Horne and Weinman (1999) found that patients' perceptions about the necessity of their medications weighed against their concerns about potential adverse effects were related to their adherence to medicines. This study involved 324 patients from four different chronic disease groups (renal, asthma, cardiac and oncology). Patients who had a higher belief in the necessity of taking their medicines had higher reported adherence, whereas patients who had higher concerns regarding their medicines had lower reported adherence. Furthermore, stepwise multiple linear regression analysis showed that beliefs about medicines accounted for 19% of the explained variance in adherence, and were more powerful predictors than sociodemographic or clinical factors.

Furthermore, a review of qualitative studies (Pound et al., 2005) revealed patients have a widespread caution about taking medicines mainly due to adverse effects. Other commonly concerns held by patients included worries about dependence, addiction and tolerance, the possibility of medicines masking other symptoms and the potential harm from taking medicines on a long-term basis. In some cases, medicines had a significant impact on identity, presenting problems of disclosure and stigma. This review found that patients either accept their medicines actively or passively, or reject them. Many active accepters modified their regimen to reflect a desire to minimise the intake of medicines and this was echoed in some patients' use of non-pharmacological treatments to either supplement or supplant their medicines. The review concluded that the main reason why patients do not take their medication as prescribed is not because of failing in patients, doctors or systems, but because of patients' concerns about the medicines themselves.

### 1.7.4 Transtheoretical Model of Change (TMC)

The TMC is one of the stage models of health behaviour and was developed by Prochaska and DiClemente in 1984. In this model, people can move through different stages of change and this can be cyclical e.g. people can relapse and return to an earlier stage. Although TMC has been used with different health behaviours, such as diet, condom use, exercise, drug abuse etc., much of the original and continuing studies on the model have focused on initiation and cessation of addictive behaviours, particularly smoking (Prochaska et al., 1992; Prochaska et al., 1993; Prochaska et al., 1994).

The model suggested that health behaviour change occurs in different stages, not as a result of a single one-off decision. The three organising constructs of the model include: the stages of change, the process of change and the levels of change.

1. The stages of change consist of six different stages. These reflect the patient's readiness to change the problem behaviour. According to this model, a patient can successfully change their behaviour if they move through the six stages. The six stages of change are precontemplation, contemplation, preparation, action, maintenance and termination where the patient no longer has the problem behaviour.

2. The process of the change, this takes place as individuals move through the six stages of change. This is divided into ten different processes. The first five processes are cognitive (consciousness raising, dramatic relief, environmental revaluation, self re-evaluation and self-liberation) and the other five processes are behavioural (counter conditioning, helping relationships, reinforcement, stimulus control and social liberation).

3. The level of change includes five different levels, and these are:

- Changes related to symptoms or situation.
- Changes related to maladaptive cognition.

- Changes related to interpersonal problems.
- Changes related to family problems.
- Changes related to intrapersonal conflicts.

The use of TMC in practice is limited as there is some concern about the validity of the assessments of the different stages within the theory (Bosworth and Voils, 2006). A review of studies (Ficke and Farris, 2005) identified 11 articles including TMC and drug use in the last 10 years; however, only five had empirical applications. The results showed that there were two types of applications of this model in medication use: 1) measurement of stage of change regarding adherence and 2) prediction of adherence using the model concepts. 1 and 2-item measures of adherence stage of change have been validated in two different studies. The studies showed that medication adherence stage of change varied by type of drug. In two studies, the pros and cons of medication taking and stage of change were useful in predicting adherence. However, the authors concluded that TMC has not been used extensively to examine medication adherence and without further research, no clear recommendation can be provided as the effectiveness of the model in improving adherence.

To conclude, theories of social psychology have been widely used to explain and predict patients' medication adherence behaviours. However, the evidence supporting the use of these theories is mixed and there is still no single theory that would perfectly address the complexity of medication non-adherence problem.

# CHAPTER 2 NON-ADHERENCE TO MEDICATION IN HYPERTENSION

## 2.1 Prevalence of hypertension and non-adherence to antihypertensive medicines

Hypertension is a major health problem throughout the world due to its high prevalence, and patients with hypertension are more prone to developing serious conditions such as cardiovascular disease. In industrialised countries, advances in the diagnosis and treatment of high blood pressure have played a major role in recent dramatic declines in coronary heart disease and stroke mortality (WHO/EMRO, 2005). However, in the last few years, the control rates for high blood pressure in many of these countries have reduced. In the UK, the latest prevalence statistics for England were provided by the National Quality and Outcomes Framework statistics for England 2007/2008 (The NHS Information Centre for Health and Social Care, 2008). It reported that the raw prevalence (number on clinical register/number on practice list * 100) for hypertension in England was 12% in year 2005/2006, 12.5% in year 2006/2007 and 12.8% in year 2007/2008.

Worldwide, the overall prevalence of raised blood pressure in adults above the age of 25 years was around 40% in 2008 (WHO, 2011). The proportion of the world's population with high blood pressure or uncontrolled hypertension fell modestly between the years of 1980 to 2008. However, because of population growth and ageing, the number of people with uncontrolled hypertension rose from 600 million in 1980 to 1 billion in 2008 (WHO, 2011). In the Eastern Mediterranean region, the prevalence of hypertension is 29% and it affects approximately 125 million individuals (WHO/EMRO, 2005).

Non-adherence to prescribed antihypertensive medicines has been notoriously poor (Svensson et al., 2000). A report of adherence to pharmacotherapy for

hypertension by WHO (2003) has estimated that 30-50% of hypertensive patients do not adhere to their prescribed regimen. Studies have reported different rates of non-adherence to antihypertensive medications. For example, a study by Okano et al (1997) estimated the rate of non-adherence to be 48%. Another study investigated the discontinuation of the antihypertensive medication and reported the non-adherence rate of approximately 24% (Christensen et al., 1997). Caro et al (1999) studied the rate of persistence to antihypertensive medication including β blockers, diuretic, angiotensin converting enzyme (ACE) inhibitor and calcium channel blocker in newly diagnosed hypertensive patients over the first year of treatment. The result after 6 months showed poor persistence with therapy which differed according to the initial therapeutic agent, it was 89% for ACE inhibitors, 80% for diuretics, 86% for calcium channel blockers and 85% for β blockers. In general, there is evidence that patients' adherence to medication for hypertension is sub-optimal worldwide.

## 2.2 Association between adherence to medication and blood pressure control, cardiovascular outcome and other outcomes

Hypertension is a chronic disease that causes a major health problem. Non-adherence with prescribed antihypertensive medications is a central reason for the failure to control hypertension in patients who are receiving treatment (Sharkness and Snow, 1992; Nuesch et al., 2001; O'Rorke and Richardson, 2001). High levels of non-adherence as reported in section 2.1 are of tremendous concern, given the serious consequences of uncontrolled hypertension on cerebrovascular, cardiovascular, and renal morbidity and mortality (Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, 1997). In addition, many studies highlighted that controlling blood pressure is important in reducing the risk of cardiovascular disease (Williams et al., 2004), dementia (Forette et al., 2002), and in

slowing the progression of renal disease in patients with proteinuria (Peterson et al., 1995). Moreover, hypertension contributes to the prevalence of other cardiovascular risk factors such as lipid abnormalities, changes in renal function, insulin resistance, endocrine abnormalities, obesity, diastolic dysfunction, left ventricular hypertrophy and abnormalities in vascular structure and elasticity (Munger, 2000).

A trial showed that using a combination of antihypertensive medicines (β blockers and diuretics) in older patients with hypertension reduced the risk of stroke by 25%, risk of coronary events by 19% and risk of all cardiovascular events by 17% (MRC Working Party, 1992). Another trial showed that lowering the blood pressure (using β blocker or captopril) in type 2 diabetic patients reduced the risk of both fatal and non-fatal microvascular and macrovascular complications (Holman et al., 1998). Also, in some studies adherence was significantly related to blood pressure control (Hershey et al., 1980; Burt et al., 1995), and therefore, it is important for patients to adhere to their antihypertensive for controlling their blood pressure and reducing the related risk events.

## 2.3 Barriers to medication adherence in hypertension reported in worldwide literature

In this section, the variables which act as barriers to medication adherence in hypertension will be reviewed. Most of these studies were done in the western world and used different study designs (qualitative and/or quantitative) to explore the problem of non-adherence to antihypertensive therapy. These studies have examined the effect of personal factors (e.g. ethnicity, gender, age and beliefs about illness and treatment) and external factors (e.g. type of adverse effects, polypharmacy, drug class, drug costs and communication between patients and their healthcare providers).

Lack of information about hypertension has been shown to affect patient's adherence. For example, a qualitative study was conducted using seven focus group discussions with non-adherent hypertensive patients (Gascon et al., 2004). The study identified a complex web of factors influencing adherence to antihypertensive medications. One of the factors was lack of basic background knowledge about hypertension. The fact of having high blood pressure did not seem worrisome for some patients and was often associated with certain well-recognised familiar symptoms, as if the absence of them meant that blood pressure was controlled. The majority of patients gained their knowledge about hypertension from sources other than the physician, such as TV programmes on health, magazines or talking to other people. The results of this study indicated low awareness about the condition as a barrier to following treatment advice. The authors reported that patients with a chronic condition, such as hypertension, lack basic background knowledge about the disease, its potential risks and why it is important to follow the prescribed treatment in the absence of symptoms and therefore, it does not seem odd that patients have lay knowledge and beliefs on medication that can, consequently, reduce their adherence rate.

Demographic characteristics of patients such as age and gender have been studied in relation to antihypertensive medication adherence. Regarding age, there have been mixed findings. A study showed that increasing age of hypertensive patients was associated with increased adherence (Jackson et al., 2008). This study showed that adherence was higher in those aged ≥ 64 years (75.2%) compared to the subgroup aged 18-36 years (69.6%) ($p= 0.023$). Also Ross et al (2004) reported in a study that older hypertensive patients were more likely to be adherent than younger patients (odds ratio (OR 5.9), $p < 0.001$). In contrast, a study of elderly patients (age ≥ 65 years) showed that only 20% of patients exhibit "good adherence" (Monane et al., 1996). However,

another study of 125 hypertensive patients found no relationship between age and medication adherence (Sharkness and Snow, 1992).

In regards to patients' gender, findings were mixed and inconclusive. Some studies found men to be more non-adherent to their medication and others found women to be more non-adherent. The PACE study (Wang et al., 2005) of patients aged more than 65 years old showed that reduced antihypertensive use was associated with female gender. In contrast, Ross et al (2004) reported that women were more likely to be adherent than men (OR 0.6, p= 0.015).

Socioeconomic status is another variable which has been studied in relation to medication adherence in hypertension. A study by Saounatsou et al (2001) showed a positive correlation between the years of schooling and hypertensive patients' adherence to their medication. Patients who had more years of schooling showed the greatest improvement in their medication adherence after completing a training program regarding adherence with their antihypertensive medication. In contrast, Bovet et al (2002) showed that the mean 12 months adherence was not significantly associated with individuals' level of education.

Race and ethnicity has shown limited body of evidence in regards to association with medication adherence. However, some studies have reported an association between race and ethnicity, and adherence to antihypertensive medication. In a study of hypertensive patients with minimal financial barriers (Bosworth et al., 2006); African Americans were more likely to have inadequate baseline blood pressure control than Whites (63% vs. 50%; odds ratio = 1.70; 95% confidence interval [CI] 1.20-2.41). Among 20 factors related to blood pressure control, African Americans also had a higher odds ratio of being non-adherent to their medication (OR= 1.81). In addition, an

association between adherence to specific antihypertensive drugs and race and ethnicity was reported by some studies. For example, adherence with diuretic therapy was significantly lower in Chinese (22%) and Hispanics (32%) than in Whites (47%, $p < 0.001$ for both comparisons) (Kramer et al., 2004).

Clinical variables such as comorbidities have been shown to be associated with adherence to antihypertensive medication. Patients with hypertension may have one or more comorbidities, such as Type 2 diabetes mellitus, which necessitates the use of additional medications. Monane et al (1997) showed in a study that adherence was significantly higher in patients with pre-existing cardiovascular diseases such as ischemic heart disease and congestive heart failure (OR 1.2, 95% CI 1.1 to 1.3). In addition, a retrospective cohort study (Wang et al., 2005) was conducted among hypertensive elderly patients. The results showed that adherence with antihypertensive medication was consistently lower in patients with chronic obstructive pulmonary disease or asthma (odds ratio [OR] = 0.43), depression (OR = 0.5), gastrointestinal disorders (OR = 0.59), and osteoarthritis (OR = 0.63), compared to patients without these conditions (reference, OR= 1.0). The result of this study suggests that non-cardiovascular comorbidities negatively affects adherence to antihypertensive medication in the elderly (Wang et al., 2005).

Treatment related factors such as the types of medicines, complexity of the treatment, duration of therapy and properties of medicines could affect patient adherence with their therapy. A retrospective cohort study (Bailey et al., 1996) showed a lower refill rate among hypertensive patients taking alpha-blockers (11%) than those taking beta-blockers (30%), adrenergic agents (34%), calcium channel blockers (39%), ACE inhibitors (44%), direct vasodilators (45%), or thiazide diuretics (46%). Also,

other studies (Pham et al., 2001; Wogen et al., 2001; Conlin et al., 2002) reported that patients receiving initial therapy with angiotensin II receptor blockers (ARBs) showed a slightly greater adherence rate (56% to 76%) than those receiving other classes of drugs (e.g. adherence to ACE inhibitors ranged from 58% to 65.2% and calcium channel blocker ranged from 60% to 67%). In addition, a study (Bloom, 1998) looked into one year follow up of patients using initial antihypertensive drugs as an initial treatment. The study found that the percentage of patients continuing initial angiotensin II (A-II) antagonist treatment was higher than the percentage of patients continuing with angiotensin converting enzyme inhibitors, thiazide diuretic, beta-blocker, or calcium antagonists (64% vs. 58%, 38%, 43%, and 50%, respectively).

Most hypertensive patients need two or more antihypertensive drugs to achieve adequate blood pressure control (Chobanian et al., 2003), but most physicians appear reluctant to use more than one antihypertensive medicine (McInnes, 1999). However, it was revealed in many studies (Stephenson et al., 1993; Kjellgren et al., 1995) that the complexity of the antihypertensive treatment and the difficulty of incorporating it into daily routines may also play a role in patients' non-adherence to their medication. Nuesch et al (2001) showed in a prospective case control study that hypertensive patients' adherence to their medication dropped significantly from 93% (SD 16%) with once daily dosing regimen to 77% (33%) with twice daily dosing regimen ($p < 0.005$). This finding suggests that fewer daily doses or monotherapy of antihypertensive medications is associated with better adherence. Moreover, an analysis was done by Jackson et al (2008) to assess the impact of multiple combination therapies on adherence to medication in 908 hypertensive naive population. The result showed that the use of the two pill regimens (valsartan + amlodipine or valsartan/HCTZ + amlodipine) was associated with enhanced adherence compared with the 3-pill therapy

(valsartan + HCTZ + amlodipine). The group of patients who had valsartan + amlodipine showed the highest adherence (75.4%) followed by valsartan/HCTZ + amlodipine group (73.1%) and last was valsartan + HCTZ + amlodipine group (60.5%) (Overall ANOVA, p= 0.023). The result suggested that patient adherence improves with simplifying the medication regimen.

The duration of the therapy has been suggested to have an effect on the level of adherence. Saounatsou et al (2001) showed that the duration of hypertensive therapy had a significant negative correlation with patient's adherence to their medication ($r_s$ = -0.45, p= 0.005). Hypertensive patients who had long-term treatment showed poorer adherence to their medication regimen than those who had more recently started.

Properties of medication such as tolerability have been shown to have an effect on adherence to medication. Wright (2000) found in pooled results from randomised controlled trials, which recorded the discontinuation of antihypertensive drugs due to their adverse events, that fewer patients taking thiazide diuretics significantly discontinued their treatment than patients taking beta-blockers and alpha-adrenergic blockers. The frequency of the treatment withdrawal due to adverse events was significantly lower for thiazides than beta-blocker (six trials, 0.7 [CI 0.6-0.8]), calcium channel blockers (four trials, 0.7 [CI 0.5-0.9]) or alpha adrenergic blockers (one trial, 0.1 [CI 0.04-0.4]). Thiazides showed also a lower withdrawal rate than ACE inhibitors but this difference was not statistically significant (two trials, 0.6 [CI 0.3-1.2]).

The supply of medicines is limited in most low income countries and patients often have to buy their medicines out of pocket (WHO, 2003). For example, 36.8% of patients in Kassala (Sudan) were non-compliant with their antihypertensive regimens because they could not afford to buy their medication (Elzubier et al., 2000). Therefore, strategies for improving access to drugs such as affordable prices, sustainable financing and reliable supply systems have been shown to have an important influence on patients' adherence especially among poor people in the population (Schafheutle et al., 2002).

The treatment of hypertension is likely to be successful in reducing the blood pressure and improving patients' clinical outcomes if the treatment is accepted by the patient (McInnes, 1999). Naik et al (2008) assessed the interrelation of patient-clinician communication factors to determine their independent associations with controlling hypertension in diabetes care. Two hundred and twelve patients participated in this study by filling a 63-item questionnaire. The results of the study showed that three communication factors had a significant association with hypertension control. Two had direct effects on hypertension control which are patient's endorsement of a shared decision-making style (odds ratio 1.61, 95% confidence interval 1.01 to 2.57) and proactive communication with one's clinician about abnormal results of blood pressure self-monitoring (odds ratio 1.89, 95% confidence interval 1.10 to 3.26). The third factor is clinicians' use of collaborative communication when setting treatment goals; this factor had a total effect on hypertension control of 0.16 ($p < 0.05$) through its direct effects on proactive communication ($\beta=0.22$, $p < 0.01$) and decision making style ($\beta=0.28$, $p < 0.001$).

A study by Bovet et al (2002) examined the effect of regular follow up on patient's adherence to their antihypertensive medication. The result of this study showed that satisfactory adherence was found to be higher in participants who attended follow up regularly (in 73.9%), but this percentage decreased to 52.2% after six months and to 54.5% after one year. In comparison, satisfactory adherence was found only in 29.4% among participants who attended follow up irregularly after one month and 5.9% after one year. In addition, patients would appreciate more attention from their physicians e.g. having more frequent appointments. Patients with more frequent physician visits showed better adherence to their antihypertensive treatment (McInnes, 1999). A study by Monane et al (1997) showed that adherence was significantly higher in hypertensive patients who had more physician visits (OR 2.2 for eight or more recent visits, 95% CI 1.8 to 2.5).

Beliefs about illness and medications are also a precipitating factor to patients' adherence/non-adherence to antihypertensive medications. It has been reported in the literature that perceptions of illness have an effect on antihypertensive medication adherence (Horne and Weinman, 1999; Patel and Taylor, 2002; Ross et al., 2004). Moreover, studies have related beliefs about medicines to medications adherence (Patel and Taylor, 2002; Ross et al., 2004; Bane et al., 2007). For example, a study used the BMQ and IPQ-R to investigate the perceptions of illness and beliefs about medicines among hypertensive patients (Ross et al., 2004). In this study, beliefs about the necessity of taking medicines, concerns about taking medicines, emotional response to illness, perceptions of consequences, personal control beliefs and treatment control perceptions were all associated with adherence to medicines. Using logistic regression, emotional response to illness and perceptions of personal control were most predictive of adherence. Age was related to compliance, but also was related to perceptions. For

example, older patients showed lower emotional response, consequence and personal control beliefs, but higher treatment cure beliefs.

Locus of control has been studied in relation to adherence and non-adherence behaviours in hypertension (Wang et al., 2002; Bosworth et al., 2006; Hong et al., 2006). For example, a study by Hong et al (2006) was obtained from the baseline interview of patients participating in a larger randomised controlled trial designed to test two interventions to improve blood pressure control. These patients were taken before their randomisation in the larger study. The sample for this study consists of 588 hypertensive patients. Measures for adherence were obtained from the Morisky self-reporting medication taking scale (Morisky et al., 1986). The result of the study suggested that fewer medication barriers, higher internal locus of control (the degree in which an individual believes that her/his health status is influenced by one's own behaviour) and lower external locus of control (the degree in which an individual believes that other people, chance, luck, or fate determines one's health status) were associated with better antihypertensive medication adherence. Furthermore, the relationship between medication adherence and medication barriers was stronger when the internal control was higher ($b= -0.24$, $p < 0.01$).

In contrast, Wang et al (2002) reported that they observed in their study a trend toward increased antihypertensive medications adherence with external rather than internal locus of control. The mechanism by which this observation could be explained is that patients who believe that their fate is determined by forces outside themselves may be more likely to take medicines according to their physicians' instructions.

Lack of social support has been frequently cited as a barrier for patients when coping with their hypertension or incorporating it into their daily lives, therefore it might be an important factor in their adherence to medications. A study by Nelson et al (1980) was conducted to evaluate adherence with therapeutic regimens and to obtain information on variables potentially related to adherence. Results demonstrated that three predictors including patients' perceptions of being socially isolated make independent contributions to antihypertensive medications adherence. In addition, a study by Earp and Ory (1979) showed an association between social support and adherence to antihypertensive medicines. These findings may be useful to healthcare providers in treating hypertension, as it might be useful to include the family members in patients' treatment plan.

Other barriers to antihypertensive medication adherence reported in the literature are: using more than one pharmacy by patients (Monane et al., 1997) and cultural and language barriers (McInnes, 1999).

Although the above studies revealed rich information about the barriers hypertensive patients face in adhering to their medication, there were some limitations in these studies. Definitions of adherence differed among the studies, which could have led to different estimations of the adherence rate. For example, three studies reported that patients receiving initial therapy with ARBs showed a higher adherence rate than those receiving other classes of antihypertensive drugs but the values ranged from 56% to 76% (Pham et al., 2001; Wogen et al., 2001; Conlin et al., 2002). This could be due to using different definitions on how adherence should be measured and defined in these studies, which could have had an impact on adherence and blood pressure level, and thus adherence rate appeared to be variable.

Problems with sampling were evident in some studies. For example, in some studies almost all the participants were male (98%) which limits the generalisability of the sample (Bosworth et al., 2006; Hong et al., 2006).

Recruitment of samples in some studies included only hypertensive patients and excluded patients with other comorbidities. For example, one study excluded patients prescribed more than one other cardiovascular medication or medication for any other condition (Bane et al., 2007). It is important to include patients with more than one disease condition to explore the barriers that these patients face when adhering to their treatment, as they may be the ones facing greatest difficulty adhering to their medications.

Failure to discuss response rate or reasons for non-response was evident in some studies. For example, Bane et al (2007) invited 152 hypertensive patients to participate in a qualitative study (focus group and semi structured interview), but only 27 agreed to be included. Also, 21% (190) patients refused to participate in a study by Bosworth et al (2006). This could have introduced bias as patients may have chosen not to participate for the same barriers they face when adhering to their antihypertensive medication. It is possible that patients who refused to participate in the study would be the ones facing greater difficulties adhering to their drug regimen.

As for the methodologies, a study which employed five focus groups (Bane et al., 2007), could have had the inherent limitation of this methodology, which is likelihood of patients changing their opinions after interacting with each other.

Some studies did not use validated methods for data collection. For example, in the study by Hong et al (2006), locus of control was measured using the health locus of control scale (Wallston and Wallston, 1978). The three questions used to measure the internal locus of control had the internal consistency of $\alpha$=0.68, whereas, the internal consistency of the external locus of control items was $\alpha$=0.46 which is low and this could have affected the ability of the questions to capture the needed data (Hong et al., 2006).

Furthermore, some studies used only one method for measuring adherence to antihypertensive medication. For example, a medical event monitoring system (MEMS$^{TM}$) was used in a study by Nuesch et al (2001) to measure adherence to medication. This could have affected the validity of the findings as using more than one method helps overcome the shortcomings of any particular one (Smith, 2002).

In summary, the overall strength of evidence is generally weak with often conflicting findings from different studies. The studies are often small and limited with methodological weaknesses, but a wide range of factors has been examined. The findings of these studies revealed the complexities of the non-adherence problem. Non-adherence to medication occurs as a result of a complex interaction between different factors and it is unlikely to be caused by a single factor. Many different factors could affect individuals' adherence to medication including external (e.g. practical issues) and internal factors (e.g. health beliefs). These factors might be relevant to the adherence situation in the Middle Eastern countries.

# CHAPTER 3 SYSTEMATIC REVIEW OF STUDIES OF ADHERENCE TO MEDICATION IN THE MIDDLE EASTERN COUNTRIES

## 3.1 Systematic Review of Studies of adherence/non-adherence to medication

Most of the barriers and obstacles for adherence to medication might be similar in the Middle East compared to the rest of the world but it is likely that there are other barriers, which are specifically related to this particular part of the world as it has its own unique religious and cultural characteristics. As there is a limited source of adherence research in the Middle East, a comprehensive literature search was conducted using both electronic and manual approach.

The preliminary search for adherence to antihypertensive medication in the Middle East using EMBASE, MEDLINE, CINAHL, PSYCHINFO, Pub Med, Web of Knowledge and International Pharmaceutical Abstracts resulted in no studies about the particular condition. Therefore, the search was broadened to include all the studies of all chronic diseases in this region of the world. The findings from these studies were hoped to help in understanding the possible barriers that Middle Eastern hypertensive patients might face with adherence to their medication.

### Review of literature

A search of studies related to medication adherence in chronic diseases in the Middle East region was performed using the following databases: EMBASE, MEDLINE, PSYCHINFO, CINAHL, Pub Med, International Pharmaceutical Abstracts and Web of Knowledge. The search terms were (adherence or compliance or therapeutic alliance or non-adherence to medication or therapy refusal AND Middle East or United Arab Emirates or Saudi Arabia or Kuwait or Bahrain or Qatar or Oman or Jordan or Egypt) with or without the combination of the key words (treatment or regimen).

The above search led to the identification of only one relevant article (Al-Saffar et al., 2005); therefore an online search was carried out using Google and other libraries such as the London School of Hygiene and Tropical Medicine library (LSHTM), School of Oriental and African Studies library (SOAS) and the British Library for the major clinical journals in the Middle East countries. All journals were searched for relevant papers and the citations of relevant papers were hand searched for further articles. All the studies were analysed for their findings and the quality of the research. The following journals were hand searched:

1. Arab Medical magazine
2. Middle East Health
3. Middle East Journal of Family Medicine
4. Eastern Mediterranean Health Journal
5. Annals of Saudi Medicine
6. Saudi Medical Journal Online
7. Kuwait Medical Journal
8. Qatar Medical Journal
9. Journal of the Gulf and Arabian Peninsula studies
10. Medical Principle and Practice

This comprehensive literature search yielded 19 studies of adherence to medications in chronic conditions in Middle East region; the studies found are: Jabbar and Al-Shammari, 1993; Khalil and Elzubier, 1997; Al-Sowielem and Elzubier, 1998; Bassili et al., 1998; Fido and Husseini, 1998; Kamel et al., 1999; Khattab et al., 1999; El-Shazly et al., 2000; Elzubier et al., 2000; Al-Faris et al., 2002; Youssef and Moubarak, 2002; Al-Saffar et al., 2003; Baune et al., 2004; Al-Saffar et al., 2005; Fahey et al., 2006; Gulbay et al., 2006; Al-Jahdali et al., 2007; Hashmi et al., 2007; Roaeid and

Kablan, 2007. See Table 3.1 for a summary of these studies. Table 3.1 includes the study setting and country, the population and sample, definition or classification (level) of adherence/non-adherence, methods and measures used to assess adherence/non-adherence and study findings and conclusions.

***Table 3.1: Summary of the studies of adherence to medications in chronic diseases in Middle Eastern countries (n= 19)***

| Study/setting/country | Sample | Definition of patients' adherence/ non-adherence | Methods/measures | Study findings and conclusions |
|---|---|---|---|---|
| Al-Faris et al., 2002. Outpatient clinics, Saudi Arabia. | 147 children with epilepsy. | Non-adherent: missed a total of 1 day doses/week. | Cross-sectional study. Adherence to medication measured by patients' self-reports using detailed questionnaire. | 14% of patients non-adherent with medication. Variable linked to non-adherence: type of seizures. Variables *not* linked to non-adherence: age, nationality, sex, family size, area of residence, frequency of medication and side effects of medication. |
| Bassili et al., 1998. Outpatient clinics, Egypt. | 250 children with bronchial asthma. | Adherent, poorly adherent or non-adherent (physicians' judgment) | Cross-sectional study. Adherence to management measured using questionnaire filled in by physicians. | 2.8% of patients poorly adherent or non-adherent with symptomatic management during acute attacks. 38.4% poorly adherent or non-adherent with prophylactic management. |
| Hashmi et al., 2007. Outpatient clinics, Pakistan. | 438 patients with hypertension. | Adherent: took ≥ 80% of doses as prescribed. | Cross-sectional study. Adherence to medication measured by 2 self-report methods: total number of tablets prescribed/ week and how many pills taken and missed; Morisky scale (Morisky et al., 1986). | 23% of patients non-adherent with medication. Variables linked to non-adherence: increasing age, better awareness and higher number of pills prescribed. Variables *not* linked to non-adherence: depression. |
| Fahey et al., 2006. 2 primary health care (PHC) centres, UAE. | 203 patients with hypertension. | Non-adherent: took < 80% of doses correctly. | Cross-sectional study. Adherence to medication measured by: 7-item questionnaire modified from Morisky scale to determine patients' adherence; and 10-item questionnaire to elicit physician's estimate of patients' adherence. | Non-adherence (patients' self-report) 48%; (physicians' estimate) 29%. Non-adherence (patients' report) negatively correlated with achieving target blood pressure and positively correlated with physician's evaluation of seriousness of disease. Non-adherence (physicians' estimate) negatively correlated with treatment effectiveness, patients' knowledge, communication quality and seriousness of condition. |

*Table 3.1: Summary of the studies of adherence to medications in chronic diseases in Middle Eastern countries (n= 19) Cont.*

| Study/setting/country | Sample | Definition of patients' adherence/ non-adherence | Methods/measures | Study findings and conclusions |
|---|---|---|---|---|
| Baune et al., 2004. Outpatient and PHC clinics, Palestine. | 336 patients: case group of 112 with acute stroke and hypertension and control group of 224 with hypertension only. | No clear classification. | Case–control study. Adherence to medication measured using questionnaire. | 25% of case patients were non-adherent. |
| Youssef and Moubarak, 2002. PHC centres, Egypt. | 316 patients with hypertension. | Fully adherent: no doses missed. Partially adherent: took ≥ 90% of doses. Non-adherent: took < 90% of doses. | Cross-sectional study. Adherence to medication measured by patients' self-reports using questionnaire. | 22.2% of patient's partially adherent and 25.9% non-adherent.<br>Variables linked to non-adherence: educational level, complications related to hypertension, side effects, smoking, restriction of dietary salt and fat, knowledge about nature of disease, associated complications and ideal management plan, perception of benefits of adherence to treatment, blood pressure control and susceptibility to unfavourable events related to hypertension.<br>Variables *not* linked to non-adherence: patients' demographic characteristics, duration of the original illness, presence of coexisting health problems, number of hypertensive drugs, frequency of dose, patients' perception of danger of original disease and adherence to ideal exercise and ideal body weight. |
| Elzubier et al., 2000. Outpatient clinic, Sudan. | 198 patients with hypertension. | Non-adherent: took < 80% of pills. | Cross-sectional study. Adherence to medication measured by: patients' self-report of whether taking medication regularly or not; pill counts; and verified by blood pressure measurement. | 49.5% of patients non-adherent (40% with the pill count method).<br>Variables linked to non-adherence: inability to buy drugs, asymptomatic nature of hypertension, complications of hypertension and blood pressure level.<br>Variables *not* linked to non-adherence: lack of belief in drugs, side effects from drugs, number of drugs taken and dosage regimen. |

***Table 3.1: Summary of the studies of adherence to medications in chronic diseases in Middle Eastern countries (n= 19) Cont.***

| Study/setting/country | Sample | Definition of patients' adherence/ non-adherence | Methods/measures | Study findings and conclusions |
|---|---|---|---|---|
| Al-Sowielem and Elzubier, 1998. 4 PHC centres, Saudi Arabia. | 190 patients with hypertension. | No clear definition of adherence. | Cross-sectional study. Adherence to medication measured by: patients' self-report using a questionnaire; and verified by therapeutic outcome (diastolic blood pressure > 90 mmHg). | 25.3% of patients non-adherent based on self-report and 65.8% based on therapeutic outcome (diastolic blood pressure). Variables linked to non-adherence: irregular follow-up, younger age and better educated. Variables *not* linked to non-adherence: sex, nationality, difficulty with adherence, presence of other diseases, continuity of care with same physician, preference of place of care, number of drugs taken for hypertension and mode of diagnosis of hypertension. |
| Khalil and Elzubier, 1997. 5 PHC centres and 2 outpatient clinics, Saudi Arabia. | 347 patients with hypertension. | Pill count (average of two visits two weeks apart). Non-adherent patients were those taking < 80% of their medications, based on the average. | Cross-sectional study. Adherence to medication measured by: pill count; and verified by blood pressure measurement. | 47% of patients non-adherent. Variables linked to non-adherence: age, sex (female), nationality (Saudi Arabian nationals had higher non-adherence), duration of disease, presence of complications, follow-up in PHC rather than hospital, side-effects, duration of treatment, number of drugs, education about disease offered by health care provider and illness-associated symptoms. |
| Roaeid and Kablan, 2007. Diabetes centre, Libyan Arab Jamahiriya. | 805 patients with diabetes (type 1 and 2). | No clear definition or classification. | Cross-sectional study. Adherence to treatment measured by patients' self-report through interviews; and questionnaire filled by physicians. | 27.1% of patients not taking treatment regularly. |
| El-Shazly et al., 2000. 14 outpatient clinics and diabetic centres, Egypt. | 1000 patients with diabetes (type 1 and 2). | No clear definition or classification. | Cross-sectional study. Adherence to medication measured using questionnaire filled by physicians. | 11.4% of patients non-adherent (15.1% in non-health insured patients and 5.7% in health insured patients). Variable linked to non-adherence: not having health insurance. |

*Table 3.1: Summary of the studies of adherence to medications in chronic diseases in Middle Eastern countries (n= 19) Cont.*

| Study/setting/country | Sample | Definition of patients' adherence/ non-adherence | Methods/measures | Study findings and conclusions |
|---|---|---|---|---|
| Khattab et al., 1999. PHC centre, Saudi Arabia. | 294 patients with diabetes (type 1 and 2). | Good adherence: took medications as prescribed. Fair adherence: missed 1–3 doses/month. Poor adherence: missed 4 doses/month. | Cross-sectional study Adherence to medication measured by: self-report questionnaire filled by physicians (diabetic follow-up card); and pill count. | 1.4% of patients had poor adherence, 14% fair adherence and 84.2% good adherence. Variables *not* linked to non-adherence: sociodemographic characteristics of patients, care characteristics and disease characteristics. |
| Kamel et al., 1999. Diabetic clinic, Egypt. | 300 patients with diabetes (type 1 and 2). | Adherence was classified as poor when < 50%, satisfactory when 50-75%, and very good when > 75% of medications were taken. | Cross-sectional study. Adherence to medication measured by patients' self-report using a questionnaire. | 1.7% of patients had poor, 20% satisfactory and 78.3% very good adherence. Variables *not* linked to non-adherence: the usage of insulin injections, medication names and medication types. |
| Al-Saffar et al., 2005. Outpatient clinic, Kuwait. | 278 patients with depression. | Non-adherent: took < 80% of expected pill count *and* self-reported failure to take medication as prescribed. | Educational interventional study. Adherence to medication measured at 2 months and 5 months by patients' self-report and tablet count. | 88% of patient's non-adherent in the control group at both follow-ups. Variables *not* linked to non-adherence: concern that therapy would impose restrictions on patients' lifestyle or have an adverse effect on their work; patients' belief that their physicians really understood the nature of their problem and side effects of medications. |
| Al-Saffar et al., 2003. Outpatient clinic, Kuwait. | 176 patients with depression. | Good adherence: pill counts of 100–/+20%. Non-adherence: self-reported failure to take medication as directed. | Cross-sectional study. Adherence to medication measured by: patients' self-report; and pill count. | 30% of patients non-adherent (via pill counts) and 24% (via self-report). Variables linked to non-adherence: patients' view about whether depression was more of a psychological than a medical problem; female sex; belief that depression was a disease best treated by medication; concern about the addictive nature of therapy and uncertainty whether or not physicians can do anything to help. Variables *not* linked to non-adherence: patients' characteristics and side effects of medication. |

*Table 3.1: Summary of the studies of adherence to medications in chronic diseases in Middle Eastern countries (n= 19) Cont.*

| Study/setting/country | Sample | Definition of patients' adherence/ non-adherence | Methods/measures | Study findings and conclusions |
|---|---|---|---|---|
| Fido and Husseini, 1998. Outpatient clinic, Kuwait. | 120 patients with psychiatric problems. | Non-adherent: failure to take medication as prescribed for > 1 week. | Cross-sectional study Adherence to medication measured by patients', caretakers or relatives' self-report using questionnaire (checklist). | 55% of patients prematurely discontinued medication. Variables linked to non-adherence: male sex, previous multiple hospital admission, diagnosis of schizophrenia and mania, age, being single and educational level. |
| Al-Jahdali et al., 2007. Outpatient clinic, Saudi Arabia. | 334 patients with asthma. | No clear definition or classification. | Cross-sectional study. Adherence to inhaled corticosteroids measured by patients' self-report though structured questionnaire interviews. | 38% of patients non-adherent. Variables linked to non-adherence: education, negative perception of the role of inhaled corticosteroids in management of bronchial asthma and negative perception regarding inhaled corticosteroids safety e.g. leading to addiction. Variables not linked to non-adherence: duration and severity of asthma. |
| Jabbar and Al-Shammari, 1993. Outpatient clinic, Saudi Arabia. | 104 patients with epilepsy. | Non-adherent: missed a total of 3 days doses/month. | Cross-sectional study. Adherence to medication measured by pill count. | 30.8% of patients non-adherent. Variables linked to non-adherence: educational level and adverse effects of disease on patients' academic performance. Variables *not* linked to non-adherence: sex, marital status, age, family history of disease, duration of disease, type of the epilepsy, level of control and therapeutic regimen. |
| Gulbay et al., 2006. Outpatient clinic, Turkey. | 140 adults with chronic obstructive pulmonary disease. | Used medication "correctly": patients who had correct knowledge on at least 2 of their bronchodilator medication doses and who used convenient inhalation technique. Used medication "regularly": patients who said they took medication every day. Adherent: used medication correctly *and* regularly. | Cross-sectional study. Adherence to medication measured by patients' self-reports using questionnaire. | 10%–20% of patients did not use medication correctly and regularly. Risk of poor adherence increased 44.4 fold with: lower educational level, female sex, unawareness of chronicity of disease and being uninformed. |

**Studies of adherence/ non-adherence to medication in general in the Middle East**

These studies were conducted in all regions of Middle East: Egypt (4 studies), Sudan (1), Libyan Arab Jamahiriya (1), Saudi Arabia (6), Kuwait (3), The UAE (1), Palestine (1), Turkey (1) and Pakistan (1). Seventeen studies were conducted among adult populations and two among children (Bassili et al., 1998; Al-Faris et al., 2002). In addition, seventeen studies were cross sectional and descriptive apart from two in which one was an educational intervention study (Al-Saffar et al., 2005) and the other was a matched pair case control study (Baune et al., 2004).

The studies focused on different diseases and illness groups including hypertension (n=7), diabetes (n=4), psychiatric (n=3), asthma (n=2), epilepsy (n=2), and COPD (n=1). The studies reviewed were conducted in a variety of settings such as outpatient clinics (O.P clinics) (n=12), primary healthcare centres (PHCs) (n=3), diabetes centre (n=1). However, some were conducted in more than one setting such as O.P clinics and PHCs (n=2), and O.P clinics and diabetic centres (n=1). The sample size varied between these studies with a range of 104 to 1000, a median of 278 patients.

**Measures employed for data collection on adherence to medication**

Adherence to medication was measured using self-reports, pill counts and health outcome measures. Almost all of the studies (17 of 19) used self report methods either alone (Bassili et al., 1998; Fido and Husseini, 1998; Kamel et al., 1999; El-Shazly et al., 2000; Al-Faris et al., 2002; Youssef and Moubarak, 2002; Baune et al., 2004; Fahey et al., 2006; Gulbay et al., 2006; Al-Jahdali et al., 2007; Hashmi et al., 2007; Roaeid and Kablan, 2007) or combined with other methods especially pill count (Al-Sowielem and Elzubier, 1998; Khattab et al., 1999; Elzubier et al., 2000; Al-Saffar et al., 2003; Al-Saffar et al., 2005). In one study pill count alone was used (Jabbar and Al-Shammari,

1993) and in another pill count was combined with BP measurement (Khalil and Elzubier, 1997).

In 12 studies, self-reports were obtained through structured questionnaires (Al-Sowielem and Elzubier, 1998; Bassili et al., 1998; Fido and Husseini, 1998; Kamel et al., 1999; El-Shazly et al., 2000; Al-Faris et al., 2002; Baune et al., 2004; Fahey et al., 2006; Gulbay et al., 2006; Al-Jahdali et al., 2007; Hashmi et al., 2007; Roaeid and Kablan, 2007). Two studies (Fahey et al., 2006; Hashmi et al., 2007) used previously validated measures (Morisky scale; Morisky et al., 1986), however in one of these (Hashmi et al., 2007) details were not provided on the translation or cross-cultural validity. In another two studies, authors reported that they had adapted a questionnaire from earlier relevant published studies (Al-Jahdali et al., 2007) or from a medical book (Baune et al., 2004), but details of this adaptation process were not provided.

In seven studies, respondents were directly asked about their adherence to medication e.g. the total number of tablets they had been prescribed per week and how many pills they took and missed in the last 3, 5 and 7 days (Hashmi et al., 2007) or previous month (Youssef and Moubarak, 2002) or whether they had taken their medication as directed by the physician (Jabbar and Al-Shammari, 1993; Khattab et al., 1999; Al-Saffar et al., 2003; Al-Saffar et al., 2005) or whether they were taking their drugs regularly or not (El-Zubier et al., 2000).

In four studies, questionnaires were administered by the patient's physicians (Bassili et al., 1998; Khattab et al., 1999; El-Shazly et al., 2000; Roaeid and Kablan, 2007).

**Definition or classification (level) of adherence/non-adherence**

Different definitions of adherence or non-adherence were employed. Fourteen studies provided information on these definitions, whereas five did not provide clear information.

Six studies considered patients to be adherent if they reported taking ≥80% of their doses as prescribed (Khalil and El-zubier, 1997; El-Zubier et al., 2000; Al-Saffar et al., 2003; Al-Saffar et al., 2005; Fahey et al., 2006; Hashmi et al., 2007). In one further study, this was 75% (Kamel et al., 1999). In another study, adherent patients were those who used their medication correctly (knowledge on at least two of their bronchodilator medication doses and correct inhalation technique) and regularly (everyday) (Gulbay et al., 2006). Conversely, in other studies non-adherence was defined as missing a total of one day dosage/week (Al-Faris et al., 2002), or <90% of their pills (Youssef and Moubarak, 2002), or 4 doses per month (Khattab et al., 1999) or a total of three days' doses/month (Jabbar and Al-Shammari, 1993). One study did not report actual values but instead defined non-adherence as 'failure to take medications as prescribed for a period greater than a week' (Fido and Husseini, 1998).

In addition, in one study the authors stated that doctors made a judgment about patients' compliance based on their answers to questions, the details of which were unspecified in the paper (Bassili et al., 1998).

**Adherence/ non-adherence rates**

Overall, studies estimated the rate of non-adherence to medications in the Middle East between 1.4% and 88%. Studies in which questionnaires were completed by the patient's physicians tended to report low non-adherence rate compared to the other studies (Bassili et al., 1998; Khattab et al., 1999; El-Shazly et al., 2000; Roaeid and Kablan, 2007). In one study in which data on adherence were collected both by

patients' self-reports and their physicians, the physicians overestimated the level of their patient's adherence to medication. They estimated the non-adherence rate to be 29% compared with patients who reported it to be 48% (Fahey et al., 2006).

Within the same illness group, seven studies among hypertensive patients reported non-adherence rates between 23% and 49.5% and four studies among diabetic patients reported non-adherence rates between 1.4% and 27.1%. Two studies conducted with patients with depression reported non-adherence rate of 24 to 30% in one study (Al-Saffar et al., 2003) and 88% in the other (Al-Saffar et al., 2005).

**Reasons for non-adherence**

A wide range of reasons was given by patients for non-adherence to medications. These included:

- Forgetfulness (Jabbar and Al-Shammari, 1993; Khalil and Elzubier, 1997; Al-Faris et al., 2002; Youssef and Moubarak, 2002; Al-Saffar et al., 2005; Al-Jahdali et al., 2007).
- Drug side effects (Jabbar and Al-Shammari, 1993; Khalil and Elzubier, 1997; Fido and Husseini, 1998; Youssef and Moubarak, 2002; Al-Saffar et al., 2005).
- Wanting a "drug holiday" (Youssef and Moubarak, 2002).
- Concerns about drug dependency (Fido and Husseini, 1998; Al-Saffar et al., 2005).
- Feeling well (Khalil and Elzubier, 1997; Youssef and Moubarak, 2002; Al-Saffar et al., 2005; Al-Jahdali et al., 2007).
- Medication was not helping them feel better (Al-Saffar et al., 2005; Al-Jahdali et al., 2007).
- Irregularity of follow-up (Al-Sowielem et al., 1998).
- Lack of health education (Khalil and Elzubier, 1997).

- Shortage of drugs (Jabbar and Al-Shammari, 1993; Khalil and Elzubier, 1997).
- Unawareness of the chronicity of the disease (Gulbay et al., 2006).
- Busy parents (Al-Faris et al., 2002).
- Not have been told to continue the treatment (Jabbar and Al-Shammari, 1993).
- Disbelief about the value and need for adherence (Jabbar and Al-Shammari, 1993).
- Social stigma (Fido and Husseini, 1998).
- Complexity of the treatment regimen (Fido and Husseini, 1998).
- Inability to see their usual doctor (Al-Saffar et al., 2005).
- Only using the medication as needed (Al-Jahdali et al., 2007).
- Feeling better (with bronchodilators) (Al-Jahdali et al., 2007).
- Inability to afford the drugs (Elzubier et al., 2000).
- Feeling lazy (Al-Jahdali et al., 2007).

**Findings of the studies**

The findings of these studies indicate that there is a problem of non-adherence to medication among patients with chronic conditions in the Middle Eastern countries. However, caution must be taken before drawing a conclusion on the rate of non-adherence due to the wide discrepancy in the estimates of non-adherence rates between these studies, which varied from 1.4% to 88%. This variation could be due to different disease conditions studied and patients' population or differences in the definitions of adherence/non-adherence to medications used or differences in methodologies employed.

The non-adherence rate was higher among hypertensive patients than those with diabetes which could be due to the nature of hypertension disease (asymptomatic) or

different perceptions of seriousness of the condition. This is supported by the international literature as the WHO report that estimates of the extent to which patients do not adhere to pharmacotherapy for hypertension vary between 30 and 50% (WHO, 2003), compared to an estimated 7-64% non-adherence with hypoglycaemic agents (Cramer, 2004).

The four studies where the interview based questionnaires were administered by the physicians reported lower non-adherence rates compared to the other studies (1.4% (Khattab et al., 1999), 27.1% (Roaeid and Kablan, 2007), 11.4% (El-Shazly et al., 2000), 2.8% with symptomatic management during acute attack (Bassili et al., 1998)). This could be as a result of patients exaggerating their medication adherence behaviour in front of their treating physicians for fear that admitting their poor adherence would affect the quality of care they would receive, or to gain their physicians approval (Horne et al., 2005).

Many variables were suggested to affect patients' adherence to their medications, but there were some contradictory results. For example, non-adherence was shown to be higher in younger patients in two studies (Al-Sowielem and El-Zubier, 1998; Fido and Husseini, 1998) and higher in older age by another (Khalil and El-Zubier, 1997).

The reasons reported by patients for non-adherence to their medications varied between the studies but the two most frequently reported reasons were forgetfulness (6 studies) and suffering or avoidance of drug side effects (5 studies). The reasons reported by patients in the Middle East are similar to those reported in the international literature. However, some common reasons reported by international literature were not reported

by these patients such as patient satisfaction and/or lack of trust in healthcare providers and social support. The reason for this could be that patients in the Middle East may be more afraid to complain about their doctors in order to avoid problems, which might compromise their treatment. These studies were not designed to explore beliefs about illness and medicines. There is a need for a more qualitative approach to explore how the context of the healthcare system, access to medication and beliefs affect non-adherence to medication for patients with chronic conditions in the Middle East.

To conclude, these studies confirm the existence of non-adherence as a problem among patients with chronic diseases in the Middle East. However, there was great variation in the medication non-adherence rates reported, probably due to differences in the definitions of adherence/non-adherence used and methodologies employed. Some barriers and predictors of non-adherence among patients in this region were identified. Findings highlight the necessity of expanding the research area in this region, and improving the quality of such research. Therefore, there is a need for further research on the rate of non-adherence and barriers to patients' adherence to their medications in order to identify the type of interventions that may be needed for improving patients' adherence behaviour.

## 3.2 The need for antihypertensive medication adherence studies in the United Arab Emirates

Similar to many other countries worldwide, hypertension is emerging as a major clinical and public health concern among the Emirati population in the UAE. The latest figures from the Ministry of Health of the UAE show that 36% of the Emirati population suffer from hypertension (Saberi, 2009).

The burden of hypertension in the UAE is high, as it has a serious impact on morbidity due to its complications as well as mortality rate. Patients with hypertension who are at high risk, or those with intermediate or low risk that cannot be managed by initial non-pharmacological measures (e.g. diet control and exercise), require pharmacological treatment (WHO, 1999). Given the continually increased burden of the disease and the large increase in the development of complications each year, non-adherence to treatment appears a likely explanation for the problem. This is consistent with a study by Abdulle et al (2006) which suggested that not having controlled blood pressure among self-reporting normotensives and self-reporting hypertensives in the UAE could be due to either inadequate treatment regimens or lack of patients' adherence to their medications regimen due to side effects or the asymptomatic nature of the disease. Despite the availability and accessibility to the Emirati population of the best available and most advanced treatments for hypertension, patient outcomes are far from optimal and the development of complications continues to be a problem in many patients, leading to cardiovascular diseases, stroke and renal disease.

As presented in Chapter 3, seven studies were found addressing the issues of adherence/non-adherence to antihypertensive medications in the Middle Eastern countries estimating that about 23%-49.5% of hypertensive patients were non-adherent

to their medications (Khalil and Elzubier, 1997; Al-Sowielem and Elzubier, 1998; Elzubier et al., 2000; Youssef and Moubarak, 2002; Baune et al., 2004; Fahey et al., 2006; Hashmi et al., 2007). Out of these studies, only one study was found addressing adherence/non-adherence to antihypertensive medications in the UAE (Fahey et al., 2006).

The UAE study by Fahey and colleagues (2006) found the rate of non-adherence to antihypertensive medications to be 48% as reported by patients themselves, compared to 29% as estimated by their physicians. In this study, a 7-item questionnaire based on the Morisky scale (Morisky et al., 1986) was adapted and translated to Arabic language and used to determine patients' adherence to their medications. A 10-item questionnaire was also developed to elicit physicians' perceptions of their patients' adherence. The study did not assess the relationship between non-adherence to antihypertensive medication and other variables such as demographic factors (age, sex, education level etc.) and disease or treatment factors. Moreover, this study did not assess the predictors and/ or barriers of non-adherence to medications in hypertensive patients in the UAE, as its main aim was to compare the physicians' estimation of adherence/non-adherence of their patients to patients self-reporting their adherence/non-adherence. The study was conducted in two primary healthcare centres in Abu-Dhabi city, which is not representative of the whole population of the UAE. However, it does give an overview of the extent of the problem, as it is the only study, which has been conducted in this area of research within the UAE.

In summary, the literature search on adherence to medication in general shows that it remains an unsolved problem despite decades of research (Vermeire et al., 2001). Therefore, studying adherence of patients to antihypertensive medications in the UAE is

important for many reasons. Firstly, the burden of the disease is continuing to increase and this will lead to the development of its complications. Secondly, many hypertensive patients in the Middle East region are characterised as not being adherent to their medication due to their partial mistrust of healthcare providers or wrong perceptions of the potential complications of the condition (Abdulle et al., 2006). Thirdly, only one study of adherence to antihypertensive medication was conducted among the UAE population. Finally, there are no studies exploring patients' perceptions of illness and treatment among Emirati patients with hypertension. Therefore, it is important to study patients' perceptions as well as the barriers to adherence to treatment in hypertension. Identifying the barriers and factors associated with non-adherence is essential as understanding these barriers would help in identifying the type of interventions to use for improving hypertensive patients adherence to their medications in the UAE. This thesis aims:

1. To explore potential barriers to adherence to medications and other self-care behaviours among Emirati hypertensive participants in the UAE.
2. To assess the extent and predictive factors of non-adherence to antihypertensive medications in the UAE in order to recommend potential interventions needed for improving adherence.

To achieve these aims, this thesis involved two research studies: 1) a semi-structured interview study and 2) a quantitative cross-sectional survey. The interview study was conducted to determine the issues of importance to people suffering from hypertension, when making decisions about taking their medications. Following the qualitative data analysis, a questionnaire including all the relevant issues emerged from the interviews was developed. The survey study was conducted to assess the extent of non-adherence to antihypertensive medication in the UAE. It also aimed to investigate

the association between different factors and adherence to medication in order to identify the predictors of non-adherence to medication among Emirati hypertensive patients.

# Section 2- An Exploratory study of hypertensive Emirati patients' perspectives of barriers and facilitators to medication adherence and other hypertensive self-care behaviours

# CHAPTER 4 THE EXPLORATORY STUDY-METHODOLOGY

## 4.1 AIM AND OBJECTIVES

### AIM

To explore potential barriers to adherence to medications and other self-care behaviours among Emirati hypertensive participants in the UAE.

### OBJECTIVES

1. To identify the reasons why patients might or might not take their medication as prescribed.
2. To investigate patients' beliefs about their illness and their beliefs regarding the need for their medications and concerns they have about using them.
3. To examine patients' views and experiences regarding their health care providers and current health care system at the Ministry of Health in the UAE.
4. To explore the impact of cultural factors and lifestyle on patients' medication adherence behaviour.

To achieve the above objectives a qualitative approach was selected. This chapter describes the methodology of the semi-structured interview study which was carried out to explore issues related to medication adherence among Emirati hypertensive patients. The results and discussion of this study will be reported in chapter 5.

## 4.2 METHODS

This section will describe the methods used and justify the choice of specific assessment and procedures to meet these study objectives.

### 4.2.1 Study design and rationale for the chosen method

A qualitative approach was chosen to explore the factors associated with non-adherence to antihypertensive medication in Emirati patients in this part of the research. These methods are considered appropriate to answer the "why?" and how?" questions, which helps to explore the processes and patterns in the individuals thoughts and behaviour. This method is known for its flexibility of approach as well as being receptive to respondents' viewpoints. So, by using this method the researcher should be prepared to consider new issues and ask questions throughout data collection and analysis, in order to get a deeper understanding of phenomena of interest in their natural context. This method helps the researcher to understand the respondents' interpretations, views, experiences, beliefs and attitudes (Smith, 2002). It can also clarify the diversity of meanings assigned by different participants to a certain event or concern.

Having chosen a qualitative approach, the next step was to determine which qualitative method would be most appropriate to meet the study aim and objectives. Non-adherence to medication may involve complex and interrelated means of cultural, physical, psychological, social, and spiritual dimensions in the lives of patients. Focus groups could have been used to meet the aim of this research as it makes use of group dynamics to stimulate discussion, generate ideas and gain insights in order to pursue a topic in greater depth (Bowling, 2002). However, confidentiality cannot be obtained using this method and the presence of others can be inhibiting to some respondents

(Smith, 2002). Therefore, this method was avoided, as it is not commonly used in the UAE and there were doubts about the feasibility in this context (because culturally it is not usual or favourable for patients to discuss their personal issues in front of strangers). Moreover, this method would not allow a deep exploration of patients' perceptions.

Face to face interviews offer an advantage over the other qualitative research methods such as focus groups. Qualitative interviews are divided into three major approaches, in which each approach serves a different purpose and hence requires a different procedure (Kvale, 1996). First, the structured interviews which are seen as an alternative to the self-completion questionnaires for collecting qualitative data (Smith, 2002). The main reason for using structured interviews is when researchers' time is limited and there is a need to collect specific data in a comprehensive manner (Kvale, 1996). Second, the semi-structured interviews, which involve asking the participants a set of questions, related to specific topics of interest (Kvale, 1996). This can yield highly accurate data if carefully designed (Bowling, 2002) and the interviewers use a topic guide to ensure that all issues have been covered. Third, unstructured interviews aim to search deep beneath the surface of superficial responses to obtain the complexities of individuals' attitudes, behaviours and experiences as well as the true meanings that they assign to events. An unstructured topic guide allows the participants to tell their stories in their own words, with prompting from the interviewers. The disadvantages of this method is that it is time consuming, expensive, difficult to collect and analyse the data obtained, there is a greater potential for interviewers bias, and, as a small number of participants are involved in this method due to time limitation, there is a doubt of the representativeness of the data collected (Bowling, 2002).

For this study, semi-structured face-to-face interviews were chosen to explore patients' perceptions regarding their adherence to their antihypertensive medicines. Face-to-face interviews were chosen as it is the most suitable method to capture a wide range of perceptions and the interviewers can probe fully for responses and clarify any ambiguities. In addition, during the interview; discussion with patients can include sensitive topics about their daily and social life, which makes participants feel more comfortable sharing this information confidentially in a one-to-one approach. Response rate is known to be generally higher with face to face interviews, compared to telephone interviews or questionnaires that are sent through the post. Moreover, the continuity of connections and topics were important in this research, therefore, a face-to-face semi structured interview approach enabled complex issues to be examined (Bowling, 2002). Semi-structured interviews were chosen as these involve using open-ended questions to allow the participants to reply in their own words and give their opinions in full on a set of questions related to specific topics of interest. At the same time, these interviews may uncover aspects of interest that could otherwise have been missed if a quantitative approach was used (Smith, 2002).

### 4.2.2 Development of the interview topic guide

The interview questions were developed using the previously reported literature review to identify the factors that may influence medication adherence and also by consulting with academics and clinicians (cardiologist, pharmacist and psychologist). The interview schedule consisted of closed and open-ended questions that defined the aims and objectives of this part of the study. Closed questions were used to gather factual data (e.g. are you currently taking any herbal remedies?), whereas open-ended questions were used to expand on the participant's experience relevant to the topic of interest (e.g. Why do you think people have high blood pressure?). Boxes were drawn

next to each question on the interview schedule to serve as a checklist to enable the researcher to cover the same questions with all participants. Moreover, probing questions were used during the interviews to gather more details in any important issues or views outlined by respondents, as recommended by Smith (2002). Examples of probing questions used in the interviews are: 'can you tell me more about it...' and 'is there anything else?'. Leading questions were avoided as they could introduce bias and participants were allowed to talk freely and in no particular order (Smith, 2002). This allows the exploration of topics according to the importance of them placed by participants.

The interview topic guide was informed by the literature and designed to stimulate participants to talk in detail about issues related to their antihypertensive medication adherence. Respondents were invited to express their views regarding:

1) Knowledge about hypertension and their beliefs about their illness (e.g. beliefs about the cause of hypertension).
2) Knowledge about the current antihypertensive medication taken (e.g. frequency, dosage etc.).
3) Beliefs about the positive and negative aspects of taking medication.
4) Use of alternative medicines (e.g. herbal remedies) and their beliefs about the safety and effectiveness of these herbs compared to their prescribed medicines.
5) Medication taking behaviours and the reasons for non-adherence.
6) Non-pharmacological treatments (diet and exercise) and their adherence level.
7) Issues related to health care providers and health care system and their relationship with medication adherence.
8) Social support and its relation to medication adherence.
9) Anything else of importance to them regarding their condition or treatment.

Adherence to non-pharmacological treatment of hypertension such as diet and exercise was not the main interest of this study, but it was explored during the interviews. This was done in order to view adherence to medication in the context of wider disease management and lifestyle decisions. Participants were asked whether they performed self-care activities and if the response was "no", then they were asked to give the reasons which prevented them from doing so.

The interview schedule was piloted with three patients to make sure that all the questions were clear and collected all the information needed. These three hypertensive patients were selected from cardiology outpatient clinics in the UAE. The piloting process resulted in adding new questions related to social support, which was not in the original version as well as making some changes in relation to wording, and sequence of the questions. (For interview topic guide, see Appendix 1)

### 4.2.3 Ethical approval

The work described here was reviewed and approved first by the ethics committee of The School of Pharmacy, University of London in May 2009. Then it was reviewed and approved by the ethics committee of the Ministry of Health of the UAE in July 2009. See Appendix 2 for the ethics approvals. Approval was also gained from hospital and clinical management before recruitment commenced. The principal investigator had to go first to the head of the hospital, show the ethics approval letter, and explain the study. After that, she was sent with a written note from the head of the hospital to the head of the cardiology department to start recruitment. The study had to be explained again to the head of the cardiology department who then allowed the researcher to start the recruitment process.

### 4.2.4 Sampling

#### 4.2.4.1 Sampling strategy

A sample was sought of Emirati Arabic speaking hypertensive patients aged over 18 years, who were currently on one or more antihypertensive medications, who had a diagnosis of hypertension confirmed in their medical file (not on their initial appointment) and who signed a consent form to participate in the study. Patients were excluded if they were non-Emirati, unable to understand or communicate in Arabic language, younger than 18 years old or emotionally/physically distressed and did not want to take part in the study. Arabic is the official language in the UAE, therefore the interviews were conducted in Arabic language in attempt to target the majority of the UAE population.

Hospitals have been chosen as the sample source because, in the UAE, patients with hypertension receive their care in the hospital setting. If a patient attending a primary healthcare centre is found to have high blood pressure then he/she is referred to a hospital to be seen by a cardiologist for more investigation and if confirmed to be hypertensive then all the follow up and prescription refill is provided by the hospital, not in primary care centres. Therefore, hospitals were the place to find these particular patients. Seven hospitals were targeted; one in each Emirate of the country to ensure that patients were drawn from different geographical areas of the UAE, and patients from both urban and rural areas were included in the study.

#### 4.2.4.2 Sampling procedure

Participants were selected from each of the seven different Emirates, which covered different geographical areas of the UAE. There are 28 hospitals in the UAE distributed between rural (12) and urban (16) areas (Ministry of Health of the UAE,

2004). Each hospital has one cardiology outpatient clinic where all the hypertensive patients are seen by their physicians. Table 4.1 illustrates the sampling frame.

***Table 4.1: Different health districts, type of population, and number of hospitals in the UAE***

| District (Emirate) | Hospitals | | |
|---|---|---|---|
| | Urban | Rural | Total |
| Abu Dhabi | 6 | 6 | 12 |
| Dubai | 4 | 0 | 4 |
| Al-Sharjah | 2 | 3 | 5 |
| Ajman | 1 | 1 | 2 |
| Umm Al-Quwain | 0 | 1 | 1 |
| Ras Al-Khaimah | 1 | 1 | 2 |
| Al-Fujairah | 1 | 1 | 2 |
| Total | 16 | 12 | 28 |

For sampling, one hospital (i.e. cardiology outpatient clinic) within each health district was randomly selected by an electronic random function using Microsoft Excel. The names of the hospitals in each Emirate were entered separately into the program to choose one hospital in each area at random. In one Emirate (Umm Al-Quwain), there is only one hospital and therefore this was selected. In the end, seven hospitals were chosen for recruitment of patients (See Figure 4.1 and Table 4.2 for the hospital sampling procedure).

***Figure 4.1: Flow chart of the hospital sampling procedure***

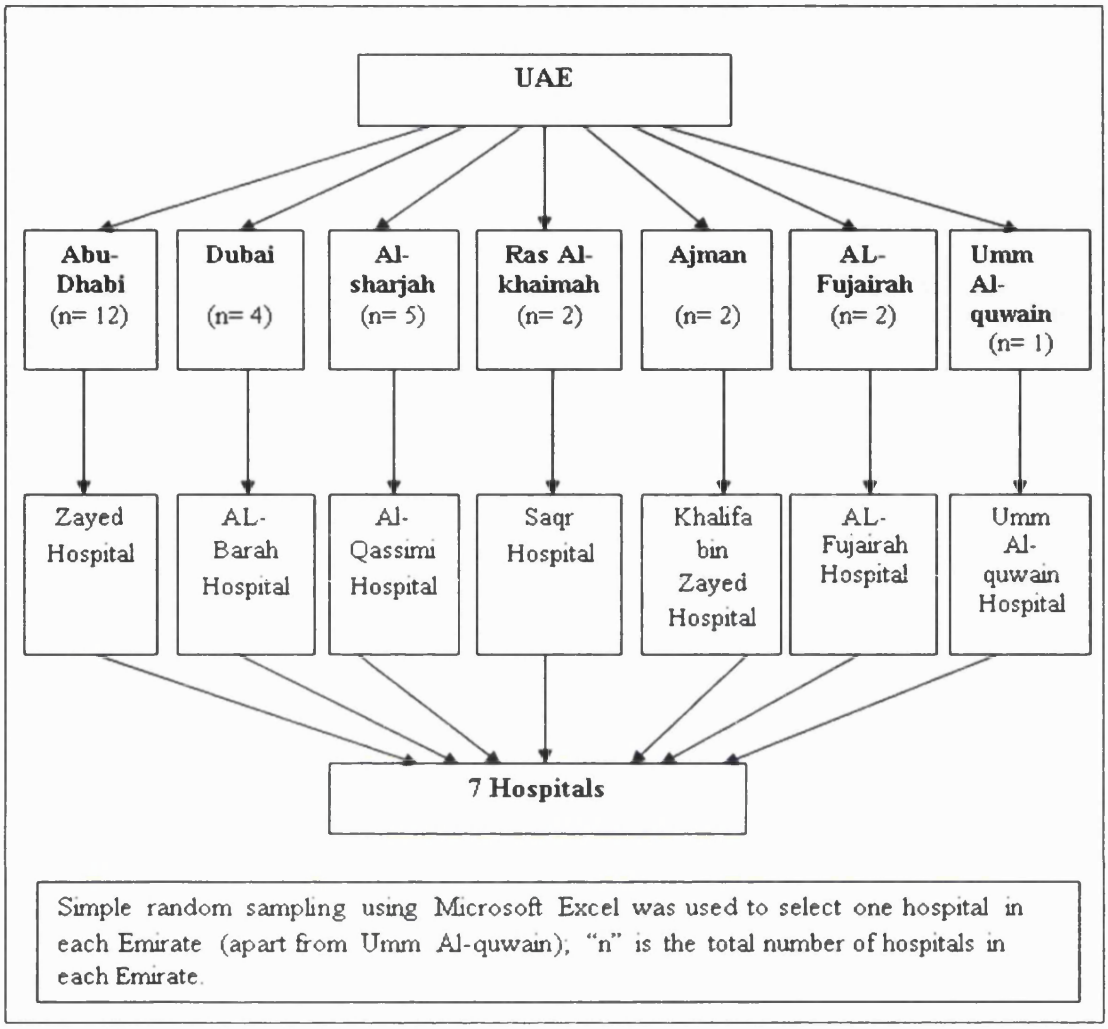



***Table 4.2: List of the hospitals selected for patients recruitment***

| Name of the hospitals | Location (Emirates) | Areas |
|---|---|---|
| Zayed hospital | Abu Dhabi | Urban |
| Al-Barah hospital | Dubai | Urban |
| Al-qassimi hospital | Al-sharjah | Urban |
| Saqr hospital | Ras Al-Khaimah | Rural |
| Khalifa bin Zayed hospital | Ajman | Urban |
| Al-Fujairah hospital | Al-Fujairah | Rural |
| Umm Al-Quwain hospital | Umm Al-Quwain | Rural |

Purposive maximum variation sampling technique was used for this study. This sampling technique involves purposefully picking participants to produce a wide range of variation on dimensions of interest (Patton, 1990). Although the sample obtained was

not meant to be statistically representative of all hypertensive Emirati (because of the necessarily small sample sizes in qualitative research), efforts were made to ensure that the sample included in the study reflects the diversity of Emirati hypertensive patients. Patients had a wide range of demographic and clinical characteristics. The sample varied in terms of residential areas (rural and urban), age group, marital status, gender, duration of their hypertension, educational level, etc. This was done by the help of the receptionists and the nurses in the cardiology outpatient clinics. Therefore, the data collected by this technique allowed a range of perspectives to be identified.

#### 4.2.4.3 Sample Size

The final number of participants was guided by the principles of saturation sampling. This is reached when additional interviews were no longer providing novel information and the same or similar themes, topics or issues emerged from the respondents. This was reached by 20 interviews, when no new themes emerged from the information provided by the participants.

#### 4.2.4.4 Patients recruitment and data collection

In the hospitals, data collection commenced in the mornings, which is the time given for cardiology clinic appointments. The researcher could not identify hypertensive patients on her own and was not allowed to check their medical files before they had agreed to take part in the study and had signed consent forms. Therefore, the researcher with the help of the receptionists in cardiology outpatients' clinics, identified the hypertensive patients when they came for appointments. The receptionists were asked to identify all the hypertensive patients with or without other complications to avoid any selection bias. Once identified, the researcher approached them and explained the study to them. Patient information leaflets (Appendix 3) were used to explain the research

aims to interested patients. After explanation, patients were asked if they would like to participate in the study. Consent forms (Appendix 3) were provided for the patients to sign if they agreed to participate in the study and to allow the interviews to be recorded.

The time and place of the interviews were chosen by the participants. Several options were offered, including participants' own homes or a private room at the hospital. Patients were given options to select alternative settings if preferred. The aim was to ensure that interviews would be private, comfortable and quiet. Patients were also given the option of having someone with them during the interview. The aim and objectives of the study were clarified. The researcher then assured patients that there were no right or wrong answers and that the patient's views and opinions were the primary interest of the research. This was done in order to relieve the initial tension and encourage patients to give their true accounts of the issues concerned. Confidentiality was also ensured as this could have affected participants answers due to fear that it would affect the quality of care they receive from healthcare providers. The first question, an ice breaker question or greeting, was important to relax the respondent and start the agenda (Bowling, 2002). Before starting, participants were also told about their right to withdraw before or during the interviews.

Seventeen interviews were conducted at a private room located in the cardiology outpatient clinics and three at the patients' houses. All the interviews, which were done at the hospital, were conducted on the same day as the initial meeting with the patients. The other three were arranged for a week later at the patients' homes. Three participants had their carer with them during the interviews as they were elderly patients in need of support; one had her private nurse, one had her daughter and the last had his wife. Out of these three, the private nurse and the daughter participated to a little extent in the

interviews. In both cases, the researcher still kept reminding the participant and the carer about the importance of the responses being from the participant themselves. Data collection for this part of the study, took place between October and December 2009.

### 4.2.5 Analysis and presentation of the interview data

#### 4.2.5.1 Transcription and translation

The researcher conducted the interviews in Arabic, digitally recorded and transcribed them. After switching off the recorders, some participants provided additional information on which hand written notes were made by the researcher as soon as the participants had left. All the extra field notes were included into the transcripts, which was then ready for the analysis.

All the stages of data analysis, codes and theme generation were conducted in Arabic, but the final themes were translated into English. The translation of the final themes was done simultaneously and independently by the main researcher and another bilingual person (N.N.). Then, the two translations were compared and all inconsistencies were resolved by discussion. The few amendments that were required were mostly grammatical amendments and a couple of spelling mistakes. A grammatical change where, for example, the tense and plurality of the words changed but the underlying concept remains intact. It was decided that translation into English would be done once the final themes were agreed on. This approach was taken for the following reasons:

1. To preserve the conceptions and cultural meanings of the Arabic language linguistic expressions that are difficult to translate into English. Important information may have been lost if translation was carried out earlier (i.e. before data analysis).

2. There is lack of semantic and conceptual equivalence across languages (e.g. although it could be possible to identify words or phrases in Arabic language that have matching or similar meanings to those in the English language, it is time and labour consuming and would not add to the quality of the final findings).

Furthermore, previous researchers have reported problems with data analysis when translation was done before the analysis. A study by Twinn (1997) used semi-structured interviews of Cantonese nurses and patients. It was reported that although there was no difference in the major categories identified when the analysis was carried out from the translated English transcripts or directly from Chinese transcripts, but there were minor differences in the generation of themes within each category. In addition, some difficulties emerged relating to translation of words that have no true equivalence within the source language. A previous work by the same author (Twinn, 1994) showed that during the analysis of translated semi structured interview data there was a query about a particular response from one participant. Therefore, there was a need for translation of a section of the interview by another bilingual nurse. The bilingual nurse interpretation was quite different from the first one, so a third nurse was asked to translate the same data. Interestingly, all three translations were different from each other. Therefore, in this study, only the final themes were translated into English language.

#### 4.2.5.2 Data analysis

A framework analysis technique was used to analyse qualitative data in this study, it was developed by researchers at the UK National Centre for Social Research (Ritchie and Spencer, 1994). This analytic approach develops a thematic framework,

which is used to classify and organise data according to key themes, concepts and emergent categories. The framework identifies a series of main themes that can be further subdivided into related subtopics. Each main theme is charted by completing a matrix (table) where each individual case has its own row and columns that represent the subthemes. The cells of the matrix contain relevant summaries from the data set and the charts can then be used to examine the data for patterns and connections.

Prior to this study, the literature was searched for issues relevant to barriers to adherence to medication in the international literature as well as the Middle Eastern region. Therefore, Framework analysis was used for the data analysis of these transcripts because it allows for the inclusion of '*a priori*' concepts from the literature as well as emergent concepts in the coding process. The strength of this analysis is that following a well-defined procedure makes it possible for others to reconsider and rework ideas precisely because the analytic process is accessible, as it has been documented.

The framework analysis consists of five different stages. The first stage is familiarisation, during this stage the researcher gets familiar with the data while transcribing the interviews and gains an overview of depth, richness and diversity of this data. The second stage is identifying a thematic framework where codes are developed from both emerging and pre-existing issues. Indexing follows as the next stage where the thematic framework is applied to the data using numerical or textual codes to identify specific data, which corresponds to differing themes. The charting stage then takes place where charts are created using headings from the thematic framework to summarise data and refer to it easily. Finally, the researcher addresses the key objectives of the research through the mapping and interpretation stage (Ritchie and

Spencer, 1994). At this stage, the researcher began to put together key characteristics of data and to map and interpret the data set as a whole. Although emergent categories, associations and patterns started during the indexing and charting stages, the deeper and systematic process of detection was done at this final stage.

#### 4.2.5.3 Validity and reliability of methods

To ensure the validity and the reliability of the coding of Arabic transcripts, the main researcher and another cardiology clinical pharmacist (A.S.) who is working in a research committee in Zayed hospital (Abu Dhabi) coded a random sample of three interview transcripts (participants 12, 14 and 16) separately and independently. The two then met to compare the two sets of coding and resolve any inconsistencies. The disagreement between the two researchers was then calculated based on cases of disagreement in concepts (when totally different concepts were identified) and cases of missed coding (when one of the researchers missed coding a chunk of text while the other one coded it). In cases where both researchers coded the same concepts but with different wording, this was not considered a disagreement. The inter-coder reliability was assessed using the following formula (Artstein and Poesio, 2008):

$$\text{Inter-coder reliability} = \frac{\text{Number of agreements}}{\text{Number of agreements + disagreements}}$$

For transcript of interview 12, A.A and A.S disagreed in concepts in three instances, and A.A. missed coding one segments, giving a total of four disagreements. Therefore:

$$\text{The inter-coder reliability for interview 12} = \frac{41}{45} = 91.1\%$$

For transcript of interview 14, A.A and A.S disagreed in concepts in one instance, and A.A missed coding one segments, giving a total of two disagreements. Therefore:

$$\text{The inter-coder reliability for interview 14} = \frac{49}{51} = 96.1\%$$

For the last transcript, interview 16, there were no concepts disagreements, but A.S missed coding one segment and A.A missed another two, given a total of three disagreements. Therefore:

$$\text{The inter-coder reliability for interview 16} = \frac{39}{42} = 92.9\ \%$$

The disagreements were resolved and all interview transcripts were checked to modify codes based on this process. The inter-coder reliability was acceptable for the three interview transcripts as all the values are more than 90%. Due to the high inter-coder reliability achieved after the third transcript, it was decided to cease the validity check after three transcripts.

Furthermore, the first three interviews were translated into English language and sent to the research team in the UK (F.S and S.C) along with the coding index. Each member of the research team reviewed the coding independently to ensure the validity of coding and that important concepts related to medication adherence were not missed by A.A. The team were satisfied with the coding index and coding process, but slight modifications were recommended which were added to the index.

The interview transcripts were further checked to modify or/add codes based on this process. In addition, to ensure validity, more steps were undertaken, including:

- Open-ended questions were used to allow respondents to raise the issues that they believed are important to the study, whereas the role of the interviewer was to explore these issues in greater detail. The direction of the content of the interview was guided by the responses of the interviewee rather than following the agenda of the researcher (Smith, 2002). This step was done in an attempt to collect data, which reflected the true perspectives of the respondent on the issue of interest.
- The researcher assured participants of the confidentiality and independence of the research in an attempt to relax the responders and make them feel comfortable to discuss any issues related to the study and to give their true views (Smith, 2002).
- Whenever a new code was added, all the previous interview transcripts were checked for the relevance of this code, which ensured consistency and thoroughness of coding.
- Argumentative validation was used where the data set was used to argue a contradictory viewpoint emerged in the interviews (Smith, 2002).
- The findings were compared to the existing knowledge of the subject in the literature (Smith, 2002).
- Using a computer indexing software package MAXQDA 2007 was also a useful tool for validating the qualitative analysis, by identifying all data relating to the issues of interest for inspection by the researcher anytime (Smith, 2002).

In addition to the inter-coder reliability mentioned above, another way for assuring reliability was by recording the interviews to enable the conduct of the interviews to be reviewed, including the verification of the questions used during the interviews (Smith, 2002).

#### 4.2.5.4 Use of computer software

A qualitative data indexing software package MAXQDA 2007 was used to facilitate coding and retrieval of the qualitative data. The software allowed the researcher to code segments of text, store the transcribed text in an organised form, search and retrieve particular segments of texts for inspection and to link relevant data to form categories. This was all done in Arabic language.

# CHAPTER 5 THE EXPLORATORY STUDY-RESULTS AND DISCUSSION

## 5.1 Participants' demographic characteristics and clinical variables

Twenty two hypertensive Emirati patients were approached by the researcher. A final number of 20 patients agreed to participate (90% response rate). The reason for the two patients who did not want to participate was lack of interest in taking part in the study. Out of the total of 20 participants enrolled in this study, twelve participants were female and eight were male. Their age ranged from 25 to 80 years, with the average of 56 years old. Three quarters of the participants were married, three were widowed and two were single.

Eleven participants were illiterate (cannot read and write). Two had finished primary school, three finished secondary school, three held a diploma certificate and only one participant was a university graduate. The majority of the female participants were housewives, five of the participants were retired and the remaining five were full time employees. Twelve participants came from urban areas, whereas eight came from rural areas.

The clinical characteristics of the participants were also obtained. The duration of hypertension of the participants varied from 1 to 26 years. Sixteen participants had other chronic diseases apart from hypertension, with the most common being cardiovascular diseases (11). Four of the participants were managed with a single drug while others were receiving a combination of two drugs (9) or three drugs (6) or four drugs (1) of different classes of antihypertensive. Thirteen participants had their blood pressure uncontrolled and only seven had their blood pressure controlled (the blood pressure level was based on the WHO/ISH hypertension guideline (WHO/ISH, 2003),

which recommends the target blood pressure is < 140/90 mm Hg and in high-risk patients (e.g. diabetes) to < 130/80 mm Hg).

## 5.2 Thematic framework

A thematic analysis was undertaken for the analysis of data as mentioned previously in section 4.2.5.2. Seven themes were identified using the thematic framework in this study, some were based on the interview topic guide and others emerged from the interview data. All the themes contained a number of sub-themes. Therefore, seven matrices were created, one for each theme. All the sub-themes within a specific theme were placed in a matrix as separate columns, an example of this is provided in appendix 4, and then participants' views and statements relating to these were summarised in each cell. The seven themes and key subthemes, which were identified, were:

1) Adherence/non-adherence to medication: The extent and types of non-adherence to medication.
2) Illness: Subthemes related to participants' knowledge about hypertension, the effect of it on their life, beliefs about their illness and beliefs about the influence of God in relation to their illness.
3) Medicines: Subthemes related to medications such as knowledge about antihypertensive medicines, beliefs about their medicines and reasons for taking medicines.
4) Social support: Types of social support participants received relating to their medication taking and illness management in general.
5) Healthcare providers/system: Subthemes related to healthcare providers, services provided to the patients by their hospitals and requests or suggestion required by participants to help in managing their hypertension.

6) Herbal medicines: The use of herbal medicines, beliefs about the safety and effectiveness of herbal medicines and beliefs about the traditional healers.
7) Barriers to other hypertension self-care behaviours: Subthemes related to reasons for non-adherence to diet, exercise and self-monitoring blood pressure.

This section will discuss the different themes/subthemes that emerged from the interview data. Quotes from the participants' interviews will be given to illustrate each themes/subthemes. All quotations were anonymised and cited by a participant code instead.

### 5.2.1 Adherence /non-adherence to medications

Adherence to medications was explored by examining statements reported by the participants describing their medication taking behaviours. As qualitative methodology was used, it allowed detailed information about the types of non-adherence to be elicited. Therefore, participants were classified into adherent or non-adherent, then the non-adherent patients were further categorised into intentional, unintentional or combined intentional and unintentional non-adherence. This was done as intentional and unintentional non-adherence have different causes and thus require different solutions (WHO, 2003).

Patients who reported deliberately stopping or altering the use of their medicines were intentionally non-adherent, whereas those who intended to take the medicines, but failed to take their medicines as prescribed due to certain constraints were unintentionally non-adherent. It is worth noting that this classification is not clear-cut and categories may overlap, as some patients could be unintentionally non-adherent at certain times and intentionally non-adherent at other times. For example, one participant mentioned that she sometimes forgot to take her antihypertensive medications (i.e., unintentional non-adherence), although she also mentioned that sometimes she would deliberately not take her medications if she feels that her blood pressure is controlled or she feels better (i.e., intentional non-adherence). Therefore, this participant had combined unintentional and intentional non-adherence.

The majority of the participants (15) reported some non-adherence to their medicines. In term of intentionality, intentional non-adherence was reported slightly more frequently than unintentional non-adherence. A quarter of the non-adherent participants reported both intentional and unintentional non-adherence.

Forgetting was the only reason reported for unintentional non-adherence, often resulting from travelling or being away from home, the nature of work, old age and/or rushing to work.

*"Honestly, I forget to take them. For example, yesterday I forgot to take the morning medication and I remembered at night so I took it at night instead, I go to work in a rush and I forget to take them"*

*(Participant 17, line 27-32)*

*"Sometimes I go to another region of the country for a day or two and I always forget to take my medicines with me"*

*(Participant 2, line 75)*

This has been supported in this literature, as forgetfulness reflected the reason for non-adherence across a range of chronic illness groups (Clifford et al., 2008). However, a few participants reported developing strategies to avoid forgetting to take medication; this is consistent with what has been reported in the literature (Johnson et al., 1999). For example, one participant in the current study reported dividing her medicines in half and keeping one at home and the other at work. She decided to do that as she sometimes forgets to take her morning dose at home, because she rushes to work.

Participants reported different reasons for intentional non-adherence and in some cases; more than one reason was reported for their intentional non-adherence behaviour. The major reason for intentional non-adherence to medication was feeling better which was reported by four participants. Other reasons reported for intentional non-adherence were to experiment with the effect of a herbal medicine alone, a dislike of dividing

tablets into halves, a fear of becoming addicted, reducing the number of pills per day, a belief that the medicine is strong ( i.e. dose is high), concern about adverse effects of the medicine, perception of no observed benefit, experimenting with different patterns of dosing regimens, a dislike of taking medicines sometimes, laziness and the last participant believed that he does not suffer from hypertension.

*"I do not like to divide tablets into halves, so I take one whole tablet instead of half"*

*(Participant 3, line 52-56)*

*"At the beginning of my illness, doctor prescribed for me medicines for hypertension, but I didn't go to the pharmacy in the first place to dispense the prescription"*

*(Participant 3, line 30-31)*

A quarter of the non-adherent participants reported being both intentionally and unintentionally non-adherent to their medication.

*"I receive calls from my work to go anywhere any time without previous notice. I forget to take my medicines with me most of the times and take them when I get back home... I do not take all my medicines every day; I do like sometimes to reduce the number of the tablets I take per day"*

*(Participant 12, Line 35-36, 41-44 and 26)*

A few patients showed they were not passive recipients of medical advice; rather they sometimes process this advice and develop their own way of taking medications based on what makes sense to them. For example, one participant stopped his prescribed medicines for three weeks to experiment with herbal remedies, and when this caused

him severe diarrhoea and increased his sugar and blood pressure level; he stopped it and went back to his prescribed medicines. This is consistent with what is reported in the literature about patients tending to test and modify their medicine according to their needs, i.e. self-regulate their illness (Siegel et al., 1999).

### 5.2.2 Illness (hypertension)

In this study, the illness perceptions reported by the participants were related to their personal ideas about the cause of hypertension, their understanding of the illness, the label they use to describe hypertension and the symptoms they view as being part of the illness (identity), emotional and consequence representations (the expected effects and outcome of the illness) of hypertension.

#### Beliefs about the cause of hypertension

A few participants did not know why they had developed hypertension or what could have been the cause of it. However, the majority of the study participants displayed different beliefs about the cause of their hypertension. Most of the participants thought there was a role of stress in causing or worsening hypertension.

*"I guess I became sick because I have a lot of problems in my life such as a sick husband with dementia, an old mother who I look after and also I had a son who was hit by a car and died couple of years ago"*

*(Participant 8, line 50-51)*

*"I started having a high blood pressure when I started getting family problems and was just about to end my married life"*

*(Participant 9, line 13)*

Some participants acknowledged the role of genetic and hereditary factors in causing their hypertension. A few others thought that unhealthy life style caused their hypertension including lack of exercise and eating unhealthy food.

*"I eat everything and don't exercise at all. My daughter bought me a treadmill but I never used it"*

*(Participant 14, line 53)*

Only one participant thought that it was her fate to get hypertension and another one reported having a white coat hypertension (syndrome) as his blood pressure tended to increase when in hospital.

*"This is from God; it is my fate to be ill"*

*(Participant 8, line 48)*

*"I fear hospitals and doctors and this might be the reason behind the increase in my blood pressure when measured in the hospital. At home my blood pressure is stable"*

*(Participant 1, line 49-50)*

**The level participants' showed of understanding their illness and identifying its symptoms**

Participants showed different levels of understanding their illness. This lack of knowledge that some participants showed could be due to the insufficient information provided to them by their healthcare providers. A couple did not know that hypertension is an asymptomatic disease that does not cause any symptoms until it has reached a very severe level.

*"I don't know why I have hypertension, I don't have headache or feel dizzy. Even when they tell me in the hospital that my blood pressure is high, still I feel fine"*

*(Participant 9, line 29-30)*

Several participants thought that diet, taking medicines and exercise could control hypertension.

*"I advise everybody to exercise; this is the most beneficial factor controlling my illness".*

*(Participant 11, line 73-74)*

A few participants were not aware that hypertension does not get cured by taking medicines. One participant was not aware that blood pressure raises and lowers naturally through the day depending on a lot of conditions. A couple of the participants were wondering why they suffer from hypertension as both reported being happy, relaxed, and not having stress or worries in their life.

*"I feel better when I take my medicines, but I don't get cured from the disease"*

*(Participant 4, line 47)*

Although hypertension is an asymptomatic disease, patients in the current study reported symptoms of hypertension. Other studies also have shown that hypertensive patients do perceive symptoms of their illness (Theunissen et al., 2003) and have shown an association between identity beliefs and adherence measures (Meyer et al., 1985). In the current study, patients felt the symptoms of hypertension when the blood pressure is too high such as heavy breathing, palpitation, headache or dizziness depending on the

person's condition. In addition, some participants were aware of the symptoms of very high blood pressure; as one participant was aware that headache is a sign of high blood pressure, while another thought that hypertension starts from the head because he used to get severe headache before he was diagnosed as having hypertension.

**Beliefs about the consequences of hypertension**

Most of the participants reported negative consequences (the expected effects and outcome) of hypertension on their lives; however, some did not report any negative consequences. It has been reported in the literature that consequences were associated with expressing emotions and poor psychological well-being (Hagger and Orbell, 2003). Therefore, these beliefs are important as they may elicit an emotional response and maladaptive coping, which could lead to poor medication adherence.

In the current study, some participants showed lack of awareness about the consequences of hypertension. For example, one participant believed that he could sometimes treat himself because he knows better than anyone else about his own condition. Another measures her blood sugar level frequently, but does not measure the blood pressure level at home and thinks that diabetes is worse than high blood pressure. Lower perceptions of consequence to illness were associated with higher adherence among hypertensive patients in a study by Ross et al (2004).

Most of the participants reported negative consequences of hypertension on their lives. Some were aware that hypertension could lead to cardiovascular disease and stroke as they read a lot about their condition or they have seen that happen to patients close to them. Others were aware of the consequences of hypertension as they suffered from these consequences themselves.

*"High blood pressure can cause me paralysis or clots. I read a lot about my disease and I have seen a lot of patients that have suffered because of it"*

*(Participant 20, line 110)*

*"Yes, I felt pain in my chest, suffocation and had severe headache. I could not look at the light directly. I was getting tired and I remained like this until I lost consciousness and was admitted to the hospital. I was in the intensive care for a while and the diagnosis was hypertension; it was above 200 at that time"*

*(Participant 17, line 22-24)*

In contrast, a few participants reported not experiencing any serious effects on their lives as a result of their hypertension. The effects of hypertension were described with several phrases e.g. "fine", "stable", "normal", "do not feel anything" and "do not have any problem".

*"Even when they tell me in the hospital that my blood pressure is high, still I feel fine"*

*(Participant 9, line 37)*

*"Do not feel anything at all. Thank God I suffer from nothing"*

*(Participant 1, line 46)*

**The emotional impact of hypertension on the participants**

Hypertension had some emotional impact on the participants of this study. A few participants mentioned that they were tired of taking so many medicines. A couple said that sometimes they want to stop taking their medications because they are bored of taking many.

*"I take medicines in the morning, in the afternoon and at night; what to do, god is great... Sometimes I get so tired and bored of taking all these medicines and think of stopping them, but then I rethink and tell myself that these are important and I should take them if I want to be well"*

*(Participant 5, line 44-46 and 47)*

*"I used to tell my mother 25 years ago not to take so many medicines because this might kill her. I never thought that I will end up taking a lot of medicines one day myself"*

*(Participant 14, line 97)*

Two participants reported that they were bored of the restrictions that the disease placed on their diet. In addition, one participant described the psychological phase that she went through when given the diagnosis of hypertension and being in tears as soon as she heard that.

*"I didn't cry for myself, but for my sick mother. Who will take care of her if something happens to me?"*

*(Participant 20, line 91-94)*

In two cases, participants reported how hypertension affected their life badly and showed low mood as a result of their illness.

*"I'm suffering a lot because of this illness"*

*(Participant 6, line 46)*

*"I never thought of becoming this sick and reaching this level of illness"*

*(Participant 14, line53)*

These emotional responses reported by the participants could have been the reason behind their medication non-adherence behaviour. The relationship between emotional response and non-adherence to antihypertensive medication has been reported in the literature (Ross et al., 2004). Negative emotional responses to hypertension may adversely affect adherence to medication by encouraging maladaptive coping mechanisms (e.g. denial), or it could lead to anxious or depressed patients who are less adherent to their medicines due to psychiatric illness (Wang et al., 2002; Wing et al., 2002).

**Other beliefs which may affect patients managing their illness**

A God-centred locus of control was reported by only a couple of participants, but it is worth mentioning as it illustrates that religion plays a role in the way some Emirati hypertensive patients perceive their illness. In the current study, belief in God was a motivation to cope with their disease and to ignore its impact on their life, for example:

*"I take my medication and my life is in God's hand. What is meant to be will be"*

*(Participant 18, 64)*

This is consistent with findings of other studies in the literature (Greenhalgh et al., 1998; Adams, 2003; Azlin et al., 2007) which highlighted that God-centred locus of control and religion played an important role in the way patients with chronic illness

managed their illness. This could therefore affect adherence and alter lifestyle in either a positive or a negative way.

### 5.2.3 Medicines

**Knowledge about antihypertensive medications**

The majority of the participants knew the correct use and frequencies of their medicines. Only a few knew the name of their medicines. One participant did not know that Natrilix is an antihypertensive medicine although she had taken it for a year. Another participant was not aware that antihypertensive medicines should be taken regularly, not as needed.

*"I usually take my medicines when I feel ill. The last 10 days only, I started taking them as I felt a bit ill"*

*(Participant 7, line 62)*

The lack of knowledge about antihypertensive medication expressed by the participants could be due to the little amount of information provided to them by their treating physician and/or inadequate communication between the pharmacists and the patients.

**Beliefs about the medicines**

The current study showed that beliefs about antihypertensive medications influenced how participants made sense of their medicines, and ultimately their medication taking behaviours. A range of beliefs emerged from these interviews; some were about the necessity of taking medicines and others related to the concerns about

taking them. Participants' views on their medicines varied from seeing them as useful and beneficial to useless.

Necessity of taking medicines

Some of the positive statements about medicines made by participants included: "taking medicines became part of my life", "I will die if I stop taking these medicines", "if patients take their medication as prescribed they will never be ill", and "medicines are good but patients aren't because they don't fully follow the given instructions". Eight participants perceived their medicines to be useful and believed in the necessity of their medications for controlling their hypertension, for example:

*"I feel better when I take my medicines."*

*(Participant 14, line 47)*

*"Before taking medications, I used to have a headache. But now I am better. I think the medications are useful."*

*(Participant 20, line 135-136)*

Beliefs about the necessity of taking medication have been strongly related to medication adherence among patients with chronic illness in the literature (e.g. Horne et al., 1999). In the current study, some participants reported necessity beliefs about taking their medicines, which suggests that these beliefs are probably important in an asymptomatic condition such as hypertension. This has been supported in the literature as belief in the necessity of medication was strongly related to adherence to antihypertensive medication (Ross et al., 2004).

Concerns about taking medicines

Some negative statements reported by participants included: not controlling the condition, whether you take them or not you still feel the same, and one believed that Natrilix is not an antihypertensive medicine and that it had no effect. Participants who thought that medications were not effective stated either that they simply did not feel anything different or that their blood pressure was not controlled. In addition, one participant believed that not taking medication up to twice a month would not have a negative effect on health.

*"I do not know how effective this medicine is... I don't feel ill or tired when I stop taking it"*

*(Participant 9, line23)*

Participants' adherence to their antihypertensive medicines could have been influenced negatively by these beliefs. In some cases, participants reported some doubt about the personal need for antihypertensive medication and in other cases concerns about taking them. It was reported in the literature across different illness groups that non-adherence to medication was related to concerns beliefs about taking medicines (e.g. Horne et al., 2004; Brown et al., 2005).

### 5.2.4 Social support

This study also identified the considerable role that participants' families play in their disease management. Families were quoted as an important source of support, providing both moral support and physical assistance to the participants. The majority of the participants (13) reported getting different types of support from family members. Family support appears to be important to participants' decisions regarding adherence to

medications and could affect these decisions either negatively or positively. In this study, family support included providing advice, for example:

*"My daughter advises me always about taking my medicines"*

*(Participant 7, line 56)*

In addition, some participants reported practical support from their family members such as collecting their medication for them and driving them to hospitals.

*"My son goes to the hospital every 2 to 3 months to get my medicines"*

*(Participant 18, line 29-30)*

*"Sometimes I change my appointment because no one takes me to the hospital. If none of my sons are available then I cannot go to the hospital, I live too far and cannot drive myself"*

*(Participant 4, line 61-62)*

Others got help managing their condition directly from family, including: measuring their blood pressure level, preparing pill boxes and in some cases providing every single dose to the participants.

*"I would not take my medication if my wife didn't do that. I prefer this special box as it is easy and very comfortable even when I travel abroad for a short term; I take the dosage necessary for the period of my trip in a small divided box"*

*(Participant 1, line 70-74)*

*"I used to take my medicines by myself in the past, but my daughter started giving me each tablet at its time 3 days ago. I guess she thinks that I forget to take some of them sometimes"*

*(Participant 19, line 71-72)*

The influence of social support was apparent in the majority of the interviews. Most of the support came from the family members of the participants and in one case from the carer. Emirati people value family intimacy and have the advantage of cohesive and supportive family networks. This suggests that a family-centred approach to education by doctors may be beneficial. Social support could help patients overcome personal, emotional and other barriers such as medication availability, and may influence their adherence to medication. In contrast, in one case it influenced a patient's decision to stop taking medicines e.g. participant 3 did not take his medicines for three years from the beginning of his diagnosis because of his mother's advice, as she thought that he might become addicted to these medicines.

Moreover, participants reported getting advice from their family members regarding their medicines, lifestyle changes and their treatment plan in general. Therefore, they constituted a major source of knowledge and might have influenced patients' behaviour. For example, one participant stopped taking his medicines to try herbal remedies recommended to him by his aunt.

*"My aunt sent me an herbal medicine from Yemen. She said that it has been tried before and it is very effective, so I stopped taking all my medicines for 3 weeks to experiment the effect of the herbal medicine alone. However, I had to stop it as it caused me chronic diarrhoea; I dropped from 85kg to 74 kg"*

*(Participant 2, line 269-71)*

### 5.2.5 Healthcare providers/system factors

Several factors related to healthcare providers and healthcare services/system emerged from the analysis of the 20 interviews, which might have influenced participants' medication adherence and their treatment plan in general. Access to hypertension care across different Emirates (health districts) varied and participants in certain Emirates may have been disadvantaged in this regard compared to others. For example, participants reported changing the nearby hospitals and attending others due to lack of medicines, equipment or more specialised healthcare teams, this was usually the case in rural areas. In addition, the current health services provided suggest that healthcare provision is currently fragmented and spread over several places such as big cities, which are inconveniently geographically distanced from each other. This may limit the communication and cooperation between healthcare providers at different sites and also create access difficulties for patients. This section describes the subthemes, which might have influenced adherence among the study participants.

#### Physicians' willingness to allow patients to contribute and be involved in their treatment plans

Respondents suggested that doctors do not consider the patients' perspective within the consultations and do not involve them in decisions about their treatment plan. All participants reported not being engaged in a negotiation regarding their treatment

plan. The current study suggested that lack of time might be one possible reason for doctors' adoption of a paternalistic approach e.g. several participants reported that they did not want to ask questions to their doctors as their doctors were very busy and had so many patients to see. However, most of the participants wanted their treating doctors to make the decisions about their treatments and did not show interest in taking part in their therapy plans. Participants' personal support for this approach could be another reason for the wide use of this approach by the healthcare providers. Similar issues were reported in the literature, for example, a UK qualitative study by Weiss et al (2004) used Decision Analysis to understand newly diagnosed hypertensive patients involvement in decisions about their healthcare. They found that only a few patients felt they were able to discuss issues with their doctors, and that most either said they tried but felt the doctors did not have enough time or they just "did as they were told". In addition, old age or low educational level of this study's participants, with most participants having grown up at a time when a doctor's influence was accepted as authoritarian could be the explanation for this attitude.

In contrast, several participants were not happy with their doctors' attitude and wished to be involved in the decision made regarding their medicines.

*"One of my previous antihypertensive medicines was changed during my last visit to the hospital; the doctor increased the dose of this medicine from 10 to 20mg today. Although I told him that I prefer the old medicine because the new one gives me severe headache, but he told me that these medicines are all the same and that I have to take it... The new medicine is as bad as the doctor; I had an argument with him regarding this medicine, but no point. What can I do?"*

*(Participant 6, line27-28, 50-51)*

*"I told him that Natrilix is not good for me and doesn't control my blood pressure, but he said it is a good medicine, just keep taking it"*

*(Participant 13, line 41-42)*

**Continuity of care**

Another issue, which has been reported by the participants in this study, which might have implications on their medication adherence, was discontinuity of care. This included not being seen by the same doctor every time they attend their appointments. The majority of the participants were followed up by the same doctor every 2 to 3 months. In contrast, a few participants had an issue regarding the discontinuity of care, which caused them concern. For example, one participant did not see his treating doctor the last two times he went for his follow up visits, whereas another participant sees different doctors every time she attends the clinic. These participants were not satisfied with the care provided by the substituted doctors and wished to see their treating doctors again.

*"There should be one doctor to follow up with, not every day a new doctor. New doctors keep wasting time and checking patients' files in front of them and don't know the case well; this is a very difficult situation"*

*(Participant 6, line 48, 72-73)*

**Patients' education**

The lack of knowledge among the participants in this study could be related to the lack of counselling and education provided by the healthcare providers. Most of the participants in this study reported that the healthcare providers provided little or no education about hypertension and its treatment.

As for pharmacists, the role of pharmacists was reported by five participants as mainly to be dispensing and providing information about the prescribed medicines. Out of these, three participants reported an insufficient amount of information provided by the pharmacists.

*"Pharmacists do not give extra information unless I ask for that"*

*(Participant 5, line 89)*

In addition, it has been reported in the current study that pharmacists use a quick swipe of the pen across medication packaging to indicate the frequencies of taking the medicines. The International Pharmaceutical Federation (2001) clearly states that the absolute minimum information for labelling a prescribed medicine is to have strength, individual dosage instructions and generic name. Therefore, this study suggested that these requirements were not always fulfilled by pharmacists when labelling medicines.

*"Pharmacists don't provide me with sufficient information about my medicines. They just quickly swipe using a pen across the medications packages to indicate how many times I need to take these medicines and put them in a bag and hand it over to me"*

*(Participant 17, line 38-50)*

In addition, a few participants reported using daily or weekly pill boxes to improve their medication adherence. All participants started using these pill boxes themselves without any help or even advice from the health care providers in an attempt to improve their medication adherence.

As for doctors, almost half of the participants were satisfied with regards to the information provided to them by their doctors.

*"Doctor explained to me about hypertension as well as the complications of it, including cardiovascular diseases and stroke. Also, he told me that I suffer from essential hypertension and explained that to me too. My treating doctor provided me with much information and in details"*

*(Participant 9, line 50-52)*

In contrast, nine participants reported lack of information given to them by their treating doctors. However, several reported that they do not blame the doctors, as they do not have enough time to spend with each single patient.

*"I mean the doctor doesn't explain much to me because he sees many patients per day. I don't blame him for not providing enough information because he just doesn't have enough time to spend with every single patient"*

*(Participant 12, line 70-72)*

This is a cause of concern as many participants showed evidence of underestimating the severity of hypertension, not incorporating lifestyle changes needed to manage their hypertension properly and altering their antihypertensive medications on their own which may be a result of this lack of information from the healthcare providers. A previous study (Gascon et al., 2004) highlighted that patients with a chronic condition, such as hypertension, lack basic knowledge about their disease, its potential risks and why it is important to follow the prescribed treatment in the absence of symptoms. In the current study, most participants felt that doctors' education and

support were essential, but lacking. Therefore, they wanted more education about hypertension and its treatments to be provided to them by their healthcare providers particularly the doctors.

**Trust in health care providers**

Most of the study participants reported that they trust their doctors. Reasons reported by the participants for their trust were: doctors know about the treatment more than them, explain everything clearly, care about them, have a good personality, are understanding and kind, co-operative, answer the questions and explain things and provide advice regarding lifestyle changes. However, only two of the participants who said they trusted their doctors, in reality reported non-adherence to the doctors.

*"I had a consultation two weeks after I stopped my medicines for 3 weeks to use a herbal remedy. After the examination, the doctor told me that I have high blood pressure and blood sugar level and he asked me why. I said I do not know but I am drinking a lot of tea with sugar these days. I didn't tell the doctor"*

*(Participant 2, line77-80)*

Some participants reported a lack of trust in their healthcare providers e.g. one participant was told by the first doctor that she suffers from nothing, although she had a high blood pressure. In addition, in some cases participants' showed more trust in relatives than in their healthcare providers.

*"My mother suffers from hypertension and diabetes for very long time and she advised me not to take any medicines. She told me that if I start taking them I would end up like her; not being able to survive without medicines, these are addictive... So, I did not take any for three years since being diagnosed"*

*(Participant 3, line 30-33)*

**Perceptions of care provided by the healthcare providers/organisation**

When speaking about healthcare providers, participants mostly referred to their doctors. This illustrates that doctors were considered the key players in delivering hypertension care in the UAE. Pharmacists and nurses were not reported by the participants to be involved in their illness treatment plans; this finding reflects the findings of other studies in the international literature (Bane et al., 2007). Bane et al (2007) reported in a qualitative study among British hypertensive patients, that the participants did not raise the issue of other health care professionals (e.g. nurses and pharmacists) involvement in hypertension management.

The current study highlighted the limited role of healthcare providers other than doctors in providing hypertension care. Participants did not mention nurses, and only one participant had been seen by a dietician. Pharmacists were recognised as suppliers of medicines and received a great amount of criticism compared to doctors. This was due to their lack of involvement in patients' care, particularly in providing sufficient information about medications. This could be due to the lack of awareness or exposure to their roles in disease management and health promotion (Bane et al., 2007).

Almost half of the participants reported that their doctors care about them and are concerned about their health. In contrast, four participants reported lack of care from

their health care providers. One participant told the doctor that he did not like breaking a tablet in half because one half was always bigger than the other. No specific advice was given in response; just that the patient had to do it. Another informed her doctor about her non-adherence to medication, but the doctor did not say anything and kept quiet. Another participant said that she does not see the doctor; he just gives the prescription to her son to dispense her medicines from the pharmacy every 2 to 3 months. Also, the same participant used to take one tablet of Coversyl 4 mg per day, but her son came last week and told her that the doctor increased the dose to 2 tablets per day; the doctor increased the dose based on information given by the son, without seeing or examining the patient herself.

Two participants reported being referred to a dietician by their doctors, but only one has been seen. The majority reported that they had never been referred to a dietician since being diagnosed. In one case, the participant went to a nutrition shop herself to buy products for reducing her weight.

*"I have never being transferred to a dietician since I was diagnosed of having diabetes and hypertension"*

*(Participant 14, line 114)*

It was also reported by a few participants that there are a lack of doctors. Therefore, doctors may not spend enough time with every single patient as they see so many per day. Another participant said that the clinic was so busy so she could not ask her doctor anything, as he had no time.

*"I saw that with my own eyes, they are really busy having so many patients per day, I do not blame my doctor for not spending enough time with me"*

*(Participant 12, line70)*

A few participants also reported having a problem with rescheduling their appointments; implying that the appointment department in the hospitals would not help patients if an appointment was missed. Two of these participants had suggestions regarding the appointment departments in the hospitals. They wanted an improvement in the appointment services and wished to receive an appointment reminder.

*"Why don't they send an appointment reminder to the patients? They could do that through sending messages on their mobiles, e-mails, post or even by calling them; it will help patients a lot"*

*(Participant 3, line 61-63)*

**Inequality of the services provided**

Some participants perceived there were inequalities in care provision and supply of medicines between hospitals and clinics in rural than in urban areas, and considered living in rural areas as disadvantaged compared to inner cities of the UAE. One participant reported attending a hospital in the city because of the lack of services in hospitals in her rural area. Another has changed hospitals twice where she lives in the rural area because of lack of medicines and services. A third used to attend a hospital in a rural area, but changed it because of lack of services and supplies.

Some participants perceived an inequality in availability of medicines at different hospitals. A few participants reported not getting all the medicines on time from the hospital pharmacies in which they have to come later to collect the unavailable ones, usually after a week or 10 days from their clinic visit. Two participants reported that they purchased unavailable medicines a couple of times from private pharmacies; this might not be convenient for other patients and could present a barrier to medication adherence. Another reported unavailability of the required medication strength.

*"I have to take two tablets of Norvasc 5mg when 10 mg is not available. I like to take less medication"*

*(Participants 20, 107-108)*

In addition, one participant complained of changes to the trade names of the medications (supplying companies). This participant wanted the hospital to purchase each medicine from the same manufacturer all the time as he felt that this is important to prevent patients from getting confused with their medicines as different brands have different tablet size, colour, pack design, and names. This is also a reason for concern as lack of understanding the medicines could be a cause of unintentional non-adherence to medication.

*"The hospital pharmacy purchases medicines from different companies. The pack of the same drug keeps changing, which is very confusing"*

*(Participant 15, line 44)*

A recent report has acknowledged access to medicines as a cause for non-adherence (WHO, 2003). However, in this study, a few participants reported unavailability of medicines in the hospital pharmacies, but did not report this specifically as a reason for their non-adherence. They either had enough medicines to take until the medicines were made available in the hospital pharmacies or as reported in two cases the patients bought the unavailable medicine themselves from private pharmacies. In addition, unavailability of certain medication strength and trade name were reported by the study participants, which all could be a cause of unintentional non-adherence, but in the current study, none of the non-adherent participants reported these as a reason for their non-adherence behaviour.

Moreover, some services were provided by hospitals in few Emirates, but not all. For example, one participant's daughter reported that the hospital decided to send a nurse every month to check on her mother at home because she refuses to go to see her doctor. The nurse measures the participant's blood pressure and blood sugar level on each visit and reports to her doctor. This service is not provided to all hypertensive patients within the UAE.

### 5.2.6 Herbal medicines

There is a long history of using traditional herbal remedies among UAE citizens. It is easy to buy these remedies from specialist outlets known as "condimental" shops, health food shops, supermarkets and pharmacies. Pharmacies are the only outlet under regulatory control of the Ministry of Health. People in the UAE self-administer herbal remedies for the management of acute and chronic conditions.

In the current study, seven participants reported taking some form of herbal medicines, five participants had previously used some and eight had never used any herbal remedies. All participants who reported current or previous use of herbal medicines knew the condition for what these herbs were used for. Only five of these participants knew the name of the specific herbs. Participants used a wide range of herbs for a number of complaints. Participants reported using different types of herbal medicines such as thyme, ginger, sage, anise, green tea, herbal teas, turmeric, henna, hibiscus, mint and caraway. Two participants used herbs prepared by traditional healers, another used an herb sent to him from Yemen by his aunt; all three did not know the herbs they used. Herbal medicines were used for the treatment of different conditions including vitiligo, diabetes, joints pain, stomach upset, hypertension, general health, eczema and constipation. One participant reported drinking green tea just because he likes it, not to treat any medical condition.

In this study, most of the participants did not reveal their use of herbal remedies to their health professionals, fearing disapproval. Only one participant reported that she informed her physician about the use of herbal medicines. Almost all the participants who had used or were currently taking herbs took them concurrently with prescribed medicines and for the same conditions as those being treated with prescribed medicines. In one case only, a participant switched and used herbal remedies instead of his prescribed medicines to experience the effect of herbal remedies alone.

This section describes the subthemes that emerged in regards to herbal medicines in more detail.

**Effectiveness and safety**

When asked about the perceived effectiveness of herbal medicines, participants who were currently using herbs thought that they were either effective or very effective. Most of the participants who were currently taking herbal medicines reported using them on an occasional/ when needed basis, whereas a few were taking more than one concurrently and several used herbs on a daily basis.

A couple of participants stopped using herbal medicines because they felt no effect. However, several others reported that the herbs were useful, but they stopped the use of these herbs for different reasons, including: adverse event associated with it (chronic diarrhoea), her doctor asked her to do so and lack of time.

*"I used to feel very relaxed and active after drinking these herbs, even if I slept for 4 hours a day used to feel relaxed... I used to feel fresh and energetic when used to drink these herbs regularly... I stopped because I did not have time as my father is dead and I look after my old mother and in charge of everything in the house. I don't have time to do anything for myself now, but will take these herbs again"*

*(Participant 20, line 26, 32-36)*

**Beliefs about herbal medicines**

Participants were asked about their beliefs about herbal medicines and reported beliefs which varied from useful to harmful. Several of these participants reported positive views on herbal medicines e.g. they perceive that herbs cannot be harmful, help in detoxifying the body from toxins and should be used before starting any Western medicines (when first diagnosed as having the disease).

*"I felt that these herbs helped in eliminating toxins from my body"*

*(Participant 20, line32)*

In contrast, a couple were scared of using any as these might harm them e.g. one had concerns regarding the use of these herbs together with the western medicines as these might cause interactions and the other had concerns regarding an unhealthy increase or decrease in blood pressure which might be caused by these herbs. In addition, one participant believed only in using Western medicines, and felt that herbal medicines were completely ineffective.

*"I mean, I believe in Western medicines not in herbs, these are nonsense. It might work for some, but I don't like them personally".*

*(Participant 6, line 54)*

**Trust in traditional healers**

All participants who currently or previously used herbal medicines reported buying them from condimental shops, supermarkets/grocery stores and herbal medical centres. None of the participants bought herbs from pharmacies. Several participants had some views about the traditional healers. Positive views about traditional healers included: trusting the traditional healer as the participant takes the herbal ointment and drinks as per the healer instructions, participant always buys his herbs from the healers and one reported that whenever she feels ill she goes to the traditional healer to get some herbs as per the healer recommendations.

*"The traditional healer mixes the herbs in the water and gives it to me to drink. He knows what they are, I do not. I just take the medication as per his instructions"*

*(Participant 1, line 24-25)*

Only one participant reported a negative view about the traditional healers, she thought that there is no reason for seeking a traditional healer's help because they learned their job by practising and trial and error; unlike healthcare professionals who studied medicine and have a strong medical background.

### 5.2.7 Barriers to other hypertension self-care behaviours

Although adherence to antihypertensive medicines was the main focus of this research, participants were also asked about other hypertension self-care behaviours including: (1) adherence to healthy diet, (2) adherence to exercise, and (3) adherence to blood pressure self-monitoring. Life-style modifications should be made along with pharmacotherapy, as without these changes an optimal blood pressure control cannot be achieved. This study suggests that adherence to medication was higher than adherence to diet and exercise recommendations. It has been reported in the literature that the rate of non-adherence is even higher when there is a need for a modification of an existing lifestyle habit such as exercise (Dishman, 1982).

In line with barriers to antihypertensive medication adherence, a lack of education and counselling by doctors was reported by most participants and could have led to non-adherence to lifestyle changes. The reasons for non-adherence to exercise, diet as well as self-blood pressure monitoring reported by the participants are described in the next section.

**Adopting and maintaining a healthy diet**

It is generally accepted that hypertensive patients should implement lifestyle changes as well as take medication to manage their hypertension. To fully succeed in this, it is important that patients receive support from their healthcare providers. There was evidence that instructions provided by the healthcare providers were insufficient. For example, only one participant was provided with written instructions from a dietician. In the current study, the majority of the participants (19) reported being non-adherent to a healthy diet. Different reasons were reported for non-adherence to diet recommendations, but the main reason was wanting to eat like the rest of the family, which was reported by 12 participants. This could be due to patients not wanting to be recognised as being sick e.g., one participant reported "I don't like to be sick or feel that I am sick". Other reasons reported including: lack of motivation, lack of awareness, participant lives in a company's accommodation, where no healthy food is provided and participant loves food.

*"Whenever anybody at my home cooks food, I have to eat it. My children advise me not too, but I keep shouting and screaming until they give me what I want. I cannot stop it, I love food"*

*(Participant 14, line 45-46)*

**Adopting and maintaining an exercise regime**

Exercise has little cultural meaning for Emirati patients as people are not used to exercising. Although, some participants reported that their doctors talked to them about the benefits of exercise, it was still perceived as difficult or potentially exacerbating their disease. As for exercise adherence, fourteen participants reported that they were non-adherent to exercise. Walking was reported as the most common exercise of the six

patients who did exercise. One reported going to the gym and another reported swimming. Different reasons were reported for non-adherence to exercise with lack of motivation (e.g. lazy, weather or feeling bored of exercising) being the main reason as was reported by eight participants. The second reason was comorbidity; five participants reported not exercising due to the existence of comorbidities including: arthritis, diabetic foot and heart failure. Only one participant reported lack of time as a reason for non-adherence to exercise.

*"I cannot exercise because I suffer from back and joint pain"*

*(Participant 4, line 65)*

**Self-blood pressure monitoring**

Although over half of the participants reported they were self-monitoring their blood pressure levels at home, only three did this on a regular basis. Out of these three, one reported measuring herself, one by the participant's daughter and the third by a nurse. Participants who do not measure their blood pressure at home reported not having the monitoring device, apart from one who reported a lack of trust in the accuracy of these devices.

*"I do not have the blood pressure monitoring device and only hope that they provide everything for the patients such as these self-monitoring devices"*

*(Participant 17, line 64)*

Healthcare providers need to address the barriers for not self-monitoring blood pressure as many participants get their blood pressure measured only when they attend their appointments, which could be anything between 2-6 months.

## 5.3 Summary of the findings

This chapter presented the first study exploring non-adherence to antihypertensive medications and other hypertension self-care behaviours (diet, exercise and self-monitoring blood pressure) among Emirati patients, providing evidence that non-adherence to antihypertensive medications and other self-care behaviours among this population is problematic. The main aim of this part of the research was to explore how antihypertensive medications were being taken and what were the barriers preventing adherence to medications among this particular population. In addition, participants were asked to discuss whether they adhered to other hypertension self-care behaviours, and if not, to provide reasons for their non-adherence to put non-adherence to medication in wider context of self-care behaviours.

Twenty Emirati hypertensive patients participated in this study, and the results showed that most participants (all except for five) were non-adherent to their medications. Intentional non-adherence was slightly more frequent than unintentional non-adherence. The only reason reported for unintentional non-adherence was forgetting, whereas for intentional non-adherence many reasons were reported, with feeling better being the major reason.

In the current study, participants expressed different beliefs about their illness. These beliefs included: beliefs about the cause of their illness, beliefs about understanding their illness, beliefs about the consequences of hypertension and some expressed the emotional impact of hypertension on their life. Similar beliefs were found by previous studies to influence medication adherence (Rees et al., 2010).

In line with current adherence literature in which beliefs about medicines were found to be strong predictors of medication adherence (Horne and Weinmen, 2002; Ross et al., 2004; Horne et al., 2007), the current study showed that beliefs about medicines influenced how patients made sense of their medications, and ultimately their medication-taking behaviour. Findings of the current study revealed beliefs about medicines among participants such as the necessity of medicines for the management of hypertension and ineffectiveness of medications for controlling blood pressure level. Patients who do not believe in the necessity of medications for managing their hypertension may not adhere to their medications.

When speaking about health care providers, participants mainly spoke about their doctors, this illustrates that doctors were the key players in delivering care to hypertensive patients in the UAE. Nevertheless, participants reported a vast amount of criticism about their doctors, which have potential implications on their medication or treatment regimens adherence. These include ignoring patients' perspective during medical counselling, discontinuity of care, lack of education and counselling and not referring patients to other healthcare professionals.

In term of the healthcare system, the findings of this study highlighted a number of important factors, which might interfere with patients' adherence to their hypertension or other self-care behaviours. Access to medications and hypertension care across different health districts varied and participants in rural areas may have been disadvantaged in that regards compared to others.

This study showed the impact of cultural factors on the life, perceptions and therefore on medication adherence of this particular population. Emirati people value

family intimacy and have the advantage of cohesive and supportive family networks. Therefore, support from family members were reported by the majority of the study participants. Most of the time this support helped participants to adhere to their medication, such as collecting their medicines for them from the hospital pharmacy or even providing them with each single dose. In addition, participants reported receiving advice from their family members and friends regarding their illness and treatments, but in some cases, false or inaccurate information might be provided to patients by their family members, which could influence their treatment plan including medication adherence, which was evident in this study.

In addition, participants reported taking herbal remedies to help manage their hypertension. Although use of such herbal remedies was not explicitly associated with non-adherence to antihypertensive medication (except for one participant), but the majority of patients who used these remedies did not inform their doctors about it, and thus run the risk of potentially serious interactions with prescribed medicines which may adversely impact on their health.

In relation to performance of lifestyle changes, participants rarely incorporated these into their life due to several barriers. Adherence to medication was higher than adherence to self-care behaviours (e.g. diet). Different barriers reported for non-adherence to lifestyle changes with wanting to eat like the rest of the family being the main reason for non-adherence to diet and lack of motivation being the main reason reported for non-adherence to exercise.

## 5.4 Implications for further research

All the studies found in the Middle Eastern countries reviewed in Chapter 3 focused on measuring the rate of adherence to medication and the relationship between a set of variables and adherence, including demographic and clinical predictors, without examining patients' beliefs and views. Therefore, this area needs to be investigated as Donovan (1995) highlighted that the absence of the patient's perspective is one of the main reasons for the lack of progress in adherence research. For example, a study by Fahey et al (2006) showed that lack of knowledge about hypertension contributed to non-adherence to antihypertensive treatment, but we cannot assume that educational intervention alone is sufficient in promoting sustained adherence behaviour as a broader context of individuals' decisions about taking medicines, which considers how patient perceive and manage their illness should be addressed.

The purpose of this study was to explore non-adherence to antihypertensive medication in the UAE in order to identify factors of importance to this particular population. Beliefs and other barriers appeared to be associated with non-adherence to antihypertensive medicines, however it was not the purpose of this study to quantify the relationship between these beliefs/barriers and non-adherence. Further study is now justified using a large sample to quantify the role of illness and treatment perceptions as well as other barriers that emerged from the interviews relating to antihypertensive medication adherence. This will be the focus of Section 3 of this thesis. The current study, however, provides preliminary evidence for the importance of addressing patients' perceptions of illness and treatment, social support, healthcare providers' factors to facilitate adherence to medication in hypertension. All these issues, which were identified in the current exploratory study and were of importance to participants, will be used to aid in the formation of research objectives and the development of the

instrument for the study; a quantitative, cross-sectional survey, which will be reported in Chapters 6 and 7.

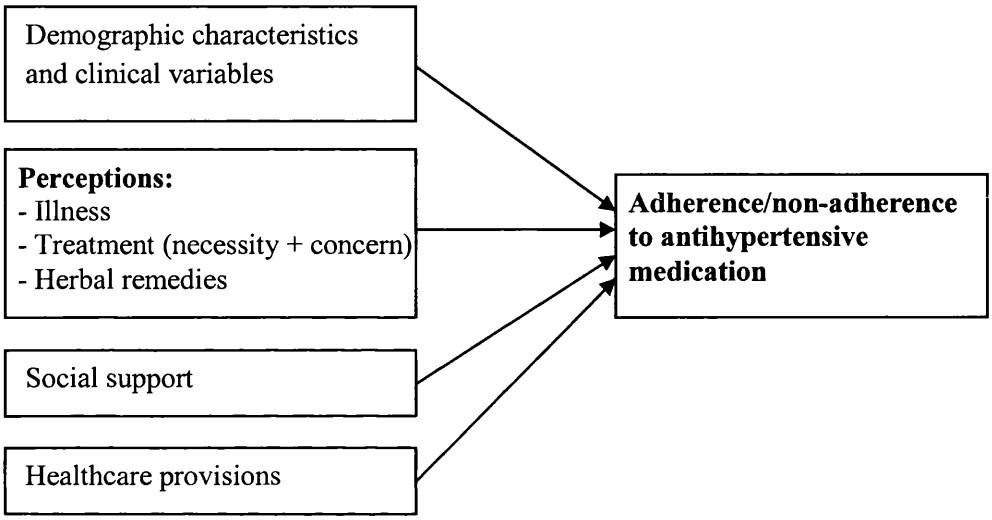
It was suggested that effective interventions to facilitate adherence to medication in chronic illness are currently hard to achieve (Haynes et al., 2008). This might be because few interventions have been developed around a suitable theoretical framework, as recommended in the Medical Research Council (MRC) guidelines (Campbell et al., 2000). Therefore, there is a need for a framework to understand how key variables interact to influence antihypertensive medication adherence behaviour and provide direction for structuring the best interventions to enhance medication adherence among hypertensive patients in the UAE in order to improve their health outcomes.

Psychological models seek to provide frameworks in explaining variations in health-related behaviour in order to develop interventions to help patients maintain their health and manage their illnesses (James and Horne, 2000). Therefore, a framework using the beliefs about illness and medicines approach will be used to explain adherence/non-adherence to antihypertensive medication in the next section of this thesis. This approach has been useful in predicting non-adherence to medication for a range of diseases (Horne and Weinman, 2002; Ross et al., 2004; Rees et al., 2010), so it will be relevant for this research.

Other external (family support and healthcare providers/system related issues) and internal (perceptions related to herbal remedies) factors which emerged from the analysis of the interviews will also be included in this framework. A framework including all these issues will be used in order to find predictors of non-adherence

among the UAE hypertensive population. See Figure 5.1 for the framework, which will be assessed in the next study which is reported in Section 3 of this thesis.

***Figure 5.1: Diagrammatic representation of the factors which will be assessed in the survey study in association with antihypertensive medication adherence/non-adherence***




There is a need to develop a data collection tool to assess the above framework. The development of the tool will be informed by the results of the current exploratory study, relevant theories, frameworks and constructs, which have been used in the literature. This will be further discussed in Chapter 6.

To conclude, this study provided in-depth information regarding patients' beliefs, behaviours and barriers to medication adherence. However, due to the nature of qualitative research and small sample size, the results cannot be generalised to the wider hypertensive population of the UAE. All these findings will be further investigated on a larger scale in the quantitative, cross-sectional survey study (Section 3).

# Section 3- A survey of predictive factors of non-adherence to antihypertensive medication in the UAE

# CHAPTER 6 THE SURVEY STUDY-METHODOLOGY

## 6.1 AIMS AND OBJECTIVES

### AIM

To assess the extent and predictive factors of non-adherence to antihypertensive medications in the UAE in order to recommend potential interventions needed for improving adherence.

### OBJECTIVES

1. To assess the extent of non-adherence to antihypertensive medications in the UAE.
2. To measure patients' beliefs about illness and medication and assess whether these beliefs influence patients' adherence to their antihypertensive medication.
3. To assess whether there is an association between adherence to medication and other factors: patients' demographic characteristics, clinical variables, social support, satisfaction with the health care provisions and perceptions about herbal remedies.
4. To assess the extent of non-adherence to other hypertensive self-care behaviours including exercise, diet, smoking and blood pressure self-monitoring.
5. To develop a predictive model of non-adherence to antihypertensive medication using logistic regression analysis.

## 6.2 METHODS

This section will describe the methods and procedures used to meet the study objectives.

### 6.2.1 Study design and the rationale for methods chosen

Quantitative methods are appropriate for testing hypotheses, investigating frequencies of events and quantifying relationships between clearly defined variables (Smith, 2002). Since the aim of this part of the thesis was to "quantify" the prevalence of non-adherence and to identify the predictive factors of non-adherence to medication, quantitative methods were more appropriate to be used. A questionnaire was designed to facilitate data collection, as this approach was appropriate for allowing the variables of interest to be gathered easily and objectively and therefore facilitating the achievement of the aims and objectives of this study.

### 6.2.2 Sampling

#### 6.2.2.1 Sampling strategy

Participants were selected from different Emirates to cover different geographical areas of the UAE, in an attempt to maximise the generalisability of the results. Emirati patients were selected as they are the national people of the UAE and no studies have been done among this specific population in regards to medication adherence. In addition, by including the expatriate, this would have introduced bias and complicated the findings as they come from different cultural backgrounds and access health care differently to Emirati patients. Expatriates partially pay for their treatment whereas the Emirati citizens get the health care for free. The questionnaire was translated into Arabic language, as it is the official language in the UAE. The inclusion

and exclusion criteria for the recruitment of participants are shown in Table 6.1 and Table 6.2.

***Table 6.1: Inclusion criteria***

| **Inclusion criteria** |
| --- |
| - Emirati, Arabic speaking patients.<br>- Age of 18 years and above.<br>- Diagnosis of hypertension confirmed in the patients' medical file (not on their initial appointment).<br>- Currently on one or more antihypertensive medications. |

***Table 6.2: Exclusion criteria***

| **Exclusion criteria** |
| --- |
| - Non Emirati patients and aged under 18.<br>- Patients who are unable to understand or communicate in Arabic language.<br>- Patients with emotional or physical distress, which prevents them from taking part in the study. |

#### 6.2.2.2 Sampling procedure

There are 28 hospitals in the UAE distributed between rural (n= 12) and urban (n= 16) areas (Ministry of Health of the UAE, 2004). For sampling, one hospital within each Emirate was randomly selected by an electronic random function using Microsoft Excel. The same sampling procedure approach was used in this cross-sectional survey study to that in the exploratory study (See section 4.2.4.2 for more details).

### 6.2.2.3 Sample size

When considering the sampling frame which was to be used to meet the research objectives of the main study, a statistician's advice was sought (D.C). The number of predictors should relate to the sample size and the statistician recommended 10 to 15 cases per predictor. In addition, 15 cases per predictor has been recommended by others in the literature (Field, 2009). Therefore, it was decided to recruit 390 patients for the main study, as 26 variables were included in the model to be used.

### 6.2.2.4 Patient recruitment and data collection

Patients were recruited in similar way to the exploratory study. In the hospitals, data collection commenced in the mornings, which is the time given for cardiology clinic appointments. Participants were sampled at different days of the week and at different times to avoid selection bias and to ensure diversity of the sample.

The researcher, with the help of the receptionists in the cardiology out patients' clinics, identified the hypertensive patients when they came for appointments. Once identified, the researcher approached them and explained the study to them. A patient information leaflet was used as a tool in explaining the research to interested patients. After explanation, patients were asked if they would like to participate in the study. A consent form was provided for the patient to sign if they agreed to participate in the study. Participants were then given a copy of the questionnaire and asked to complete it (See Appendix 5 for the patient information leaflet and the consent form).

After filling in the questionnaires, participants medical records were screened for some clinical information, including the last two BP readings, presence of other

comorbidities and list of all the medicines that the participants were taking currently (name, strength and dose).

### 6.2.3 Ethical approval

The work highlighted here was reviewed and approved first by the ethics committee of The School of Pharmacy, University of London in May 2009. Then it was reviewed and approved by the ethics committee of the Ministry of Health of the UAE in July 2009. See Appendix 2 for the ethics approvals. Approval was also gained from hospital and clinical management before recruitment commenced. The principal investigator had to go first to the head of the hospital, show the ethics approval letter, and explain the study. After that, she was sent with a written note from the head of the hospital to the head of the cardiology department to start recruitment. The study had to be explained again to the head of the cardiology department who then allowed the researcher to start the recruitment process.

### 6.2.4 The questionnaire tool

A questionnaire was developed to capture all the data needed to meet the objectives of this study, including:

- Demographic characteristics and clinical variables.
- Information on hypertension self-care behaviours.
- Rate of adherence/non-adherence to antihypertensive medication.
- Beliefs about hypertension and its medicines.
- Social support from family members and friends.
- Healthcare provisions received by the participants.
- Items raised from the qualitative interviews regarding some cultural influences (herbal remedies).

The following section will explain the development and components of the questionnaire in more detail.

#### 6.2.4.1 Patient demographics

A study suggested that there is a positive association between hypertension and poorer socioeconomic factors and more sedentary lifestyle in the UAE (Sabri et al., 2004). In addition, although healthcare services are provided free to the Emirati citizens, there might still be some inequality in providing these services. Most of the modern and more specialised hospitals are present in cities rather than the rural areas. Moreover, there is a general impression that rural areas of the UAE suffer shortage of medical staff, equipment and a shortage of medicines supplies. The current exploratory study provided evidence that these issues may be relevant and there is a need for further

investigation. Therefore, the personal characteristics and the socioeconomic status included in the questionnaire are:

- Gender.
- Age.
- Area of residence: this was categorised as urban or rural.
- Level of education: this was categorised according to the UAE statistic centre classification (illiterate, primary or secondary school, hold a degree or equivalent qualification).

### 6.2.4.2 Clinical variables

Clinical variables have been studied in relation to medication adherence (see section 1.6.2) and some have shown to be associated with patients' adherence to their medicines, therefore it was decided to investigate these factors among this study population. This section of the questionnaire recorded duration of hypertension, the average of the last two blood pressure readings, number of antihypertensive tablets taken by the participants per day, name of antihypertensive medicines taken by participants and the presence of other comorbidities. Apart from the duration of hypertension, details were obtained from patients' medical records by the researcher. The association between all the clinical variables were assessed in relation to adherence/non-adherence to medication, apart from the name of antihypertensive medicines which was only used descriptively.

### 6.2.4.3 Measurement of adherence to medications

The definition by the World Health Organisation (WHO, 2003) was used to define adherence to medication for the purpose of this research, which is: *"the extent to which a person's behaviour taking medication, following a diet and/or executing lifestyle changes corresponds with agreed recommendations from a healthcare provider".*

Different methods of measuring adherence to medications were discussed previously in Chapter 1. In this section, the reason why self-report was chosen is discussed.

Self-report method was chosen for measuring adherence because it is simple, fast, least equipment intensive, can be useful in large-scale studies and inexpensive (Gao and Nau, 2000). Moreover, many studies compared self-reporting to other methods of measuring adherence to medication and yielded significant correlations (Fairley et al., 2005; Schroeder et al., 2006). Garber et al (2004) reviewed the literature and evaluated the concordance of self-report measures (questionnaires, interviews, or diaries) with non-self-report measures (plasma drug concentration, administrative claims, electronic monitors, pill counts or canister weight, or clinical opinion) of medication adherence. The results showed that within self-report methods, diaries and questionnaires were statistically more concordant than interviews when compared with electronic measures ($p= 0.01$). Therefore, self-report was selected as a measure of adherence/non-adherence in this research. Although self-report methods have the disadvantages of overestimating adherence to medications (Waterhouse et al., 1993; Dodds et al., 2000) and being limited by patients' memory and social desirability, it is believed that patients who report poor adherence to treatment are likely to be telling the

truth (Farmer, 1999; Haynes et al., 2002). This suggests that self-report might be helpful in detecting true non-adherence. In addition, several steps were taken to minimise possible bias and ensure validity and reliability of the developed questionnaire (See Section 6.2.5.4 and 6.2.5.5).

Pharmacy records were not used as a method of assessing adherence to medication in this research because most of the UAE hospitals and primary healthcare centres are not computerised. Therefore, the pharmacy records would not be electronic and would be hand written, in which there is a great chance of missed data and information. In addition, the pharmacies are not linked to each other by any kind of system. Therefore, if a patient takes medications from different pharmacies, this could not be detected, and therefore this method was ruled out. In addition, this method gives us an indication whether the patient dispenses his/her medicines on time from the hospital pharmacy, but does not tell us what happens at home on a daily basis.

Pill counts were also inappropriate in the UAE, because some patients tend to go to private pharmacies and buy some of their medications, therefore, the medications they have might not always reflect the actual medications supply given to them by their physicians.

Direct determination by drug assays was not suitable because it is expensive, inappropriate for large samples and resource and time consuming. Moreover, hypertensive patients are usually on more than one medication, in which case the assay might not be available for all of them. Also as noted by Horne and Weinman (1999), this method might influence patients' adherence itself, as the patient has to be given a previous appointment for the assay (blood, urine etc.).

Electronic monitoring was not used because it is expensive. Also, there can be some reliability problems with it such as patients transferring tablets between bottles, outer containers may be removed and patients could open the bottle but not take the medication (Smith, 2002). Moreover, this method was not suitable to be used simply because these electronic monitoring devices are not available in the UAE.

The principal health outcome measure for hypertensive patients is the blood pressure level. This method has the advantages of being practical for clinical practice plus it is inexpensive. In contrast, the disadvantage of this method is that the blood pressure level can change for reasons other than adherence/non-adherence to antihypertensive medication such as diet (high in salt), smoking, stress, and lack of exercise. Therefore, this method was not used as a sole method for estimating the extent of patients' adherence to their medications. However, it will be used to support the accuracy of the primary method of assessing patients' adherence to medication.

In the UAE, part of the standard practice is that at each clinical visit the patient's blood pressure is measured and documented in the patient's medical file. Therefore, for the purpose of this study, the current blood pressure was the average of the last two measurements recorded in the patient's medical file. The blood pressure level was categorised based on the WHO/ISH hypertension guideline (WHO/ISH, 2003), which suggest the target blood pressure is < 140/90 mm Hg and in high-risk patients (e.g. diabetes) to < 130/80 mm Hg. Therefore:

- Patients with blood pressure< 140/90 mm Hg or in high risk patients (e.g. diabetes) < 130/80 mm Hg were considered more likely to be adherent to their medication.

- Patients with blood pressure> 140/90 mm Hg or in high risk patients (e.g. diabetes) > 130/80 mm Hg were considered more likely to be non-adherent to their medication.

Having chosen the self-report method for assessing adherence to antihypertensive medications in this study, the next step was to select which self-reporting methods to use. It was important to make sure to use a method, which provides a reliable response and a valid reflection of the issues to be measured as well as being efficient and effective in collecting data of interest (Smith, 2002). A questionnaire was chosen to be used for the data collection of the quantitative study for the advantages it has over the other self-reporting method (See Section 1.5.2.5) as well as being suitable for use in a clinical practice to recruit a large sample size. Also, it was decided to adapt a suitable questionnaire from the literature rather than developing a new one (the reason for this is discussed in Section 1.5.2.5).

The Morisky scale (MMAS) was developed by Morisky et al in 1986. It was originally developed to measure adherence to antihypertensive medications. The original scale included four items related to medication taking behaviour and showed adequate psychometric properties in the original study (Morisky et al., 1986). The scale was later modified to an 8-item medication adherence scale (Morisky et al., 2008).The new scale was supplemented with additional items addressing the circumstances surrounding adherence behaviours. The 8-item Morisky scale has been examined for its psychometric properties in 1367 patients with hypertension. The 8-item scale had improved psychometric properties over the 4-item scale with a reported internal reliability of ($\alpha$= 0.83) (Cronbach's alpha). The sensitivity to identify patients with poor blood pressure control was estimated to be 93% and specificity was 53%. The

predictive validity of the scale was established by assessing associations between adherence and blood pressure levels, social support, attitude, knowledge, coping, stress and patient satisfaction with clinic visits; all variables were significantly associated with adherence to medication and in the predicted directions ($p< 0.05$). Participants who reported positive family member social support, high knowledge of the medical regimen, stronger coping behaviour and higher satisfaction with medical care were significantly more likely to have high levels of medication adherence. On the other hand, participants who reported poor perceived health status, high levels of stress and greater complexity of the treatment regimen were found to have significantly lower levels of adherence. The concurrent validity of the 8-item scale was established by assessing correlation of the scale scores with those of the 4-item scale using Pearson's correlation coefficient (Pearson correlation of 0.64; $p< 0.05$). This scale has been successfully translated and validated in other languages than English such as Thai (Sakthong et al., 2009) and Malaysian (Al-Qazaz et al., 2010).

As the 8-item self-reported Morisky Medication Adherence Scale (MMAS) showed favourable psychometric properties and had been validated in a large hypertensive patient population, it was decided to be used for measuring participants' adherence in this study (See Table 6.3).

***Table 6.3: The 8-item Morisky scale (Morisky, personal communication, 2010)***

| Questions | No | Yes |
|---|---|---|
| 1. Do you sometimes forget to take your antihypertensive pills? *(Unintentional)* | | |
| 2. People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not take your antihypertensive medicine? *(Intentional)* | | |
| 3. Have you ever cut back or stopped taking your medication without telling your doctor, because you felt worse when you took it? *(Intentional)* | | |
| 4. When you travel or leave home, do you sometimes forget to bring along your antihypertensive medication? *(Unintentional)* | | |
| 5. Did you take your antihypertensive medicines yesterday? *(Unintentional)* | | |
| 6. When you feel like your blood pressure is under control, do you sometimes stop taking your medicine? *(Intentional)* | | |
| 7. Taking medication every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your blood pressure treatment plan? *(Intentional)* | | |

8. How often do you have difficulty remembering to take all your medications? *(Unintentional)*

**(Please circle the correct number)**

Never/Rarely.....**0**

Once in a while.....**1**

Sometimes.....**2**

Usually.....**3**

All the time.....**4**

The responses to items 1-7 were dichotomous using yes/no answer (Yes= 1 and No= 0). Responses relating to item 8 were on a five point Likert scale (0= never/rarely, 1= once in a while, 2= sometimes, 3= usually, and 4= all the time). The coding instructions were given by the author as follows:

- Items 1-4, 6, 7, 8 were reverse coded in order to make the scale range from low to high scores being equivalent to low to high adherence.
- Item 8 was standardised by dividing this item by 4.
- The total scale ranges from 0 to 8.

Participants' adherence level was then categorised as low adherence (< 6), medium adherence (6 to < 8) and high adherence (= 8). MMAS also classifies non-adherence into intentional or unintentional non-adherence. Unintentional non-adherence results if participants responded with a "yes" to items 1, 4, 5 or 8, which denoted forgetting to take medications generally, in travel or because of finding difficulties in remembering to take their medicine(s). On the other hand, intentional non-adherence results if participants responded with a "yes" to items 2, 3, 6 or 7 which denoted cutting back or stopping taking medicines without telling the physician, feeling worse or feeling better. However, for the purpose of this research, items 2, 5 and 7 were not used to classify participants into either intentional or unintentional non-adherence categories, as it was not possible to do so using these items for the following reasons:

- Item 2 (People sometimes miss taking their medications for a reason other than forgetting. Thinking over the past two weeks, were there any days when you did not take your antihypertensive medicine(s)?). According to Morisky's instructions for use of the MMAS, if a patient answered "yes" to this question, then he/she is considered intentionally non-adherent. However, it was not possible to assume that if patients did not take their medicine(s) any days within the last two weeks then they did it intentionally as they could have had impaired manual dexterity or simply misunderstood prescriber instructions.
- Item 5 (Did you take your antihypertensive medicine(s) yesterday?). According to Morisky, if a patient did not take his/her medicine(s) yesterday, then he/she is

considered unintentionally non-adherent. However, it was not possible to assume that if patients did not take their medicine(s) yesterday then they did it in an unintentional way, as they might not have taken their medicine(s) intentionally.

- Item 7 (Taking medication every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your hypertension treatment plan?). According to the original study, if a patient felt hassled about sticking to his/her hypertension treatment then he/she was considered intentionally non-adherent. However, patients feeling hassled about sticking to their treatment does not mean that they actually did not take their medicine(s). They may have felt hassled but taken it anyway.

In addition to the MMAS, another simple method of directly asking the patients to self-report their adherence level was used in the questionnaire. A systematic review of studies by Stephenson et al (1993) comparing self-report with other measures of adherences showed that most non-adherent patients can be detected by asking them about their adherence. It showed that asking patients about their adherence would detect more than 50% of patients with low adherence, with a sensitivity of 55% and specificity of 87%. Authors reported that it is essential to take into account that even when the patients admit missing doses during previous days or weeks still they tend to overestimate their adherence rate by an average of 17%. The authors concluded that questioning patients about their adherence is the most valid and readily available method for measuring adherence in the clinical practice (Stephenson et al., 1993). Moreover, Haynes et al (2002) suggested that the key validated question to measure adherence is "have you missed any pills in the past week?", and that missing 1 or more pills in a week is an indication of a problem with low adherence (Haynes et al., 2002).

An extension to the Haynes question will be used for the purpose of this research, which is: *"People often miss taking doses of their medicines, for a whole range of reasons. Thinking of your antihypertensive medicine(s), when was the last time you missed taking a dose of this medicine(s)?"*.

The data obtained from the two self-reporting methods were then compared to choose the most appropriate one to be used as a main method for assessing medication adherence in this study.

### 6.2.4.4 Measurement of perceptions about hypertension

The brief Illness Perception Questionnaire (Broadbent et al., 2006) was used to assess patients' perspectives of their illness. It consists of 9 items (see Table 6.4): eight items rated using a 0-to-10 response scale and one further question regarding assessment of the causal representation is an open-ended response item (item 9). Five items assess cognitive illness representations (consequences, timeline, personal control, treatment control and identity), two items assess emotional representations (concern and emotions), one item assesses illness understanding and the last item assesses the causal representation. The causal representation question asks patients to list the three most important causal factors in their illness. Responses to the causal item can be grouped into categories such as stress, lifestyle, etc., determined by the particular illness studied, and categorical analysis can then be performed. The brief IPQ showed good test-retest reliability in 132 renal patients and good concurrent validity when compared with the Revised Illness Perception Questionnaire (IPQ-R) and other relevant measures in 309 asthma, 132 renal and 119 diabetes outpatients (Broadbent et al., 2006). In addition, it showed good predictive validity in patients recovering from MI with individual items being related to mental and physical functioning at 3 months follow up, attendance to

cardiac rehabilitation class and speed of return to work. The discriminant validity was supported by its ability to distinguish between the five different illness groups (Broadbent et al., 2006). See Table 6.4 for the items from the brief IPQ.

***Table 6.4: The brief IPQ scale (Broadbent et al., 2006)***

| Questions | Cognitive illness representation |
|---|---|
| How much does your illness affect your life? | Consequences |
| How long do you think your illness will continue? | Timeline |
| How much control do you feel you have over your illness? | Personal control |
| How much do you think your treatment can help your illness? | Treatment control |
| How much do you experience symptoms from your illness? | Identity |
| How concerned are you about your illness? | Concern |
| How well do you feel you understand your illness? | Understanding |
| How much does your illness affect you emotionally? (E.g., does it make you angry, scared, upset or depressed? | Emotions |

The word illness in the table above was changed for the purpose of this research to hypertension and the word treatment was changed to antihypertensive medication as recommended by the authors (Broadbent et al., 2006).

### 6.2.4.5 Measurement of beliefs about antihypertensive medicines

**The Beliefs about Medicines Questionnaire (BMQ)**

The BMQ was used to assess patients' beliefs about their antihypertensive medication. It is a valid and reliable scale, which has been validated for use across a range of different diseases including renal, cardiac, diabetes, asthma, psychiatric and general medical illnesses (Horne and Weinman, 1999). The scale comprises two main sections, the BMQ specific and the BMQ general. The BMQ specific is comprised of

two subscales, which are BMQ necessity and BMQ concerns. The BMQ general also originally comprised of two subscales, which are BMQ harm and BMQ overuse. A third subscale, which is BMQ benefit, was later added to BMQ general. In this research only the BMQ specific was used to assess participants' beliefs about their antihypertensive medication.

The authors reported moderate to high internal consistencies of BMQ specific scale when used across different diseases (Horne et al., 1999). The reported Cronbach's alphas were; BMQ necessity= 0.55-0.86 and BMQ concerns= 0.63-0.80, depending on the specific diseases. Two week test-retest of the BMQ among the asthmatic group indicated reliability of its various subscales (BMQ concerns r= 0.76 and BMQ necessity r= 0.77). Discriminant and criterion validity were also established for the scale; correlations were obtained between BMQ concerns scores and self-reported medication adherence as well as between BMQ subscales scores and other measures of illness and medication beliefs. See Table 6.5 for items of the BMQ specific scale.

***Table 6.5: BMQ specific scale (Horne, personal communication, 2010)***

| **BMQ Specific (Necessity subscale)** |
|---|
| My life would be impossible without my medicines |
| Without my medicines I would be very ill |
| My health, at present, depends on my medicines |
| My medicines protect me from becoming worse |
| My health in the future will depend on my medicines |
| **BMQ Specific (Concerns subscale)** |
| I sometimes worry about the long term effects of my medicines |
| Having to take my medicines worries me |
| I sometimes worry about becoming too dependent on my medicines |
| My medicines disrupt my life |
| My medicines are a mystery to me |

Using this scale, participants are asked to rate their agreement with the specific statements using a 5 point Likert scale (1= strongly disagree, 2= disagree, 3= uncertain,

4= agree and 5= strongly agree). The scores of each subscale are computed from the sum of all items within that particular subscale and range from 5-25 for both subscales BMQ necessity and BMQ concerns. Also, the necessity-concerns differential can be computed by subtracting the total BMQ concerns subscale score from the total BMQ necessity subscale score. A positive differential score indicates that participants perceive the benefits of their medication to outweigh the risks i.e. participants' beliefs about the necessity of taking their medicines outweigh their concerns about the risk of them the medication. In contrast, negative differential score indicates that participants perceive the risk of taking their medication to outweigh their benefits. The differential scores range from -20 to 20.

Another issue related to beliefs about medicines was included in the questionnaire as it was not in the BMQ specific scale, which was chosen to assess participants' medication beliefs. A statement was developed based on what some participants reported in the interviews (If I do not take my antihypertensive medicines occasionally, it will not matter). Participants were asked to rate their responses on a 5 point Likert scale (1= strongly disagree, 2= disagree, 3= uncertain, 4= agree and 5= strongly agree).

#### 6.2.4.6 Measurement of social support from family and friends

The literature was reviewed to search for a suitable scale to measure the social support patients receive from their family and friends. The scale chosen was the chronic illness resources survey (CIRS) (Glasgow et al., 2000). The CIRS scale was developed to assess support and resources for chronic illness management. It consists of 64 items which are based on a social-ecologic model, designed to assess support and resources across chronic disease at seven levels, including: 1) family and friends; 2) physician and

healthcare team; 3) neighbourhood/community; 4) community organisations; 5) personal (helpful things you did for yourself); 6) media and policy; and 7) work (if currently employed). The subscale of family and friends support was chosen for the purpose of this research because it had good validity and reliability with reported Cronbach alpha of 0.75 and test-retest reliability of 0.78 and 0.72 at one week and one month, respectively (Glasgow et al., 2000). The construct validity of the subscale was measured by comparing the scores with an existing validated self-reported measure of social support for eating habits and exercise survey, where a significant of $r= 0.42$ was found ($p< 0.01$). Moreover, the scale has been successfully adapted for use in Chinese (Yin et al., 2008) and Spanish languages (Eakin et al., 2007), and demonstrated reasonable levels of validity and reliability similar to the original validated English-language version. Table 6.6 shows the items of the family and friends subscale from the CIRS.

Participants using this scale were asked to rate their response to each of the 7 questions on a five point Likert scale (1= not at all, 2= a little, 3= a moderate amount, 4= a good deal, and 5= a great deal) which indicates their experience over the last 3 months. Responses to all items are then summed to give a total score, which ranged from 7 to 35.

***Table 6.6: Items of the family and friends support of the Chronic Illness Resources Survey (CIRS)***

| **Family and friends** |
|---|
| Have family or friends exercised with you? |
| Have family or friends listened carefully to what you had to say about your illness? |
| Have your family or friends encouraged you to do the things you need to do for your illness? |
| Have your family or friends selected or requested healthy food choices when you ate with them? |
| Have you shared healthy low-fat recipes with friends or family members? |
| Have family or friends helped you remember to take your medicine? |
| Have family or friends bought food or prepared food for you that was especially healthy or recommended? |

### 6.2.4.7 Measurement of healthcare provisions

Several issues were raised in the qualitative interviews regarding the healthcare providers and services including satisfaction with the services provided, being well informed by the healthcare providers about their illness and treatment and trust in healthcare providers. The literature was searched to find a valid and reliable instrument for measuring these issues. Some scales were found such as the Patients Satisfaction Questionnaire (PSQ) (Grogan et al., 2000), the Consultation Satisfaction Questionnaire (CSQ) (Baker, 1990), the Medical Interview Satisfaction Scale (MISS) (Wolf et al., 1978) and the patients satisfaction scale (PSS) (DiMatteo and Hays, 1980). The CSQ and MISS measure the doctor–patient interaction in the consultation itself, not patients' satisfaction with the healthcare provision, whereas, the PSQ measures patients satisfaction with services provided, but it consists of five subscale including: doctors, nurses, facilities, access and appointments. Therefore, PSQ could not be used in this study as patients always talked about doctors, sometimes pharmacists in this preliminary study, but did not talk about nurses in their illness treatment plan. The PSS only measures patients' overall satisfaction with their physicians' care without looking into their satisfaction with other healthcare providers or heath care services provided to

them by their hospitals. Therefore, there was no suitable scale in the literature to measure the issues that arose in the qualitative interviews regarding patients' views of their healthcare. Instead, three simple statements representing the key issues raised by participants were developed and included in the questionnaire. See Table 6.7 for these three healthcare provision items.

Participants were asked to rate their responses to each item on a five point Likert scale (1= not at all, 2= to a little extent, 3= a moderate amount, 4= to a good extent, and 5= to a great extent). Each item was analysed separately.

***Table 6.7: Items of the healthcare provisions***

| **Statements other have made regarding healthcare provisions** |
|---|
| I have a lot of faith and trust in my healthcare providers |
| My healthcare providers provide me with all the information I need to know about my medicines and disease |
| I'm satisfied with the services provided to me from my hospital |

### 6.2.4.8 Beliefs about herbal remedies

As a result of the interviews analysis, three items were included in the questionnaire regarding herbal remedies. This is important, as patients' decisions about the use of their medicines could have been made in the context of beliefs about the benefits of herbal remedies. In addition, perceptions of herbal remedies may inform patients' treatment preferences. One question was whether the participants currently or had previously used herbal medicines and, if so, were asked to report the name of the herb(s). The two other questions were in relation to their beliefs about the safety and effectiveness of the herbal remedies compared to their prescribed medicine(s) (asked to respond "more", "less" or "the same"). See Table 6.8 for these three items.

*Table 6.8: Items of the beliefs about herbal remedies*

| Statements other have made regarding healthcare provisions |
|---|
| Have you used any herbal remedies for treating hypertension? |
| How effective do you think your herbal remedies for hypertension are compared to the prescribed medicines? |
| How safe do you think your herbal remedies for hypertension are compared to the prescribed medicines? |

### 6.2.4.9 Measurement of hypertension self-care behaviours

Diet, exercise, self-monitoring of blood pressure and smoking behaviours of participants were assessed. Participants were asked to tick a "Yes" or "No" for questions regarding their adherence to diet, exercise and self-measuring blood pressure. Also, they were asked to write the reasons if they reported non-adherence. Regarding smoking, participants were asked to report whether they smoke by ticking a box (yes or no) and space was provided for them to write the type and frequency of their smoking. This was done to allow for different types of smoking to be recorded, e.g. cigarettes, shisha etc.

### 6.2.5 Translation and adaptation of the questionnaire

After the first draft of the questionnaire was developed, it was circulated among the research team for their feedback. All the comments, which were related to the structure and contents of the tool, were discussed and incorporated into the second draft. The second draft was again reviewed and finalised. The second draft was then ready for translation and adaptation into Arabic language. This section gives an overview of the potential methods for translation, issues of cultural equivalence and a description of the translation process used in this study.

#### 6.2.5.1 Methods for translation

The methods which were found in the literature for the translation of questionnaires include translation/back-translation, simple direct translation and parallel blind technique.

Translation/back-translation is an iterative process in which a bilingual translator in to the target language translates an instrument. Then a second bilingual translator who knows nothing about the wording of the original source of the instrument translates the draft of the target language back in to the source language. The original and the back translated version are then compared. This process is repeated until the two source language versions are either identical or contain little differences (Behling and Law, 2000). This method was criticised for its impracticality as it is time consuming and suffers limitations inherent in the process of the translation itself (Hambleton and Patsula, 1998). Hambleton and Patsula (1998) argued that back translating an instrument correctly does not guarantee the target language version validity. Similarity of the original and back translated source language versions can be achieved although

the target language does not represent the ideas in the source language instrument well (Behling and Law, 2000).

Simple direct translation involves one bilingual individual who translates the instrument from the source language to the target language. This method is simple, practical and the results can be obtained cheaply and quickly. However, it has the disadvantage of not providing objective information about the accuracy and/or the quality of the translation as it depends on a single translator's skills and judgment (Behling and Law, 2000).

Parallel blind technique method involves two translators in which both translate the instrument to the target language independently (Werner and Campbell, 1970). Once they finish they meet up to compare the two versions and resolve any differences by discussion. This method has the advantage of practicality and speed as the two translators work in parallel rather than in sequence. Moreover, this method has the element of security as it allows checking the work of the two translators and therefore comparing between the two drafts, which increases the confidence in the accuracy of the translation (Behling and Law, 2000).

The random probe technique is recommended in the literature (Behling and Law, 2000) to enhance the quality of the translation. This is done by administering drafts of the target language instrument to a group of target language speakers who can be later asked to explain what they have understood from each translated items and why they have responded as they did to each individual item. In addition, another way of enhancing the quality of the translation is by submitting the draft to an expert committee for appraisal (Beaton et al., 2000).

### 6.2.5.2 Cultural adaptation

Hambleton and Bollwark (1991) define equivalence of test items as:

"...test items are equivalent if they measure the same behaviour across the populations of interest and examinees with equal amount of ability within the populations have equal probabilities of answering the items correctly".

In order to use a scale in a different country and among people with different cultural backgrounds, the scale should be linguistically translated and cross-culturally adapted to ensure equivalence between the original and the target versions. It has been argued that the term adaptation is preferred to the term translation because it is broader and more reflective of the processes, which should happen in practice when preparing a scale to be used in another language and culture (Hambleton and Patsula, 1998). Therefore, translation is only one step in the process of adaptation (Hambleton and Patsula, 1998). When adapting a scale to be used in a different language there is a need to revalidate the scale, assess reliability and validity of the adapted scale, and establish the comparability of multi-language scale when comparability of the scale is important (Hambleton and Patsula, 1998). Three sources of errors may arise in scale adaptation projects, these are cultural/language differences, technical methods and interpretation of results (Hambleton and Patsula, 1998). Failure to attend to the sources of errors in any of these categories can compromise the equivalence between the original and adapted versions of the scales.

<u>Cultural/language differences</u>

The assessment and interpretation of cross cultural results should be considered for all parts of the adaptation process including construct equivalence, scale administration, scale format, speed of response and other response styles such as tendency to guess, social desirability and acquiescence (Hambleton and Patsula, 1998).

Technical methods

The main five sources of errors that can influence the validity of adapted scales in the area of technical design and methods are the scale itself, selection and training of translators, the process of translation, judgmental design for adapting scales and empirical analyses for establishing equivalence. A single translator regardless of his/her competence level does not allow valuable interactions among independent translators to happen to resolve different issues which arise in preparing a satisfactory scale adaptation. Also, translators should know the cultures very well especially the target culture and not just be familiar and competent with the language involved in the translation (Hambleton and Patsula, 1998).

Factors affecting interpretation of results

The results should be used to compare groups and understand the differences not to support arguments about the exceptionality and superiority of nations. Therefore, relevant external factors to the scale should also be considered to minimise errors in interpreting the results such as educational level, motivation, cultural values and standard of living (Hambleton and Patsula, 1998).

Researchers should make sure that the scale is meaningful and suitable in a second culture, as translating an English scale into another language does not ensure that it has the same meaning across languages and/or cultures (i.e. conceptual equivalence). Fields tests are also recommended as some problems could be detected that go unnoticed by reviewers in some type of judgmental process and this applies to the use of one scale in multiple languages and cultures (Hambleton and Patsula, 1998). There is a need to ensure the scale reliability (such as Cronbach's coefficient alpha) and validity. Herdman et al (1998) developed a model to help researchers who are adapting scales for use in different languages and cultures. The model defined six different types

of equivalence, and order in which the evaluation should take place and suggested the strategies for this evaluation. The six types of equivalence, which should be assessed when translating, and adapting a scale for use in another language (Herdman et al., 1998) are:

1. Conceptual equivalence

This will be achieved when the scale has the same relationship to the underlying concept in both the origin and target culture, primarily in terms of the included domains and the emphasis placed in variable domains. The nature of the scale concept should be examined in both cultures. Information on its form and content should be obtained from literature reviews as well as through reviews of scale development. Review of the local literature and/or scales dealing with similar or related topics developed in the target language should be conducted. Experts should be consulted in the target culture to obtain a picture of the cultural environment in which the scale may be used. In addition, the general population should be involved to investigate their beliefs and behaviours regarding the scale. Unstructured interviews can be conducted to glean the concepts from the target group's perspective to increase the chance of capturing their views. Researchers should consider issues including the type of people to ask to judge the appropriateness of the scale, the need for theoretical arguments to be presented that question or accept conceptual equivalence, possible outcomes of investigating conceptual equivalence and how judgements should be made and justified.

2. Item equivalence

This exists when items estimate the same parameters on the latent trait being measured and when the items are acceptable and equally relevant in both cultures. Some issues should be considered when studying the items equivalence such as availability of the evidence, which suggest that lifestyle patterns are similar in the original and targeted countries, ways of addressing relevance or acceptability of individual items in the target

population, possible outcomes of investigating items equivalence and how the judgements should be made and justified.

3. Semantic equivalence

This is concerned with the transfer of meaning across languages, and achieving a similar effect on the participants in different languages. Some issues should be considered when examining the semantic equivalence such as the meaning of the original scale in the target language, the need for contacting the original developer of the scale and the nature of the contact, the need to refer to translation guidelines, ways of investigating the meaning of phrases/ keywords in the target language, who will do the translation, who will judge the quality of the translation, what translation protocol will be used, when a problem in translation is identified who will deal with it, and possible outcomes of examining semantic equivalence.

4. Operational equivalence

This refers to the use of a similar scale format, mode of administration, scale instructions and measurement methods in the new and original scales. Researchers should consider whether to use the same instructions and format of the source scale version in the target version.

5. Measurement equivalence

This is defined as the extent to which the psychometric properties of the original and target versions of the scale are similar. The aim is to ensure that different language versions of the same scale achieve acceptable levels in terms of their construct validity (including a scale's discriminant, evaluative and predictive properties), reliability and responsiveness. Therefore, researchers should address the scale reliability, validity, sensitivity, effect size of the scale and scoring norms.

6. Functional equivalence

This refers to the extent to which a scale does what it is supposed to do in different cultures. Functional equivalence is judged by the degree to which the other types of equivalence (the above 5) have been achieved.

From the information provided above, we could conclude that simple translation of a scale is not sufficient and cultural adaptation for new target population is generally needed when the new population differs appreciably from the original population with which the assessment scale is used in terms of culture, country and language. Careful attention is required to ensure the validity and the usefulness of the adapted scale in the new population (Geisinger, 1994).

The scales, which needed translation, were those which have been developed, validated and tested for use in English language and among English speaking population. These scales include Morisky, BMQ specific, brief IPQ and CIRS family and friends subscale. For that reason, a translation protocol was developed as described in the next section.

### 6.2.5.3 The translation protocol

Based on the literature review, a three stage process of questionnaire validation was developed and adapted. This process involved translation, group validation and post validation of the questionnaire (See Figure 6.1). In this study, the source language was English and the target was Arabic language.

*Figure 6.1: The Translation protocol*


### 6.2.5.4 The translation process: description and validity

The translation stage

Parallel blind technique was used to translate the questionnaire in which two bilingual speakers translated the questionnaire to the target language (Arabic) independently. It was recommended in the literature that one of the two translators must be aware of the concepts being examined in the study and the other being native with no knowledge about these concepts (Beaton et al., 2000; Mannion et al., 2006). This was preferred to ensure providing a more reliable equivalence from a measurement perspective, yet reflecting the language used by the population to be studied. After the two translators finished translating the questionnaire from the original language to the target language, they compared the two versions and resolved any differences by discussion. Not all discrepancies identified required amendments, but the one which needed alteration was to do with the language used, and did not alter the underlying concept of the item. Also, a few spelling mistakes and grammatical amendments were required. The aim of the discussion was towards preserving the meaning of the original English items (both semantically and conceptually).

The group validation stage

An expert panel of native Arabic speakers was formed consisting of the principal researcher, a cardiologist and a clinical pharmacist to review and critique the translated tool. Regarding the Morisky scale for measuring adherence to medication, experts were provided also with the definition of adherence used in this study (See page

164), a copy of the MMAS scale and written instructions to review the tool. The instructions used were adopted from a previous study, which validated a tool for assessing patients' adherence to diabetes activities (Hernandez, 1997). The instructions were as follows:

- Is the definition of adherence clear, concise and consistent with the meaning of adherence in health care in the UAE? (Feel free to reword if appropriate)
- Is each item of the instrument consistent with the meaning of the definition of medication adherence?
- Is each item clear and concise? (If not, feel free to reword, make additions, or delete)
- Have the major aspects of the 'domain' of medication adherence been tapped? (If not, please identify important areas that are missing)

The final instrument was also assessed by the expert panel by answering the following questions:

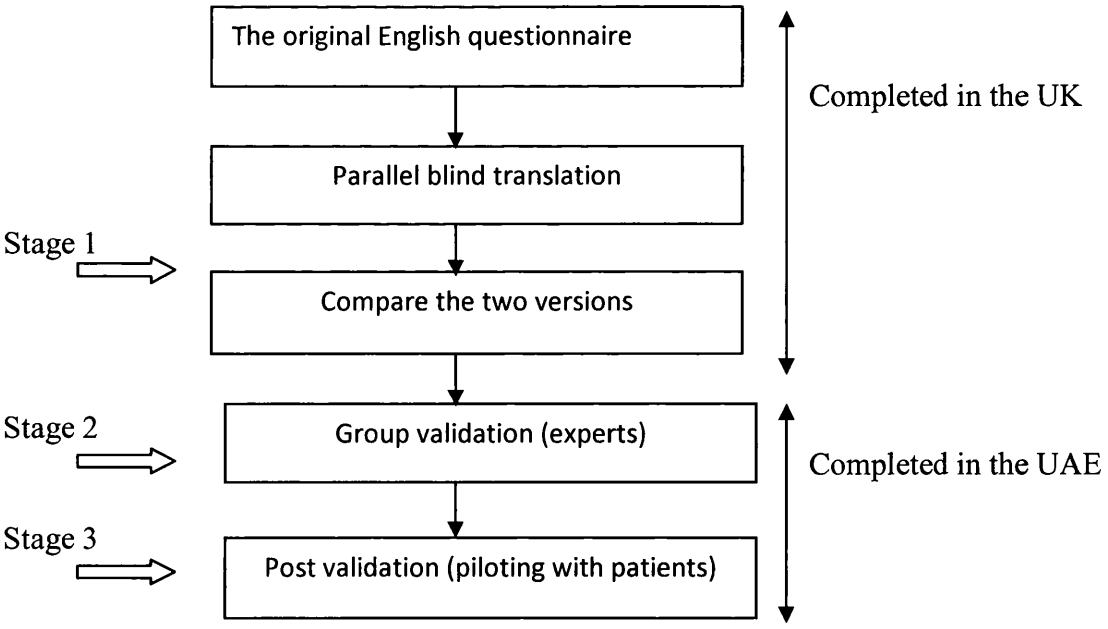
- Explain your understanding of the meaning of each item in the translated questionnaire?
- Compare these meanings with the original English version and discuss and comment on the equivalence (is it the same)?
- Suggest an alternative translation if it was felt that the translation was not suitably accurate?
- Is the translation culturally appropriate in Arabic language and does it make sense?

The questionnaire was amended after the suggestions and comments of the group validation and was ready for the next stage.

Post validation stage (piloting)

The amended questionnaire was piloted with 15 hypertensive patients recruited from the waiting rooms of the outpatient clinic of hospitals in the UAE. These patients were asked after completing the questionnaires for comments on the comprehensibility and appropriateness of the language in the Emirati cultural context. Also, they were asked about their understanding of the meaning of each question as well as the meaning of their responses. They were asked also to give comments about the questionnaire in general including the layout, wording, ease of understanding, any ambiguities etc. In addition, participants were asked to suggest a better way of expressing these items and any comments on the content and format of the questionnaire. Participants' comments were noted and further amendments were made if necessary. Figure 6.2 summarises the process of translation used in the present research.

***Figure 6.2: Translation process***



After the development, translation and piloting of the questionnaire, the following amendments were made to the questionnaire tool:

After the group validation stage:

- Participants' personal information (demographic and clinical variables) section was moved from the beginning of the questionnaire to the end in the line with recommendations (Oppenheim, 1993).
- In the demographic characteristics variables section, questions about the occupation of the participants and the marital status were deleted. These were decided to be removed from the questionnaire because of some cultural issues as people do not like to talk about them and considered these issues very personal (e.g. being divorced).
- In the clinical variables section, questions about the dosage regimen and the name of the antihypertensive medications were added.
- In the hypertensive self-activities section, the initial choice of answers to the questions about adherence to diet and exercise were never, rarely, sometimes, often and always, this was changed to either "Yes" or "No". The reason was that participants would not know how to answer these questions based on the 5-point scale. If the participants responded with a "No", then they were asked to give reasons for their non-adherence behaviour. Another question was added to this section which was "Have you been given information about healthy diet/ or exercise?", this was decided to be added as participants in the current exploratory study reported not being given information about non-pharmacological treatment. Regarding the smoking questions, initially the participants were asked directly whether they smoke or not by using a closed "Yes" or "No" question. This was changed to regularly, occasionally, or never.

There was an agreement by the research team and the expert panel that people usually do not like to admit smoking regularly especially if it is a female for cultural reasons and social stigma, therefore, it would be easier to admit smoking occasionally rather than always by answering a "Yes".

- In the section on healthcare provisions, some items were reworded to ensure better understanding by the participants, e.g. "I trust my physician" was changed to "I have a lot of faith and trust in my healthcare providers".
- In addition, some grammatical changes were made to the translated version without changing the underlying concepts and some spelling mistakes were amended.

<u>After piloting with patients phase:</u>

- In the beliefs about medicines (BMQ) section, the addition of two words (not substitution) were used to enhance the comprehensibility of an item in the BMQ scale without altering the underlying concept. The words "caused by" were added to the item "I sometimes worry about the long term effects of my medicines", so it appeared as "I sometimes worry about the long term effects caused by my medicines" in the Arabic translated version, as this makes more sense to the Arabic reader. In addition, the item about the beliefs about medicines, which was added, based on the qualitative interviews "not taking my medicines occasionally, will not affect my health negatively" was reworded to "If I do not take my antihypertensive medicines occasionally, it will not matter".
- In the beliefs about illness (IPQ) section, a slight change to the language used was made to make it easier and clearer for the participants, but without changing the underlying concept. For example, changing the item "How much does your illness affect your life" to "to what extent does your illness affect your life" in

the Arabic version. In addition, the word "help" was changed to "benefit" in the item "How much do you think your treatment can help your illness". The final version of the questionnaire is included in Appendix 6.

### 6.2.5.5 Reliability of the translated questionnaire

In addition to the field testing detailed above, the internal reliability of each scale was calculated. The results were as follows:

*Table 6.9: Scales Cronbach's Alpha coefficients*

| Scales | n | Cronbach's Alpha coefficient |
|---|---|---|
| Morisky scale (MMAS) | 15 | 0.815 |
| BMQ specific-necessity subscale | 15 | 0.842 |
| BMQ specific-concerns subscale | 15 | 0.913 |
| Brief IPQ scale | 15 | 0.778 |
| CIRS family and friends subscale | 15 | 0.846 |

All scales showed high internal reliability, with Cronbach's Alpha coefficient of more than 0.8. The lowest was for the brief IPQ scale with the only question that might possibly be thought of as a problem would be "How much control do you have over your illness?". This question had the smallest correlation with the total score and it was possible that deleting it would improve the reliability a little, but it was decided to keep it as the Cronbach's Alpha was still good and above 0 .7.

### 6.2.6 Data analysis

As a way of triangulation, participants' adherence/non-adherence to their antihypertensive medications were assessed using self-report in two ways: using the Morisky adherence scale (MMAS) and the direct method of self-report by asking the participants whether they have missed taking their medicine(s) in the last seven days. The data from the two methods were compared carefully to decide which is the most appropriate to be used as a main method of adherence assessment in this research.

Regarding the MMAS scale, owing to the small numbers of participants with medium adherence, it was decided to classify participants with high adherence as "adherent" whereas patients with medium and low adherence as "non-adherent" to allow for statistical analysis. Another reason for classifying medium adherence as non-adherence is that medium adherence is still non-adherence to some degree. This method was used successfully by Patel and Taylor (2002) and Ross et al (2004) in their use of the MMAS.

The quantitative data was analysed using statistical package SPSS (version 17). Two stages of quality assurance were conducted to eliminate potential errors caused during the process of data entry including:

- A 10% random sample of the database was checked against the original data.
- Variables data frequencies were checked for coding and typographical errors.

The quantitative data analysis was conducted in three stages:

1. Descriptive analyses were undertaken to obtain a detailed understanding of patients' experiences with their medicines. The reasons for adherence to medications were analysed separately by two independent researchers (S.C) and (A.A). The two researchers coded the reasons into unintentional or intentional non-adherence. Any disagreements were resolved by discussion (number of disagreements resolved, N= 1).
2. Bivariate analysis was conducted in order to assess the relationship between demographic, clinical variables, social support scale, healthcare provisions variables, herbal medicines variables and perceptions of illness and treatment and the outcome measure (adherence/non-adherence to medication). To explore relationships between adherers and non-adherers and normally distributed

continuous variables (scale), t-tests were conducted. To assess the association between adherence/non-adherence to medications and categorical variables, chi-square tests were conducted. See Table 6.10 below for the summary of the variables and tests conducted.

***Table 6.10: The variables used to assess their associations with non-adherence to medication (adherence is assessed as a nominal variable)***

| **Variables** | **Type of variables** | **Parametric/non-parametric** | **Test to be used** |
|---|---|---|---|
| Age | Scale | Normally distributed | t-test |
| Gender | Nominal | - | chi-square |
| Educational level | Nominal | - | chi-square |
| Area of residence | Nominal | - | chi-square |
| Duration of hypertension | Scale | Normally distributed | t-test |
| Blood pressure level (controlled vs. uncontrolled) | Nominal | - | chi-square |
| Number of antihypertensive tablets per day | Scale | Normally distributed | t-test |
| Comorbidity | Nominal | - | chi-square |
| Use of herbal medicines | Nominal | - | chi-square |
| Beliefs about safety of herbal medicines | Nominal | - | chi-square |
| Beliefs about effectiveness of herbal medicines | Nominal | - | chi-square |
| Social support scale | Scale | Normally distributed | t-test |
| Healthcare provisions item 1 | Ordinal | Normally distributed | t-test |
| Healthcare provisions item 2 | Ordinal | Normally distributed | t-test |
| Healthcare provisions item 3 | Ordinal | Normally distributed | t-test |
| IPQ-consequences | Ordinal | Normally distributed | t-test |
| IPQ- Timeline | Ordinal | Normally distributed | t-test |
| IPQ- Personal control | Ordinal | Normally distributed | t-test |
| IPQ- Treatment control | Ordinal | Normally distributed | t-test |
| IPQ- Identity | Ordinal | Normally distributed | t-test |
| IPQ- Concern | Ordinal | Normally distributed | t-test |
| IPQ- Emotions | Ordinal | Normally distributed | t-test |
| IPQ- Illness comprehensibility (understanding) | Ordinal | Normally distributed | t-test |
| BMQ- Necessity | Scale | Normally distributed | t-test |
| BMQ- Concerns | Scale | Normally distributed | t-test |
| Beliefs item from the interview | Ordinal | Normally distributed | t-test |

3. The statistically significant associations for dichotomous variables were entered into a binary logistic regression analysis to develop a model which best predicted adherence/non-adherence to medication. The logistic regression analysis was undertaken in collaboration with a statistician.

Logistic regression

Regression is a technique for fitting a particular model to a set of data to explain the most variance of that data. Logistic regression is similar to multiple regression but with an outcome variable that is a categorical variable and predictor variables that are continuous or categorical. Logistic regression can be used to predict a dependent variable on the basis of continuous and/or categorical independents and to determine the present of variance in the dependent variable explained by the independents; to rank the relative importance of independents; to assess interaction effects; and to understand the impact of covariate control variables. It applies the same theory as the multiple regressions technique in predicting an outcome variable using one or more predictor variables (Field, 2009).

Logistic regression applies maximum likelihood estimation after transforming the dependent into a logit variable, which is the natural log of the odds of the dependent occurring, or not. In this way, logistic regression estimates the probability of a certain event occurring. It calculates changes in the log odds of the dependent. Logistic regression has many analogies to ordinary least squares (OLS) regression: logit coefficients correspond to beta coefficients in the logistic regression equation, the standardised logit coefficients correspond to beta weights, and a pseudo R2 statistic is available to summarise the strength of the relationship. Unlike OLS regression, logistic regression does not assume linearity of relationship between the independent variables

and the dependent, does not assume homoscedasticity (variance of residual term is constant at each level of predictor variables), does not require normally distributed variables, and in general has less stringent requirements. Logistic regression, however, requires that observations are independent and that the independent variables be linearly related to the logit of the dependent. The success of the logistic regression can be assessed by looking at the classification table, showing correct and incorrect classifications of the dichotomous, ordinal, or polytomous dependent. Also, goodness-of-fit tests such as model chi-square are available as indicators of model appropriateness as is the Wald statistic to test the significance of individual independent variables.

A number of different methods of logistic regression can be used. Theoretical choice is applied in the forced entry method where predictors are simultaneously forced into the model without order of entry. A number of stepwise methods are described in which predictors are entered into logistic regression on a mathematical basis. The forward method initially defines a model using the constant only and then progressively identifies predictors in order of greatest correlation, which are added to the model. The backward method sequentially removes predictors that do not significantly contribute to the outcome prediction and stops when no more predictors are suitable for removal. The SPSS stepwise method is similar to the forward method except that as predictors are added to the model, redundant predictors are removed. Choice of method depends on theoretical and mathematical considerations. It is suggested that, with sound available evidence, a theoretical approach is most desirable and meaningful variables should be entered (Field, 2009). However, if specific research is limited to help make this theoretical approach, a mathematical approach should be employed rather than a random choice of variables. The number of predictors is also important and the least

number is best. The number of predictors should relate to the sample size and 15 cases per predictor has been recommended (Field, 2009).

Diagnostics of a particular model, in terms of how well the model fits the observed data, include an analysis of individual cases (outliers) which differ considerably from the model fit, and whether cases also influence the model disproportionately. Decisions to exclude cases should have reasonable argument. SPSS version 17 program index describes various tests of case diagnostics:

- Cook's [distances]: a measure of how much the residuals of all cases would change if a particular case was excluded from the calculation of the logistic regression coefficients. A large Cook's D indicates that excluding a case from computation of the regression statistics, changes the coefficients substantially. Cook's distances above a value of 1 may be cause for concern (Field, 2009).
- Leverage values: measures the influence of a point on the fit of the regression. The centered leverage ranges from 0 (no influence on the fit) to 1 (complete influence). The expected Leverage is (k + 1)/N, where k is the number of predictors and N is the sample size. Any values above twice or three times the average leverage value are cause for concern (Field, 2009). The results of Cook's D and leverage tests will be reported in Chapter 7.

Field (2009) states a number of assumptions in applying logistic regression analysis performed on a sample to a population (the results will be reported later in Chapter 7):

1) Outcome variable is categorical. Predictor variables are categorical or/and continuous.

2) Linearity in the logit: this assumes that there is a linear relationship between any continuous predictors and the logit of the outcome variable (as the latter is categorical). This assumption can be tested by looking at whether the interaction term between the predictor and its log transformation is significant. Any interaction that is significant indicates that the main effect has violated the assumption of linearity of the logit. Therefore, we are looking for values greater than 0.05 to meet this assumption.

3) Independence of errors: this means that cases of data should not be related; so residual terms should be uncorrelated for any two observations. The Durbin-Watson test is used to test for the assumption that errors are independent. Field (2009) suggests that the closer the Durbin-Watson value is to 2, the better, and that values below 1 or above 3 are serious causes for concern. Violating this assumption produces overdispersion.

4) Absence of multicollinearity: Although not really an assumption as such, multicollinearity is a problem as it is for ordinary regression. In essence, predictor variables should not display perfect linear relationships and therefore should not correlate too highly with each other. Pearson correlation was undertaken to assess multicollinearity. In addition, the variance inflation factor (VIF) and tolerance levels can be assessed. The VIF indicates whether a predictor has a strong linear relationship with the other predictors. It was stated by Field (2009) that there is cause for concern if the greatest VIF value is greater than 10, if the average VIF value is greater than 1, or if tolerance is below 0.2. Conversely, if the average VIF is close to 1 this will confirm that multicollinearity is not a problem.

In addition, logistic regression has some unique problems of its own (not assumptions, but things that can go wrong), including:

1) Incomplete information from the predictors: this should be checked before running the analysis using a crosstabulation table. The expected frequencies in each cell of the

table should be greater than 1 and no more than 20% should be less than 5. This is because the goodness of fit tests in logistic regression make this assumption. As a general point, whenever samples are broken down into categories and one or more categories are empty it creates problems. These will probably be signalled by coefficients that have unreasonably large standard errors (Field, 2009). In this study, a crosstabulations table was used which combined all possible values of all independent variables. There were data in every cell of a crosstabulations table and the smallest expected count was 6. This value still exceeds 5 and so the incomplete information from the predictors was not a problem in this study.

2) Complete separation: This occurs when the outcome variable can be perfectly predicted by one or more of the variables. This problem often arises when too many variables are fitted to too few cases. The iterative procedure in SPSS was used as it attempts to estimate the parameters of the model by finding successive approximations of those parameters. Essentially, it starts by estimating the parameters with a best guess and then attempts to approximate them more accurately. It then tries again many times and stops either when at each new attempt the approximation of parameters are the same or very similar to the previous attempt, or when it reaches the maximum number of attempts but they are not converging (i.e. at each iteration SPSS produces a quite different estimation). If the maximum number of iterations were exceeded then this certainly means that the SPSS output should be ignored as the result will be completely incorrect and this is usually revealed by a large standard error. In this study, estimation terminated at iteration number 3 because parameter estimates changed by less than 0.001, this tells us that our data did not have any problem related to the ratio of cases.

3) Overdispersion: this occurs when the observed variance is bigger than expected from the logistic regression model. It happens either due to the correlated observation (i.e. when the assumption of independence is broken) or variability in success probabilities.

Overdispersion causes a problem because it tends to limit standard errors and results in narrower confidence intervals for test statistics of predictors in the logistic regression model. SPSS produces a chi-square goodness of fit statistic, and overdispersion is present if the ratio of this statistic to its degree of freedom is greater than 1, this ratio is called the dispersion parameter (Ø). Overdispersion is likely to be problematic if the dispersion parameter approaches or is greater than 2. There is also the deviance goodness of fit statistic, and the dispersion parameter can be based on this statistic instead (again by dividing by the degree of freedom). When the chi-square and deviance statistics are very discrepant, then overdispersion is likely. In this study, the dispersion parameter using the chi-square goodness-of-fit statistic was calculated and it was equal to 0.897, which is less than 2. Also, the dispersion parameter using deviance goodness-of-fit statistic was calculated and it was equal to 0.98, which is close to 0.897. This result reveals that there is no problem of overdispersion in the data of this study.

# CHAPTER 7 THE SURVEY STUDY-RESULTS AND SUMMARY

## 7.1 Response rate

Three hundred and ninety one hypertensive patients participated in this study. The response rate was 84%. 71% of non-responders were females. The reasons reported for non-response were similar for both females and males, and included: being busy or not having enough time and lack of interest. 19 participants returned incomplete questionnaires which were excluded from the analysis as over 15% of the data were missing. The incomplete questionnaires were not counted as part of the 391 responders. Most of the participants (55%) preferred the researcher to read the questionnaire and complete it for them based on their responses. Some participants (32%) completed parts of the questionnaire on their own and needed the researcher's help to complete the other parts. Only 13% of the participants completed the questionnaire on their own without any help from the researcher. Table 7.1 illustrates the response rates from different Emirates in the UAE.

***Table 7.1: Response rate from different Emirates in the UAE***

| Health district | Total approached | Total responded | Response rate |
|---|---|---|---|
| Abu Dhabi | 62 | 53 | 86% |
| Dubai | 68 | 62 | 91% |
| Al-Sharjah | 66 | 61 | 92% |
| Ras Al-Khaimah | 86 | 69 | 80% |
| Ajman | 49 | 44 | 90% |
| Al-Fujairah | 85 | 60 | 71% |
| Umm Al-Quwain | 48 | 41 | 85% |
| Total | 464 | 391 | 84% |

## 7.2 Demographic characteristics of the sample

The demographic details of the sample are shown in Table 7.2. The mean age of recruited participants was 51.4 years (SD= 12.7, range= 25-87). More males (56.3%) than females were recruited. Participants recruited were more from the urban (62.7%) than rural areas (37.1%). This reflects the population living in urban vs. rural areas in the UAE as 22% of the total population of the UAE live in rural areas (The World Bank, 2011a). Over quarter of the participants were illiterate, this reflects the level educational level in the UAE as the World Bank (2011b) reported that total adult (15 and over) illiteracy rate for both males and females was 22.7% in year 2003.

*Table 7.2: Demographics of the study participants*

| Factor | Result |
|---|---|
| **Age (Mean, SD)** | 51.4 (12.7) |
| **Gender (n, %)** | |
| Male | 220 (56%) |
| Female | 171 (44%) |
| **Area of residence (n, %)** | |
| Urban | 245 (63%) |
| Rural | 145 (37%) |
| **Education (n, %)** | |
| Illiterate (cannot read and write) | 110 (28.1%) |
| Primary or secondary school | 105 (26.9%) |
| Hold a degree or equivalent qualification | 176 (45%) |

## 7.3 Clinical variables of the sample

The mean duration of hypertension was 7.4 years (SD= 7.1, range= 0.25-40 years). The majority of participants were taking a once daily regimen (95.7%), compared to 3.8% who were taking twice daily and 0.3% who were taking the three time daily regimen. Two hundred and fifty six (65.5%) participants reported other health conditions beside hypertension, with cardiovascular disease being the most common disease (40.7%). Approximately one third (37.3%) of these participants had more than one comorbidity in addition to hypertension. The mean total number of

antihypertensive tablets taken per day was 1.8 tablets (SD= 0.9, range= 1-6 tablets), and the mean total number of other tablets taken per day for other conditions was 2.2 tablets (SD= 2.1, range= 0-9). The most commonly used antihypertensive medicines class was beta blockers (56.8%) and the least was centrally acting agents (0.8%). The majority of participants had their blood pressure level uncontrolled (62%), the mean systolic blood pressure for the participants was 143.2 (SD= 13.5, range= 99-194) and mean diastolic was 82.1 (SD= 10.2, range= 43-111). Table 7.3 and Table 7.4 illustrate the clinical variables of the study participants and types of antihypertensive medications the participants were taking, respectively.

***Table 7.3: Clinical variables of the study participants***

| Factor (total number = 391) | Result |
|---|---|
| **Dosage regimen (n, %)** | |
| Once daily | 374 (95.7%) |
| Twice daily | 16 (4%) |
| Three time a day | 1 (0.3%) |
| [1] **Presence of comorbidity (n, %)** | |
| Cardiovascular | 159 (41%) |
| Diabetes | 137 (35%) |
| Skeletal | 40 (10%) |
| Respiratory | 18 (5%) |
| Gastrointestinal | 24 (6%) |
| Neurological | 13 (3%) |
| Autoimmune | 12 (3%) |
| Haematological | 10 (3%) |
| Others | 47 (12%) |
| [2] **Blood pressure level (n, %)** | |
| Controlled | 128 (32.7%) |
| Uncontrolled | 242 (61.9%) |
| **Total number of antihypertensive tablets taken per day (Mean, SD)** | 1.8 (0.9) |
| **Total number of other tablets taken per day (Mean, SD)** | 2.2 (2.1) |
| **Duration of hypertension (Mean, SD)** | 7.4 (7.1) Yrs<br>89.1 (85.9) months |

[1] Reported for 390 participants as was missing for one; 256 (66%) had a comorbidity. Also, the percentages add up to more than 100% as participants often had more than one comorbidity.

[2] The blood pressure level was missing for 21 participants.

*Table 7.4: Types of antihypertensive medications taken by study participants*

| Class of antihypertensive medications | Number of participants | % of participants* |
|---|---|---|
| Diuretics | 77 | 20 |
| Beta blockers | 222 | 57 |
| Calcium channel blockers | 139 | 36 |
| Angiotensin converting enzyme inhibitors (ACE inhibitors) | 163 | 42 |
| Angiotensin receptor blockers (ARBs) | 73 | 19 |
| Centrally acting agents | 3 | 1 |

* Participants were usually on more than one medicines therefore total is more than 100%

## 7.4 Number of Emirati adherers/non-adherers to antihypertensive medicines

Adherence was assessed based on two self-reported methods, as a way of triangulation. Direct method of self-reporting and Morisky's scale (MMAS) were used to measure participants' adherence to their antihypertensive medicines. Data from the two methods were compared carefully to choose the most appropriate method for the purpose of this research. Results are presented in this section. The chosen measure was used as the main method of adherence assessment in this study and all further analysis was based on this method.

### 7.4.1 Using direct method of self-report

Data were available for all participants for the question "People often miss taking doses of their medicines, for a whole range of reasons. Thinking of your antihypertensive medicine(s), when was the last time you missed taking a dose of this medicine(s)?". Participants who reported not missing any pills over the last seven days were considered adherent, whereas those who reported missing a dose or more over the last seven days were considered non-adherent to their medications. Two hundred of the participants (51.2%) reported non-adherence to their medications. Table 7.5 illustrates participants' adherence rate using this measure.

***Table 7.5: Adherence rate based on direct self-report***

| Direct self-report (n=391) | Adherers n (%) | Non-adherers n (%) |
|---|---|---|
| | 191 (48.8) | 200 (51.2) |

The most commonly reported reason by the participants for non-adherence to medication was forgetting. See Table 7.6 for the types and frequencies of participants' self-reported reasons for their non-adherence to medications.

***Table 7.6: Types, percentages and frequencies of self-reported reasons of non-adherence to medications based on direct self-report***

| Reasons for medications non-adherence (n=200) | Number of participants | % of participants* |
|---|---|---|
| Forgetting | 101 | 50.5 |
| Feel that the blood pressure level is controlled | 25 | 12.5 |
| Travelling/away from home | 22 | 11 |
| Running out of medicine(s) | 19 | 9.5 |
| Busy doing something else | 19 | 9.5 |
| Carelessness | 15 | 7.5 |
| Just did not want to take medicine(s) | 8 | 4 |
| Delaying doses | 7 | 3.5 |
| Medicine(s) cause side effect(s) | 4 | 2 |
| Lack of motivation | 4 | 2 |
| Feel lazy to take medicines(s) | 3 | 1.5 |
| Taking medication holiday | 3 | 1.5 |

* Some participants reported more than one reason for their non-adherence to medication therefore The total is more than 100%.

The reasons reported by the participants for their medication non-adherence were also classified into intentional, unintententional or combination of both intentional and unintentional by two independent researchers (A.A. and S.C.). See Table 7.7 for a summary of these findings.

*Table 7.7: Number and percentage of intentional, unintentional and combined non-adherers by direct self-report*

| Type of non-adherers (n= 200) | Intentional n (%) | Unintentional n (%) | Both n (%) |
|---|---|---|---|
| | 65 (32.5) | 113 (56.5) | 22 (11) |

### 7.4.2 Using the 8-item Morisky Medication Adherence Scale (MMAS)

The MMAS was also used to assess participants' adherence to their antihypertensive medication. Data were available for all participants. In this data set, the scale had good internal reliability, with a Cronbach's Alpha coefficient of 0.827. The scale scores range from 0 to 8, with 8 representing high adherence. See Table 7.8 for the mean and range of MMAS scores of the participants of this study.

*Table 7.8: Mean (SD) and range of scores using MMAS for the study participants*

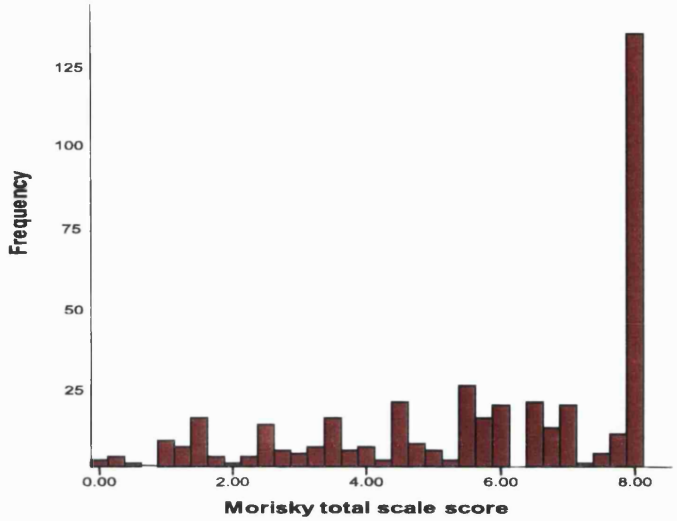
| MMAS total score (n=391) | Mean (SD) | Range |
|---|---|---|
| | 5.8 (2.3) | 0-8 |

Table 7.9 shows the number (and %) of adherers/non-adherers to medication using the predetermined cut off points of the MMAS scale (adherent= 8, non-adherent < 8) and Figure 7.1 shows a histogram of the overall adherence scores. The figure illustrates that the results are negatively skewed towards responses that denote high adherence.

*Table 7.9: Number (and %) of adherers and non-adherers using MMAS data*

| MMAS (n=391) | Adherers n (%) | Non-adherers n (%) |
|---|---|---|
| | 134 (34.3) | 257 (65.7) |

***Figure 7.1: Histogram of the overall adherence scores using MMAS scale***




The MMAS was used also to classify non-adherent participants into intentional, unintentional or both. The results are shown in Table 7.10. The results showed that most of the participants reported both intentional and unintentional non-adherence. Results for six participants could not be confirmed, accounting for the remaining 2.3%.

***Table 7.10: Number and percentage of intentional, unintentional and combined non-adherers by MMAS scale***

| **Type of non-adherers (n=257)** | **Intentional n (%)** | **Unintentional n (%)** | **Both n (%)** |
|---|---|---|---|
| | 14 (5.5) | 116 (45.1) | 121 (47.1) |

### 7.4.3 Comparisons between the two measures of assessing medication adherence

The MMAS was tested against the direct measure of adherence in two ways:

1. To compare the proportion of adherers and non-adherers using each measure.
2. To test how well each measure could identify participants with poor blood pressure control.

***Table 7.11: Comparison of adherers and non-adherers from MMAS and direct self-report***

| | | Adherence level based on MMAS | | |
|---|---|---|---|---|
| | | Adherent (%) | Non-adherent (%) | Total (%) |
| Adherence level based on the direct method of self-report | Adherent (%) | 121 (30.9) | 70 (17.9) | 191(48.8) |
| | Non-adherent (%) | 13 (3.3) | 187 (47.8) | 200 (51.2) |
| Total | | 134 (34.3) | 257 (65.7) | 391 (100) |

Table 7.11 shows that MMAS classified 257/391 (65.7%) responders as non-adherers compared to direct self-report which identified 200/391 (51.2%) as non-adherers among participants who had valid data for both MMAS and direct self-report.

***Table 7.12: Comparison of adherers and non-adherers from MMAS and blood pressure level***

| | | **Adherence level based on MMAS** | | **Total** |
|---|---|---|---|---|
| | | **Adherence** | **Non-adherence** | |
| **Is the BP controlled or uncontrolled** | **Controlled (count, %)**<br>**Expected count** | 87 (68.5%)<br>43.9 | 41(16.9%)<br>84.1 | 128<br>128 |
| | **Uncontrolled (count, %)**<br>**Expected count** | 40 (31.5%)<br>83.1 | 202 (83.1%)<br>158.9 | 242<br>242 |
| **Total** | **Count**<br>**Expected count** | 127<br>127 | 243<br>243 | *370<br>370 |

*The blood pressure level was missing for 21 participants.

Table 7.12 shows that of the 127 adherers identified by the MMAS, 87 (68.5%) had controlled blood pressure and 40 (31.5%) were uncontrolled. Also, of the 243 non-adherers identified by the scale, 41 (16.9%) had controlled blood pressure and 202 (83.1%) were uncontrolled. Participants who were non-adherent using the MMAS scale were more likely to have their blood pressure uncontrolled compared with participants who were adherent. A significant relationship between the adherence scale and blood pressure control was found (chi-square= 98.3; df= 1; $p < 0.001$). Adherence (MMAS score= 8) was associated with controlled blood pressure level, whereas non-adherence (MMAS score < 8) was associated with poor blood pressure control. MMAS correctly identified 202/242 (83.5%) of the participants with poor blood pressure control as non-adherent and 87/128 (68%) of participants with controlled blood pressure as adherent. Therefore, the MMAS had a sensitivity of 83.5% and a specificity of 68% when compared with blood pressure.

***Table 7.13: Comparison of adherers and non-adherers from direct self-report and blood pressure level***

| | | **Adherence level based on the direct method of self-report** | | **Total** |
|---|---|---|---|---|
| | | **Adherence** | **Non-adherence** | |
| **Is the BP controlled or uncontrolled** | **Controlled (count, %)**<br>**Expected count** | 102 (56.4%)<br>62.6 | 26 (13.8%)<br>65.4 | 128<br>128 |
| | **Uncontrolled (count, %)**<br>**Expected count** | 79 (43.6%)<br>118.4 | 163 (86.2%)<br>123.6 | 242<br>242 |
| **Total** | **Count**<br>**Expected count** | 181<br>181 | 189<br>189 | *370<br>370 |

*The blood pressure level was missing for 21 participants.

Table 7.13 shows that of the 181 adherers identified by direct self-report, 102 (56.4%) had controlled blood pressure and 79 (43.6%) were uncontrolled. Also, of the 189 non-adherers identified this way, 26 (13.8%) had controlled blood pressure and 163 (86.2%) were uncontrolled. A significant relationship between the adherence scale and blood pressure control was found (chi-square= 74.1; df= 1; $p< 0.001$). The direct self-report correctly identified 163/242 (67.4%) of participants with poor blood pressure control as non-adherent and 102/128 (79.7%) of participants with controlled blood pressure level as adherent. Therefore, direct self-report had a sensitivity of 67.4% and a specificity of 79.7%.

### 7.4.4 Conclusion regarding the selection of best method of adherence measurement

In deciding whether to use the direct self-report or the MMAS as the primary method for assessing adherence to medication in this research, it was acknowledged that the agreement between the two methods was not likely to be reached, as each method requires participants to recall their medication taking behaviours over different periods. Using the direct self-report, participants were asked to report whether they missed taking a dose or more of their antihypertensive medicine(s) over the last seven days. Using MMAS, participants were asked whether any of the statements denoting adherence/non-adherence to medications in general applied to them without specifying a time period, apart for two questions where participants were asked to report whether they have taken their antihypertensive medicine(s) yesterday or within the last two weeks.

However, it was interesting to find whether data from each method would give similar results for the assessment of participants' medication adherence as well as checking the best method for identifying non-adherent participants. As we know from

the literature, if a person admits to being non-adherent then it is more likely that he/she is telling the truth (Inui et al., 1981; Stephenson et al., 1993). In contrast, if a person reports being adherent, then this may not be true and could be due to other reasons such as social desirability bias, which is reported in the literature (Horne et al., 2005). Therefore, the method, which identified more non-adherent patients, would be regarded as the most accurate method and will be used for further analyses throughout this chapter. In this study, MMAS identified more non-adherers compared to the direct self-report (65.7% vs. 51.2 %, respectively) and was the method with the highest sensitivity when compared to blood pressure control.

For the reasons mentioned above, it was decided to use the MMAS as the main method for assessing non-adherence to antihypertensive medications in this study. All the analyses carried out from this point onward will be based on adherence using the 8-item Morisky medications adherence scale (MMAS).

In the next section, the bivariate analysis of the data will be reported. Bivariate analysis was conducted to assess the association between variables and adherence to medication using MMAS scale. The strongest observed associations for the outcome variables were then entered into the logistic regression analysis to develop a model which best predicted outcome (non-adherence to medication) for this specific population.

### 7.5 Relationship between demographic variables and adherence

Demographic variables (gender, age, educational level and area of residence) were assessed in relation to antihypertensive medication adherence using the MMAS self-reporting scale. An independent sample t-test was used to compare age between

adherers and non-adherers. There was a significant difference in age between adherers and non-adherers [mean 54.40 vs. 49.83; mean difference= 4.57; 95% confidence interval of the difference= 7.20 to 1.94; t= 3.42; df= 388; p= 0.001]. Non-adherers were younger compared to adherers.

A chi-square test was used to assess if there was any association between adherence to antihypertensive medication and gender, area of residence and level of education. There were no significant differences in adherence in relation to educational level and gender. However, there was a significant difference in adherence according to area of residence, where a difference in adherence was found between participants who lived in urban and rural areas. Participants who live in urban areas were more adherent to their medicines than those who live in rural areas. Results are summarised in Table 7.14.

***Table 7.14: Results of association between demographic variables and adherence to medications***

| **Demographic variables** | | **Adherent (n= 134)** | **Non-adherent (n= 257)** | **Chi-square p value** |
|---|---|---|---|---|
| **Gender** | Female | 59 (34.5%) | 112 (65.5%) | 1 |
| | Male | 75 (34.1%) | 145 (65.9%) | |
| **Area of residence** | Urban | 109 (44.5%) | 136 (55.5%) | 0.001 |
| | Rural | 25 (17.2%) | 120 (82.8%) | |
| **Educational level** | Illiterate | 43 (39.1%) | 67 (60.9%) | 0.749 |
| | Primary or secondary school | 29 (27.6%) | 76 (72.4%) | |
| | Hold a degree or equivalent qualification | 62 (35.2%) | 114 (64.8%) | |

## 7.6 Relationship between clinical variables and adherence

Clinical variables (blood pressure level controlled or not, duration of hypertension, presence of comorbidity and number of antihypertensive medications taken per day) were assessed in relation to adherence to antihypertensive medications as assessed by the Morisky self-report scale.

Blood pressure level and presence of other comorbidities were associated with adherence to medications. Patients with controlled blood pressure were more likely to be adherers to their medication than those with uncontrolled blood pressure (chi-square test= 98.269, df= 1, p= 0.001). In addition, patients who had other comorbidities were more likely to be adherers than those who did not have comorbidities (chi-square test= 8.573, df= 1, p= 0.004). This suggests that being sicker or having greater illness burden may make patients more aware of the importance of adhering to prescribed treatment.

An independent sample t-test was used to compare number of antihypertensive medications taken per day, duration of hypertension and adherence to medications. There was a significant difference in the number of antihypertensive medications taken per day between adherers and non-adherers [1.9701 vs. 1.6836, respectively; mean difference= 0.28656; 95% confidence interval of the difference= 0.47004 to 0.10307; t= 3.070; df= 388; p= 0.002]. In this study, adherers were taking more antihypertensive medicines per day than the non-adherers. This suggests that older patients who are on more medicines for hypertension are more likely to be adherent to their medication than younger or newly diagnosed patients.

In addition, there was a significant difference in the duration of hypertension between adherers and non-adherers [9.0295 vs. 6.5038, respectively; mean difference=

2.52579; 95% confidence interval of the difference= 4.01304 to 1.03854; t= 3.339; df =382; p= 0.001]. Non-adherers had less duration of hypertension compared to adherers. This suggests that recently diagnosed patients are the ones who are more likely to be at risk of non-adherence to their antihypertensive medicines.

## 7.7 Beliefs about antihypertensive medicines and medications adherence

### 7.7.1 Descriptive results

Participants' beliefs about their antihypertensive medications were assessed using the Specific Beliefs about Medicines Questionnaire (BMQ). In this set of data, the BMQ necessity and BMQ concerns subscales had good internal reliability with Cronbatch's Alpha coefficient of 0.789 and 0.774, respectively. Table 7.15 summarises participants' responses to the BMQ specific subscales.

***Table 7.15: Mean scores (and ranges) of individual BMQ specific subscales (n= 391)***

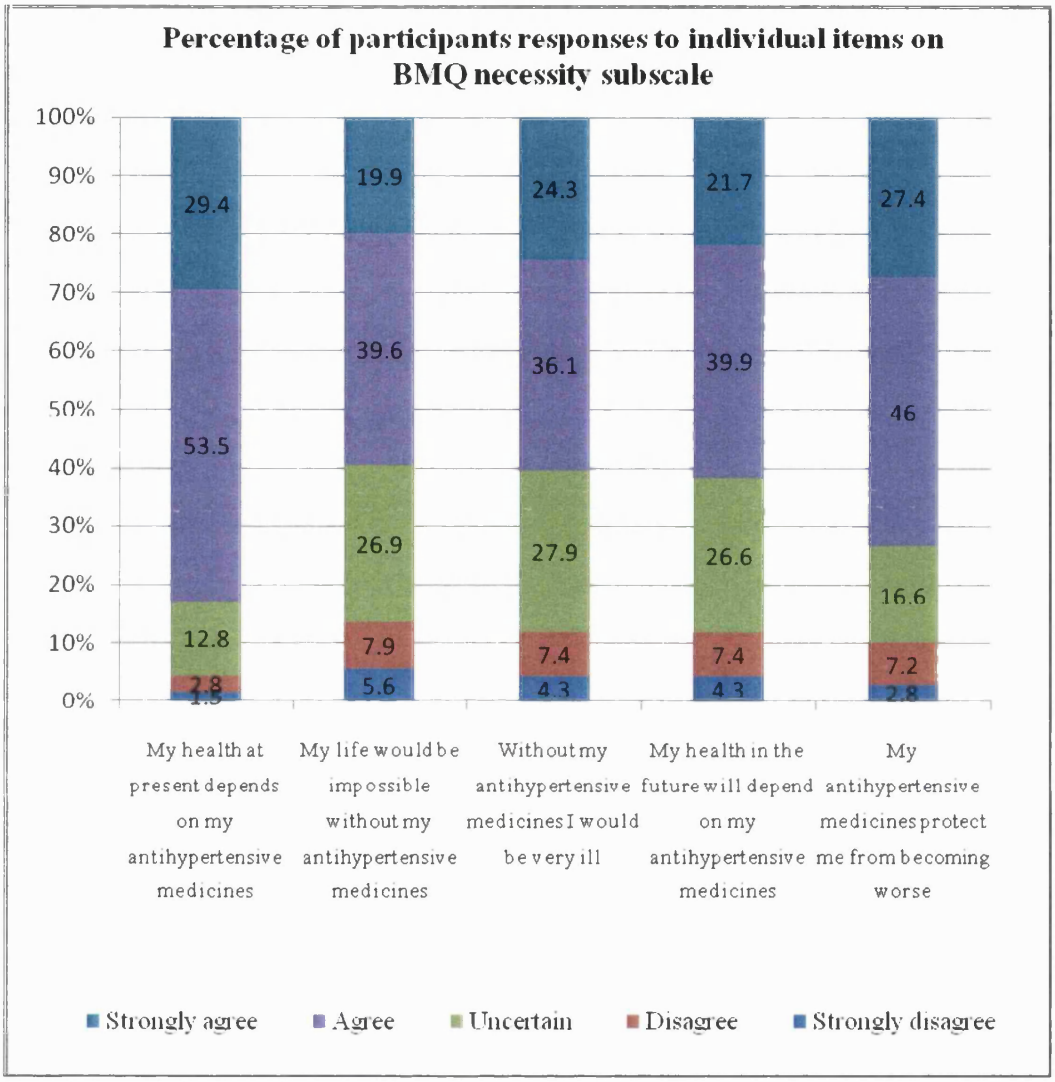
| *BMQ subscale | Mean score (SD) | Minimum | Maximum |
|---|---|---|---|
| Total necessity | 18.90 (3.679) | 5 | 25 |
| Total concerns | 16.57 (3.978) | 5 | 25 |
| Total differential (necessity-concerns) | 2.340 (5.411) | -13 | 18 |

*(Potential range of scores is from 5-25 for BMQ necessity and BMQ concerns; potential range for differential is from -20 to 20)

### BMQ-specific necessity subscale

The response to the items of the BMQ-specific necessity subscale are summarised in Figure 7.2. Although the majority of participants responded that they either agreed (36.1-53.5%) or strongly agreed (19.9-29.4%) about the necessity of taking their antihypertensive medicines, a substantial proportion of participants (12.8-27.9%) were uncertain about the necessity of these medicines. A small proportion of participants either disagreed (2.8-7.9%) or strongly disagreed (1.5-5.6%) that their antihypertensive medicines were necessary.

***Figure 7.2: Percentage of participants' responses to individual items of the BMQ-specific necessity subscale***

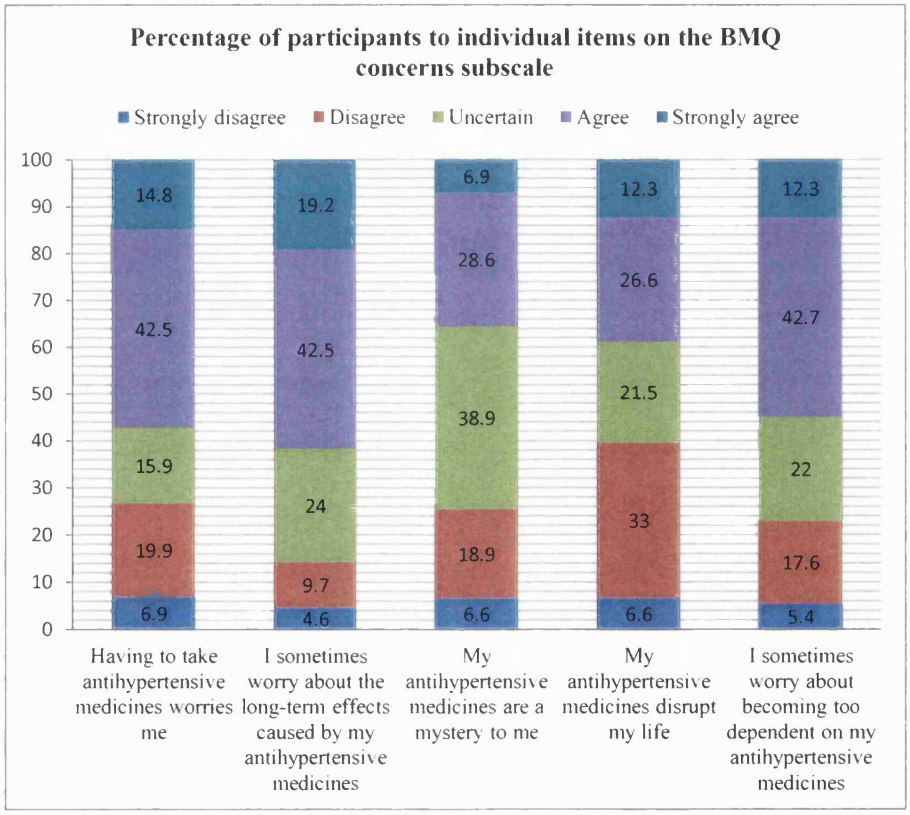



Moreover, about 12.8% of the participants were uncertain that their health at present depends on their antihypertensive medications. However, when speaking of the future, about twice as many participants (26.6%) were uncertain that their health in the future would depend on their medicines.

**BMQ-specific concerns subscale**

A larger proportion of participants either agreed (26.6-42.7%) or strongly agreed (12.3-19.2) that they were concerned about their antihypertensive medicines compared to those who disagreed (9.7-33%) or strongly disagreed (4.6-6.9%) that they had concerns about their medicines. Response to the items of the BMQ-specific concerns subscale are summarised in Figure 7.3.

***Figure 7.3: Percentage of participants' responses to individual items of the BMQ-specific concerns subscale***



In addition, an item about beliefs about medicines was raised from the qualitative interviews and was assessed in the questionnaire. Participants were asked the question "If I do not take my antihypertensive medicines occasionally, it will not matter". Around 44.8% (n= 176) of the 391 participants disagreed with that statement, 28.4% (n= 111) of the participants were uncertain and 26.5% (n= 104) agreed. This suggests that around half of the participants thought that it is necessary to take antihypertensive medicines on a daily bases, whereas quarter of them believed that complete adherence was not necessary for therapeutic gain.

### 7.7.2 Relationship between beliefs about antihypertensive medicines and adherence to medications

Box plots (Figures 7.4-7.6) were used initially to visually explore the relationship between medication adherence as indicated by MMAS self-report scale and participants scores on the BMQ-specific subscales. The circles above and below the boxplots are cases that are deemed to be outliers (Field, 2009) and will be discussed later in this chapter (Section 7.12.4).

***Figure 7.4: Box plot for adherence by MMAS scale vs. total necessity scores of participants***

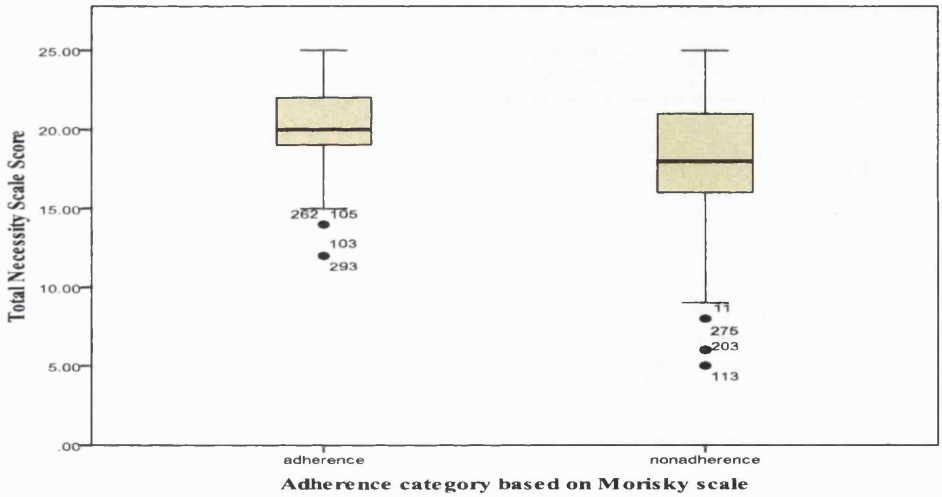



Figure 7.4 illustrates that the range of scores on BMQ necessity subscale is larger for non-adherent participants than for adherent participants ((5-25 vs. 12-25). The median score is slightly higher for adherents compared to non-adherents (20 vs. 18, respectively). See Table 7.16 for these results.

***Figure 7.5: Box plot for adherence by MMAS scale vs. total concerns scores of participants***

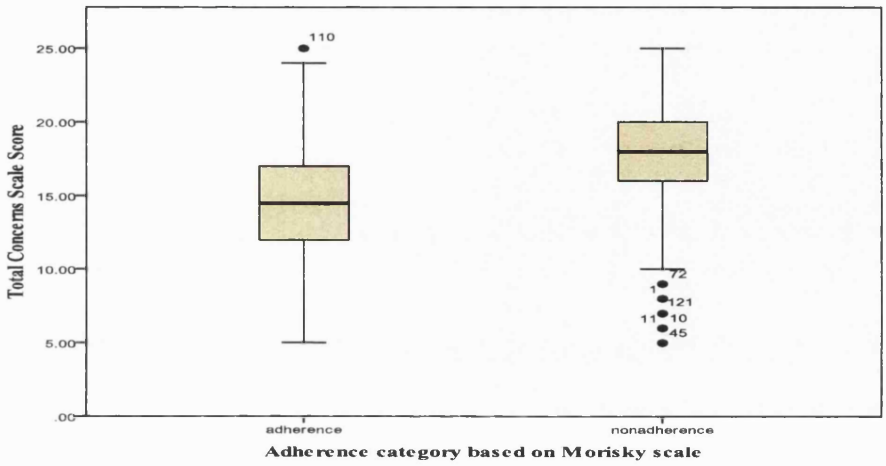



Figure 7.5 illustrates that the range of scores for both adherers and non-adherers is the same (5 to 25). The median score was higher for the non-adherent than adherent participants (18 vs. 15, respectively).

***Figure 7.6: Box plot for adherence by MMAS scale vs. total necessity- concerns (differential) scores of participants***

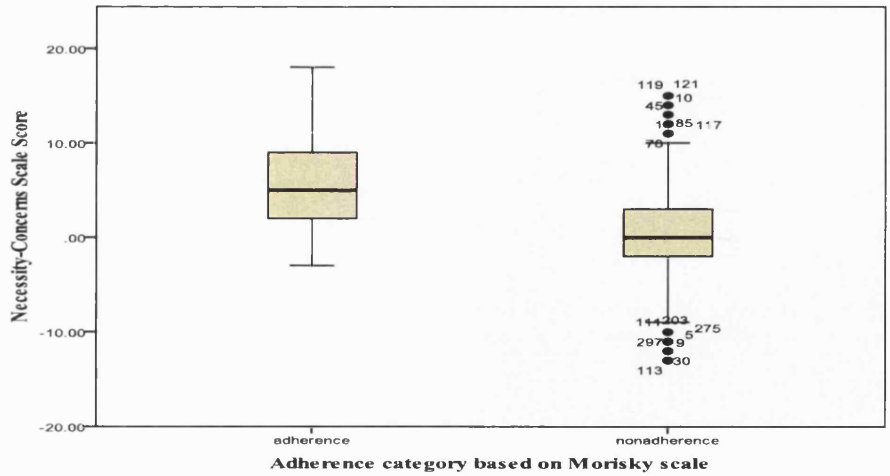


Figure 7.6 illustrates that the range of scores on the necessity-concerns differential is larger for non-adherent patients than for adherent patients (-13 to 15 vs. -3 to 18, respectively). The median score is higher for adherent patients compared to non-adherent patients (5 vs. 0, respectively).

The data for the BMQ necessity subscale, the BMQ concerns subscale and the BMQ differential were used to assess whether there were any differences on these scores between adherers and non-adherers. Table 7.16 contains the mean scores and standard deviations for the adherers and non-adherers.

***Table 7.16: Mean scores (SD) for adherers and non-adherers on the BMQ-specific subscales and differential***

| **BMQ Specific** | **Adherent (n=134)** | **Non-adherent (n=257)** |
|---|---|---|
| | **Mean (SD)** | **Mean (SD)** |
| BMQ necessity | 20.28 (2.978) | 18.18 (3.806) |
| BMQ concerns | 14.67 (4.094) | 17.553 (3.541) |
| BMQ differential | 5.634 (4.371) | 0.623 (5.102) |

Independent samples t-tests for assessing differences between adherers and non-adherers in their responses to BMQ-specific subscales showed a significant difference in the mean scores between these two groups as seen in Table 7.17.

***Table 7.17: Results of the t-tests comparing adherers and non-adherers on the BMQ-specific subscales and differential***

| BMQ Specific | t-test for Equality of Means | | | | | |
|---|---|---|---|---|---|---|
| | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence interval of the Difference | |
| | | | | | Lower | Upper |
| BMQ necessity | 6.023 | 331.26 | 0.001 | 2.108 | 1.420 | 2.797 |
| BMQ concerns | -6.909 | 238.14 | 0.001 | -2.881 | -3.702 | -2.059 |
| BMQ differential | 9.669 | 389 | 0.001 | 5.012 | 3.993 | 6.031 |

As seen in tables 7.16 and 7.17, those who were adherent to their antihypertensive medications had significantly stronger beliefs about the necessity of medicines than those who were non-adherent. In addition, participants who were non-adherent to their antihypertensive medicines had significantly more concerns about taking their medicines than those who were adherent. The necessity-concerns differential scores suggested that, on average, participants' beliefs about the necessity of taking their medicines outweighed concerns about their use. However, the differential scores for non-adherers were significantly lower than that of adherers, suggesting greater concerns relative to beliefs in necessity for non-adherers compared to adherers.

Also, the item "If I do not take my antihypertensive medicines occasionally, it will not matter" which was raised from the qualitative interviews was assessed in relation to medications adherence. Independent samples t-test was used and the result revealed that those who were non-adherent to their antihypertensive medicines were more likely to believe that not taking their medications occasionally will not matter. There was a significant difference between the means from adherent and non-adherent

participants [2.4701 vs. 2.899, respectively; mean difference= -0.4287; t= -3.406; df= 389; p= 0.001; 95% confidence interval of the difference= -0.18123 to -0.67614].

## 7.8 Beliefs about hypertension and medications adherence

### 7.8.1 Descriptive results

Participants' beliefs about hypertension were assessed using the Brief Illness Perception Questionnaire (IPQ). The Brief IPQ data for the first eight items of the scale was available for the whole sample; however, some of the participants did not answer the last open-ended question regarding the causal representation. In this set of data, the brief IPQ scale had a moderate internal reliability with Cronbach's Alpha coefficient of 0.629. The causal item asked the participants to list and rank the three important factors that they believe caused their illness. Three hundred and fifty eight participants (91.6%) reported the first important factor believed to cause their illness, 218 (55.8%) reported a second important factor, whereas only 142 (36.3%) reported a third important cause of their illness. Interestingly, stress was the main reported cause of hypertension, it was reported as the first factor by 136/358 (38%) participants who responded to this question, 88/218 (40.4%) participants who responded to the second question and 51/142 (35.9%) participants who responded to the third question. Therefore, approximately three quarters (77%) of the participants who answered this question thought stress was a causal factor of their illness. Table 7.18 summarises participants' responses to the Brief IPQ individual items.

### 7.8.2 Relationship between beliefs about hypertension and adherence to medications

Independent samples t-tests were used to assess the association between adherence and consequences, personal control, treatment control, identity, concern, timeline, illness comprehensibility (understanding) and emotional representation of illness (hypertension in this case). Results are shown in Table 7.18.

***Table 7.18: Mean scores (SD) of individual items of the Brief IPQ scale and results of the t-tests of mean scores for adherers and non-adherers on this scale***

| The brief IPQ items | Mean (SD)* | | p value (2-tailed) |
|---|---|---|---|
| | Adherers | Non-adherers | |
| How much does hypertension affect your life **(consequences)** | 4.99 (3.06) | 4.44 (3.04) | 0.093 |
| How much control do you have over hypertension **(personal control)** | 7.14 (2.39) | 6.17 (3.15) | 0.001 |
| How much do you think your treatment can help your hypertension **(treatment control)** | 7.37 (2.90) | 5.52 (3.30) | 0.001 |
| How much do you experience symptoms from hypertension **(identity)** | 4.58 (3.17) | 4.45 (3.17) | 0.707 |
| How concerned are you about your hypertension **(concern)** | 5.77 (3.22) | 5.78 (3.19) | 0.969 |
| How much does hypertension affect you emotionally **(emotional representation)** | 5.14 (3.18) | 5.71 (3.02) | 0.083 |
| How long do you think hypertension will continue **(timeline)** | 8.86 (2.15) | 7.72 (2.95) | 0.001 |
| How well do you feel you understand hypertension **(understanding)** | 7.96 (2.28) | 6.77 (3.21) | 0.001 |

* Potential range= 0 to 10, with high scores indicating strong agreement with the item.

The t-tests revealed that there were significant differences between adherent and non-adherent participants in their beliefs about hypertension personal control, treatment control, timeline and illness comprehensibility (understanding) beliefs. Adherent

participants had higher personal and treatment control beliefs than non-adherent participants. It also revealed that adherers had the highest scores on the timeline and understanding item compared to non-adherers. This means that participants who were adherent were more likely to report perceptions of their hypertension being of a long duration and that they understood their hypertension compared to participants who were non-adherent.

The association between adherence to medications and the second and third ranked causal representation of illness was not possible. This was because almost half of the participants did not report their beliefs about the second important cause of their hypertension, whereas the answer for the third important cause of hypertension was missing for two third of the participants. The association between the first ranked causal representation of illness and medication adherence performed using chi-square test. The answers were categorised into two groups which are psychological factors (stress, family problems, overwork and emotional state) and clinical risk factors (diet, exercise, smoking, ageing, obesity and hereditary). The results showed no significant relationships between cause perceptions and adherence to medication (chi-square test= 0.105, df= 1, p= 0.801).

## 7.9 Adherence to antihypertensive medications and herbal medicines, and healthcare provisions issues

### 7.9.1 Herbal medicines descriptive results

Three items were used to measure participants' use and perceptions of the safety and effectiveness of herbal medicines as these items were issues reported by participants during the qualitative interviews. Data were available for 390 participants (99.7%).The majority of the participants (78.2%, n= 305) reported that they had never used any herbal remedies, 16.1% (n= 62) reported that they had used some in the past and 5.6% (n= 23) reported using them currently. Some participants reported using or having used more than one herb at one time and the most commonly used herbal remedy was Hibiscus (7.2%, n= 6). Three hundred and seventy eight patients answered the question about the effectiveness of the herbal remedies; the majority (58.8%, n= 222) thought that herbal remedies are less effective than their prescribed medicines, 36.5% (n= 138) thought both are the same and only 4.7% (n= 18) thought that herbs are more effective. Regarding the question about the safety of the herbal remedies compared to the prescribed medicines, the majority (56.1%, n= 219) thought herbs are less safe than their medicines, whereas only (14.8%, n= 58) thought that these are safer.

### 7.9.2 Relationship between herbal medicines items and adherence to medications

The chi-square test was used to test associations between adherence to antihypertensive medications and the use of herbal medicines and beliefs about their safety and effectiveness. The beliefs about the effectiveness and safety of the herbal medicines were significantly associated with adherence. Participants who thought that herbal medicines are as safe or safer than their prescribed medicines were more likely to be non-adherent to their medication than those who thought that these herbs are less safe than the prescribed medication (chi-square= 7.854, df= 1, p= 0.005). Also,

participants who thought that herbal medicines are similar or more effective than their prescribed medicines were more likely to be non-adherent to their medication than those who thought that these herbs are less effective than the prescribed medication (chi-square= 14.834, df= 1, $p < 0.001$). In contrast, the use of the herbal medicines (whether participants were currently using or used previously or never used any) had no effect on adherence to antihypertensive medicines (chi-square= 1.665, df= 1, p= 0.197).

### 7.9.3 Healthcare provisions descriptive results

Three items were used to measure perceptions of healthcare provisions, these items were modified statements reported by participants during the qualitative interviews. From the 391 participants, responses illustrate that almost half (55%, n= 215) had a "great" or "good" faith and trust in their healthcare providers. About 24% (n= 93) reported that they trust their healthcare providers to a certain extent, whereas 15.1% (n= 59) had trust to a little extent and 6.1% (n= 24) did not have trust at all. Just over half of the participants (52%, n= 203) reported that their healthcare providers provide them with all the information they need to know about their illness and treatment to a "great" or "good" extent. There is still room for improvement as a significant proportion of participants responded to the same statement as "to a certain extent" (24%, n= 94), "to a little extent" (17%, n= 67) or "never" (7%, n= 27). Over half of the participants (58%, n= 227) were satisfied to a "great" or "good" extent with the services provided to them from the hospital. Around 24% (n= 94) were satisfied to "a certain extent" and 18% (n= 70) were not satisfied or satisfied only to "a little extent". Despite the fact the almost half of the participants reported lack of trust in the healthcare providers, lack of information provided to them and lack of satisfaction with the hospital services, but participants still may have responded in a way to provide

socially desirable responses which might have underestimated these issues as they were recruited in a hospital setting.

### 7.9.4 Relationship between healthcare provisions items and adherence to medications

Three items were used to measure perceptions of healthcare provisions, these items were modified statements reported by participants during the qualitative interviews. Item 1 is "I have faith and trust in my healthcare providers", item 2 is "My healthcare providers provide me with all the information I need to know about my disease and medications" and item 3 is "I'm satisfied with the services provided to me by my hospital". An independent t-test was used to assess whether there were any differences in these perceptions between adherers and non-adherers.

Independent samples t-tests revealed that those who were adherent to their antihypertensive medicines had significantly higher faith and trust in their healthcare providers than non-adherers [3.94 vs. 3.35, respectively; mean difference= 0.586; 95% confidence interval of the difference= 0.823 to 0.350; t= 4.882; df= 309.8; p= 0.001]. Also, those who were adherent to their medication were more satisfied with the amount of information provided to them from their healthcare providers than non-adherers [3.836 vs. 3.307, respectively; mean difference= 0.528; 95% confidence interval of the difference= 0.765 to 0.292; t= 4.401; df= 324.05; p= 0.001]. In addition, adherent participants reported more satisfaction with the services provided to them from their hospitals than non-adherent participants [3.978 vs. 3.494, respectively; mean difference= 0.483; 95% confidence interval of the difference= 0.706 to 0.261; t= 4.277; df= 335.64; p= 0.001].

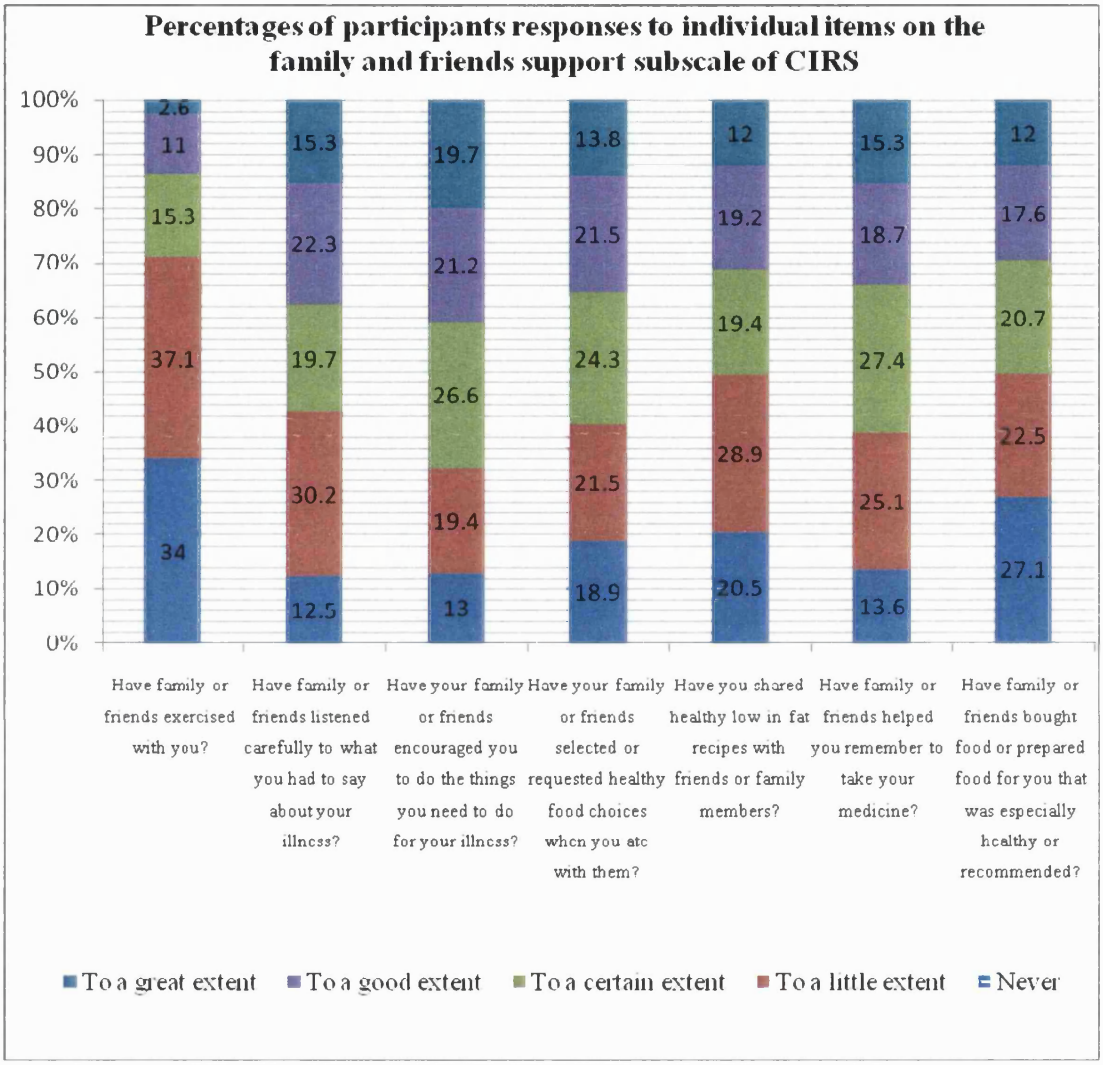
## 7.10 Social support from family and friends and medications adherence

The family and friends support subscale of the Chronic Illness Resources Survey (CIRS) was used to assess participants' perceptions of social support provided by their family and friends. In this set of data, the family and friends support subscale of CIRS had a good internal reliability with Cronbach's Alpha coefficient of 0.895.

### 7.10.1 Descriptive results

The mean of the participants' scores on the family and friends support subscale of the CIRS was 19.512 (SD= 6.987, range= 7-35). Responses illustrate that almost one third of all participants perceived a great or a good extent of family and friends support except for the item "have family or friends exercised with you". There is still room for improvement as a significant proportion of participants responded that their family or friends support in these aspects "to a certain extent" (15.3-27.4%), "to a little extent" (19.4-37.1%) or "never" (12.5-34%), depending on the specific items. See Figure 7.7 for more details.

***Figure 7.7: The percentages of participants' responses to individual items on the family and friends support subscale of CIRS which indicates their experience over the past 3 months***



### 7.10.2 Relationship between social support from family and friends and antihypertensive medication adherence

Independent sample t-tests revealed that there was a statistically significant difference between adherers and non-adherers in their perceptions of support provided by family and friends, as measured by the mean score on the family and friends support subscale from the CIRS [21.008 vs. 18.732, respectively; mean difference= 2.276; 95% confidence interval of the difference= 3.724 to 0.828; t= 3.090; df= 389; p= 0.002]. This suggests that patients who receive more support from their family members and friends are more likely to be adherent than those who do not receive this support. Table 7.19 illustrate data related to these findings.

***Table 7.19: Results of t-tests for equality of mean scores for adherers and non-adherers on the family and friends support subscale of the Chronic Illness Resources Survey (CIRS)***

| | **t-test for Equality of Means** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **t** | **df** | **Sig. (2-tailed)** | **Mean Difference** | **Std. Error Difference** | **95% CI of the Difference** | |
| | | | | | | **Lower** | **Upper** |
| **Total family and Friends support scale** | 3.09 | 389 | 0.002 | 2.276 | 0.737 | 0.828 | 3.724 |

## 7.11 Summary of bivariate analysis

Relationships between demographic, clinical variables, social support from family and friends, herbal medicines items, healthcare provisions items, illness and medication perceptions, and the outcome (medication adherence) have been shown. The statistically significant relationships are summarised in Table 7.20. However, seven factors were not associated with medication adherence; these were gender, educational level, the use of herbal remedies and beliefs about consequences, identity (symptoms), concerns and emotional representations of hypertension.

***Table 7.20: List of variables which showed a significant association with non-adherence to medication (using MMAS scale)***

| **Variable** | **p value** |
|---|---|
| Younger age | 0.001 |
| Rural area of residence | < 0.001 |
| Uncontrolled blood pressure level | < 0.001 |
| No or less presence of comorbidities | 0.004 |
| Lower number of antihypertensive tablets per day | 0.002 |
| Shorter duration of hypertension | < 0.001 |
| Lower belief in the necessity of their antihypertensive medicines | < 0.001 |
| Higher concerns about taking their antihypertensive medicines | < 0.001 |
| Low timeline beliefs (believe that hypertension is a short term condition) | < 0.001 |
| Low personal control beliefs | 0.001 |
| Low treatment control beliefs | < 0.001 |
| Low beliefs about understanding hypertension | < 0.001 |
| Higher beliefs that if do not take medicines occasionally, it will not matter | 0.001 |
| Less support from family and friends | 0.002 |
| Low faith and trust in the healthcare providers | < 0.001 |
| Less satisfaction with the amount of information provided | < 0.001 |
| Less satisfaction with the services provided by the hospitals | < 0.001 |
| Herbal medicines being more effective than prescribed medicines | < 0.001 |
| Herbal medicines being safer than prescribed medicines | 0.005 |

## 7.12 Binary logistic regression

Next, binary logistic regression was used with adherence to medication (using MMAS scale) as the outcome. The reason for choosing this analysis is because the outcome variable (dependent variable) is categorical and at the same time binary: adherent or non-adherent. In logistic regression, the predictor variables can be either continuous or categorical. Binary logistic regression is used to generate a model from which predictions can be made about the likelihood that hypertensive patients are adherent or non-adherent to their medicines. It was used to identify the most important predictive variables for non-adherence to antihypertensive medication, using the variables that were identified as important in the bivariate analysis. Nineteen variables (as seen in Table 7.20) were considered appropriate to enter into logistic regression analysis which met the assumption of needing approximately 15 participants per variable used in a logistic regression analysis. In this study, forced entry method of regression was used in which all predictors were forced into the model simultaneously. This method relies on good theoretical reasons for including the chosen predictors, but the experimenter makes no decision about the order in which variables are entered. It is believed that this method is the only appropriate method for theory testing because stepwise techniques are influenced by random variation in the data and so seldom give replicable results if the model is retested (Field, 2009).

### 7.12.1 Model summary and descriptive

Model with the constant (adherence/non-adherence to medication) only (before including the predictors)

In this study, the -2 log-likelihood of this baseline model (initial model when only the constant is included) was 449.84. In SPSS, rather than reporting the log-likelihood itself, the value is multiplied by -2 (and referred to as -2LL): this multiplication is done because -2LL has an approximately chi-square distribution and so it makes it possible to compare values against those that we might expect to get by chance alone.

When including only the constant, SPSS bases the model on assigning all participants to a single category of the outcome variable. As it is crucial to try to maximise how well the model predicts the observed data, SPSS predicts that every patient belongs to the category in which most observed cases fell. In this study, SPSS has predicted that all patients were non-adherent, which results in 0% accuracy for the patients who were adherent, and 100% accuracy for those observed to be non-adherent (See Table 7.21). Overall, the model correctly classified 66.6% of patients. Therefore, using only constant, the model was guessing that everyone was non-adherent and it was right 66.6% of the time. This percentage will be compared with the percentage correct of the full model to see how a new model (including all variables) improves this percentage correct and differentiates between adherent and non-adherent patients, i.e. how much a model can add to that.

***Table 7.21: Classification table[a, b] of adherence/non-adherence when no predictors included in the model***

| | | Predicted | | |
|---|---|---|---|---|
| | | Adherent or non-adherent? | | Percentage correct |
| | | Adherent | Non-adherent | |
| Adherent or non-adherent? | Adherent | 0 | 118 | 0 |
| | Non-adherent | 0 | 235 | 100 |
| Overall percentage | | | | 66.6 |

a. Constant is included in the model
b. The cut value is 0.5

Moreover, at this baseline stage the value of the constant ($b_0$) was equal to 0.689. The residual chi-square statistic (score statistic) was 160.454, which is significant at $p < 0.05$. This statistic tells us that the coefficients for the variables not in the model are significantly different from zero, in other words that the addition of one or more of these variables to the model will significantly affect its predictive power.

The model including the predictors

The model including the predictors showed to be significant with the variables included (chi-square= 200.793, $p < 0.001$). The overall fit of the new model was assessed using the -2LL, this also tells us if this step is significant in addition to the overall model (we know that large values of the log-likelihood statistic indicate poorly fitting statistical models). At this stage of the analysis the value of -2LL should be less than the value when only the constant was included in the model because lower values of -2LL indicates that the model is predicting the outcome variable more accurately. When only the constant was included, -2LL= 449.84, but after including the predictors this value has been reduced to 249.047. This reduction tells us that the model is better at predicting whether someone was non-adherent than it was before predictors were added. The R square values can be used as effect size measures for the model, so for these data,

the independent variables would thus explain somewhere between 43.4% and 60.2% of the variation in result as seen from Table 7.22.

***Table 7.22: Likelihood ratio test and R squares values***

| -2 Log likelihood | Cox & Snell R Square | Nagelkerke R Square |
|---|---|---|
| 249.047 | 0.434 | 0.602 |

Also, when only the constant was included, the model correctly classified 66.6% of cases, but after the inclusion of the predictors, this rose to 83.6% (See Table 7.23). Therefore, percentage correct improved by adding the independent predictor variables and this is a good sign as it tells us that the model more successfully differentiates patients who are adherent and non-adherent to their medicines.

***Table 7.23: Classification table[a] of adherence/non-adherence when all predictors were included in the model***

| | | Predicted | | |
|---|---|---|---|---|
| | | Adherent or non-adherent? | | Percentage correct |
| | | Adherent | Non-adherent | |
| Adherent or non-adherent? | Adherent | 88 | 30 | 74.6 |
| | Non-adherent | 28 | 207 | 88.1 |
| Overall percentage | | | | 83.6 |

a. The cut value is 0.5

The coefficient and statistics for the variables that have been included in the model at this point show that only four variables significantly improved predictability of the model, these are shown in Table 7.24.

*Table 7.24: Summary of final model*

| | B | S.E. | Wald | df | Sig. | Exp(B) (odd ratios) | 95% C.I. for EXP(B) | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Lower | Upper |
| **Treatment control perceptions** | -0.168 | 0.072 | 5.414 | 1 | 0.020 | 0.846 | 0.734 | 0.974 |
| **Specific concerns perceptions** | 0.158 | 0.050 | 9.845 | 1 | 0.002 | 1.171 | 1.061 | 1.293 |
| **Blood pressure control** | 2.705 | 0.373 | 52.66 | 1 | 0.000 | 14.96 | 7.203 | 31.06 |
| **Area of residence** | 1.247 | 0.381 | 10.70 | 1 | 0.001 | 3.478 | 1.648 | 7.342 |
| **Constant** | 4.552 | 1.936 | 5.526 | 1 | 0.019 | 94.83 | | |

EXP (B) values represent the change in the logit of the outcome variable associated with a one-unit change in the predictor variable. The logit of the outcome is simply the natural logarithm of the odds of outcome (Y) occurring. Wald statistic has a chi-square distribution and tells us whether the *b* coefficient for that predictor is significantly different from zero. If the coefficient is significantly different from zero then we can assume that the predictor is making a significant contribution to the prediction of the outcome (Y). In the new model, beliefs in treatment control, specific concerns beliefs, blood pressure control and area of residence were significant predictors of whether the patient is non-adherent to their antihypertensive medicines (the significance of the Wald statistic is less than 0.05 for each variable).

The odds ratios (EXP (B)) for the predictors are shown in Table 7.24. Scores between 0 and 1 indicates that as the predictor increases, the odds of the outcome occurring decrease. Conversely, scores above 1 indicate that as the predictor increases, the odds of the outcome occurring increase. In this model, we can say that the odds of a patient who has a high treatment control perceptions being non-adherent is 0.846 times

lower than those of a patient who has low treatment control perceptions. Also, the odds of a patient having high concerns about taking her/his medicines being non-adherent is 1.171 times higher than a patient who has no or low concerns beliefs. Moreover, the odds of a patient who has her/his blood pressure uncontrolled being non-adherent is 14.96 times higher than a patient who has a controlled blood pressure. In addition, the odds of a patient who live in rural areas being non-adherent to medicines is 3.478 times higher than those who live in urban areas.

The goodness-of-fit tests indicate the appropriateness of the model, how well it fits with the actual outcomes. This can be estimated with the Hoesmer-Lemeshow test, where the insignificance of the chi square value is an indicator of goodness-of-fit ($p > 0.05$ indicates that the model fits the data well) (Peng et al., 2002). Therefore, the non-significant chi-square ($p > 0.05$) in the current model indicates that the model fits the data well. The goodness-of-fit of the model is displayed in Table 7.25.

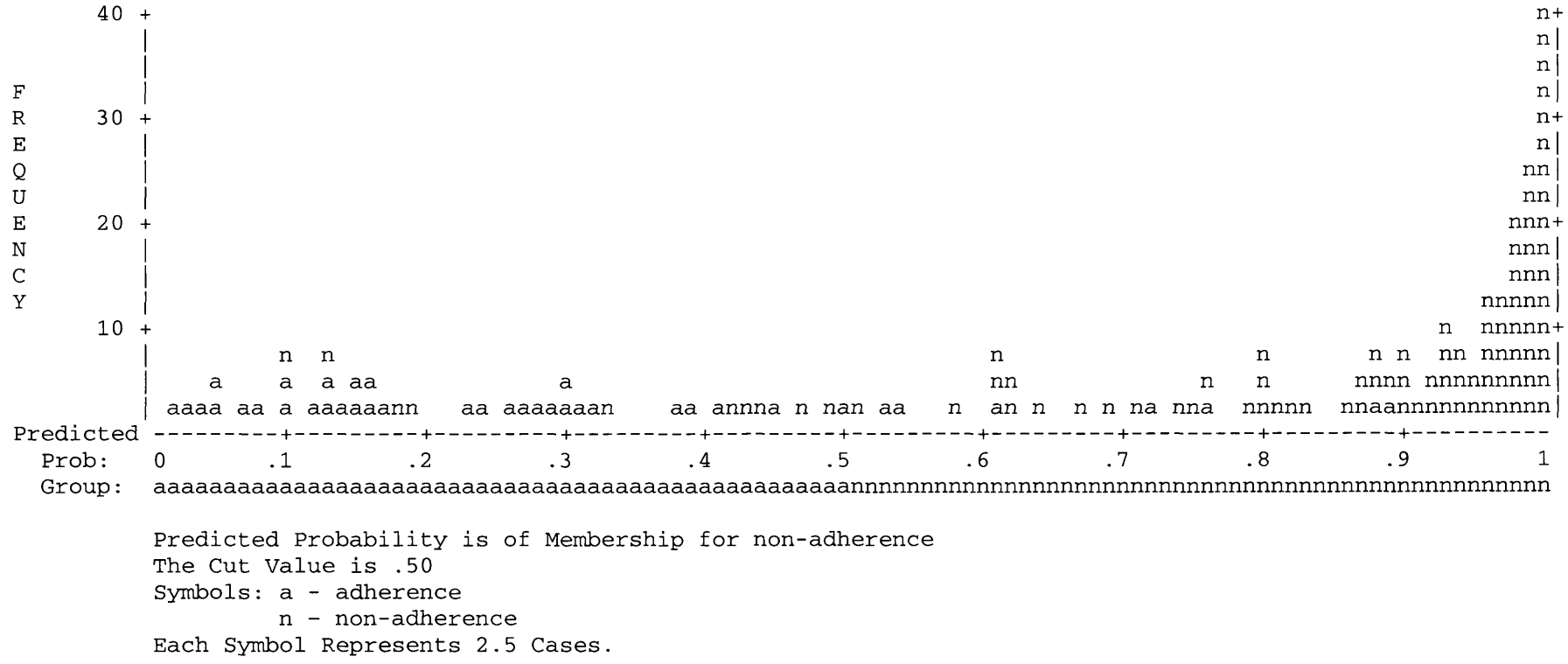
***Table 7.25: Hosmer and Lemeshow test of goodness-of-fit of the logistic regression analysis***

| **chi-square** | **df** | **Sig.** |
|---|---|---|
| 7.174 | 8 | 0.518 |

Figure 7.8 is a histogram plot of the predicted probabilities of a patient being non-adherent. If the model perfectly fits the data, then this chart should show all of the cases for which the event has occurred on the right-hand side, and all the cases for which the event has not occurred on the left-hand side. In other words, all of the patients who were non-adherent should appear on the right and all those who were adherent should appear on the left. In this study, the only significant predictor is dichotomous and so there are only two columns of cases on the plot. We really want the "n" cases

which represent non-adherence to be closer to one and "a" which represent adherence to be closer to zero. As shown in the plot, the "n" cases are more clustered near to the right of the graph (closer to one), whereas the "a" cases are more towards the left (closer to zero). Therefore, more of the non-adherent patients fall above 0.5 in terms of their predicted probability and majority of adherent patients full below 0.5. Although, there was no perfect separation, but the model is shown to be good as total separation is hard to obtain as well as non-adherence cases are predicted relatively well by the model (the probability of classification is strongly close to 1). Also, for a model to be considered good there should be few misclassified cases, which is the case in this model as few "a" cases appeared on the non-adherence side and slightly more "n" cases, appeared on the adherence side.

***Figure 7.8: Histogram plot of the predicted probabilities of participants being adherence/non-adherence to their medications***



### 7.12.2 Model parameters

When the variables were entered for analysis, binary logistic regression showed that treatment control perceptions, specific-concerns, area of residence and blood pressure control were most predictive of medication non-adherence in this population.

According to the model, the log of the odds of non-adherence to antihypertensive medicines was negatively related to treatment control ($p < 0.05$) and positively related to specific-concerns perceptions, area of residence and blood pressure control ($p < 0.05$; Table 7.24). In other words, the higher the treatment control perceptions, the less likely it is that a patient would be non-adherent to their medicines. Also, the higher the concerns beliefs about taking the medicines the more likely that a patient would be non-adherent to his/her medicines. Patients who had their blood pressure uncontrolled and who lived in rural areas were more likely to be non-adherent to their prescribed medicines than those who had their blood pressure controlled and who lived in urban areas. In fact, the odds of patients having uncontrolled blood pressure and living in rural areas being non-adherent were 14.957 and 3.478 (respectively) times greater than the odds for patients who had controlled blood pressure and who lived in urban areas.

### 7.12.3 Model assumptions

In addition to the assumption met in the choice of variables (Section 6.2.6, assumptions 1), further assumptions about the logistic regression model and its generalisability to the target population required investigation.

1) The linearity assumption (Section 6.2.6, assumption 2) was tested by looking at whether the interaction term between the predictor and its log transformation was significant. All interactions had values greater than 0.05 indicating that the assumption of linearity of the logit has been met. It was 0.365 for specific concern and 0.230 for treatment control perceptions.
2) The Durbin-Watson test was used to test for the assumption that errors are independent (Section 6.2.6, assumption 3). The Durbin-Watson value, for the four-variable model described for this sample, was 1.986, which is very close to 2. Therefore, the assumption of independent errors has been met.
3) No evidence for multicollinearity (Section 6.2.6, assumption 4) based on Pearson correlation value above 0.8 was found. Significant correlations between predictor variables were observed, however, these were small. Further demonstration of no multicollinearity can be sought beyond assessment of correlation between entered variables. The variance inflation factor (VIF) and tolerance levels were assessed by the criterion suggested by Field (2009) (See section 6.2.6). Multicollinearity was not an issue for the four-variable model in this study. The greatest value of any VIF was 1.103 which is well below 10 and the average VIF value was 1.079 which is very close to 1. Moreover, the tolerance levels were well above 0.2 and ranged from 0.906 to 0.954. Therefore, the assumption of no multicollinearity has also been met.

### 7.12.4 Case diagnosis

Case diagnostics are important to highlight cases, which may be influencing the model unduly. We would expect 95% of cases to have standardised residuals within about -2 to 2 (Fields, 2009). We have in this study a sample of 391 cases; therefore, it is reasonable to expect about 18 cases (5%) to have standardised residuals outside of the limit of -2 to 2. Thirteen cases were identified as outliers where the standardised residual lay beyond two standard deviations. This represented approximately 4% of cases, a level within the limits of 5%. In addition, 99% of cases should lie within -/+ 2.5 and so we would expect only 1% of cases to lie outside of these limits (Fields, 2009). In this study, only three cases (< 1%) lay outside of these limits. Therefore, our sample appeared to conform to what we would expect for a fairly accurate model. These diagnostics gave us no real cause for concern expect that three cases had a standardized residual greater than 3, which is probably large enough for us to investigate these cases further, using Cook's distance and Leverage values. However, no Cook's distance for the potential outliers was found to exceed a value of 1. Average Leverage was calculated to be 0.06 using the formula $((K + 1)/N)$. Therefore, values above the range 0.11 – 0.17 are cause for concern. However, no Leverage values for the identified potential outliers were greater than twice the average Leverage. We also looked at the DFBeta statistics (the scaled measures of the change in each parameter estimate) to see whether any cases would have a large influence on the regression parameters. An absolute value greater than 1 is a problem (Fields, 2009) and in all cases the values lay within -/+ 1, which showed that these cases have no undue influence over the regression parameters. Therefore, all cases were used in the model.

### 7.12.5 Summary of logistic regression analysis

Four variables were found to explain significant and substantive variance in the outcome variable of non-adherence to medication (treatment control perceptions, specific-concerns, area of residence and blood pressure control). In other words, patients who had uncontrolled blood pressure, lived in rural areas, had lower treatment control perceptions and higher concerns about taking medicines were more likely to be non-adherent to their medication. Logistic regression assumptions are important and if any are violated then you cannot generalise your finding beyond your sample (Field, 2009). However, in this study, the model described fulfils all the assumptions therefore the findings can be generalised to the wider population of interest in which patients may be identified as potential poor adherers.

## 7.13 Area of residence and factors which were associated with non-adherence to medication in the bivariate analysis

As area of residence showed to be a predictor of non-adherence in the logistic regression model, it was decided to explore this further in order to identify the reason why living in rural areas was related to non-adherence to medication in this study. Area of residence was assessed in relation to the factors which were associated with non-adherence to medication in the bivariate analysis. The findings showed that living in rural areas of the UAE and non-adherence to medication were both related to some similar factors, which could explain why these specific patients reported more non-adherence to their medicines.

One reason why living in a rural area was associated with more self-reported non-adherence, could have been due to a lower level of education among people who live in rural area compared to urban areas (chi-square= 23.009, df= 5, $p < 0.001$). Another reason could be less social support from family members and friends reported by patients who live in rural areas than the one who live in urban areas [mean 1= 17.876 vs. mean 2= 20.46, respectively; mean difference= 2.5854; 95% confidence interval of the difference= 1.166 to 4.004; t= 3.582; df= 388; $p < 0.001$]. This finding could be explained by the fact that most of the young generation in rural areas go to big cities after their graduations to work and improve their income so, therefore many live away from home and are not there to give support to their parents and elderly people in their communities.

Moreover, patients who live in rural areas reported less information provided by their healthcare providers than those who live in cities [mean 1= 3.310 vs. mean 2= 3.592, respectively; mean difference= 0.2815; 95% confidence interval of the

difference= 0.02915 to 0.5338; t= 2.193; df= 388; p= 0.029]. In addition, patients who live in rural areas were more likely than those from urban areas to express certain beliefs, which could have been the motivator for their medication non-adherence behaviour. Patients who live in rural areas reported lower treatment control of their illness than those who live in urban areas [mean 1=5.6138 vs. mean 2= 6.4571; mean difference= 0.84335; 95% confidence interval of the difference= 1.5151 to 0.17165; t= 2.469; df= 388; p= 0.014]. In addition, they had more concerns regarding taking their medicines compared to those who live in urban areas [mean 1= 17.248 vs. mean 2= 16.163; mean difference= -1.085; 95% confidence interval of the difference= -0.271 to -1.899; t= -2.620; df= 388; p= 0.009].

## 7.14 Hypertension self-care behaviours

The extent of non-adherence to other hypertension self-care behaviours was assessed in this study. This was a further objective and not examined as a predictive factor of medication non-adherence and therefore, was not included in the regression model.

### 7.14.1 Descriptive results

Adherence to other hypertension self-care behaviours (exercise, diet, smoking cessation and self-measuring blood pressure) was assessed by items in the questionnaire. Data were available for all 391 participants (100%). The highest adherence rate reported by participants was for monitoring their blood pressure level (75%, n= 293) and smoking cessation advice (72%, n= 282), respectively. The lowest adherence rate was for exercise (31.5%, n= 123) and diet (30%, n= 117). Some participants reported not being provided with information about healthy diet (31%, n= 121) and/or exercise (24%, n= 94) from their healthcare providers. These data are illustrated in Table 7.26. The reasons reported by the participants for non-adherence with hypertension self-care activities are listed in Tables 7.27-7.29.

***Table 7.26: Participants' adherence to individual aspects of the hypertension self-care behaviours***

| | **Exercise** | **Diet** | **BP self-monitoring** | **Smoking cessation** |
|---|---|---|---|---|
| **Adherers n (%)** | 123 (31.5) | 119 (30) | 293 (75) | 281 (72) |
| **Non-adherers n (%)** | 268 (68.5) | 272 (70) | 98 (25) | 110 (28) |

*Table 7.27: Participants reported reasons for exercise non-adherence*

| Reasons for exercise non-adherence (n=268) | n (%) |
|---|---|
| Lack of time | 100 (37) |
| Comorbidities | 84 (32) |
| Old age | 26 (10) |
| I do not like exercising | 16 (6) |
| Laziness | 15 (6) |
| Weather | 12 (5) |
| Housework is enough as exercise | 9 (3) |
| There is no suitable place to exercise | 9 (3) |
| Low self-efficacy | 9 (3) |
| Lack of awareness | 2 (1) |

*Table 7.28: Participants reported reasons for diet non-adherence*

| Reasons for diet non-adherence (n=272) | n (%) |
|---|---|
| Lack of motivation | 42 (15) |
| Lack of awareness | 38 (14) |
| Lack of time | 35 (13) |
| Want to eat like the rest of the family | 29 (11) |
| Carelessness | 28 (10) |
| Laziness | 27 (10) |
| Food cravings | 26 (10) |
| Low self-efficacy | 23 (9) |
| Difficult to find healthy food | 12 (4) |
| Social gathering | 12 (4) |

*Table 7.29: Participants reported reasons for self-blood pressure level monitoring non-adherence*

| Reasons for BP self-monitoring non-adherence (n=98) | n (%) |
|---|---|
| Prefer to monitor at the clinic | 52 (53) |
| Don't have a monitor | 13 (13) |
| Lack of motivation | 12 (12) |
| Don't know how to do it | 9 (9) |
| Suspicious about its accuracy | 7 (7) |
| Lack of time | 6 (6) |

### 7.14.2 The association between adherence to hypertension self-care behaviours and medication adherence

The chi-square test was used for assessing associations between medications adherence and adherence to other parts of the hypertension self-care regimen.

Adherence to diet, exercise and smoking cessation were associated with medication adherence, whereas adherence to self blood pressure monitoring was not association with medication adherence (chi-square= 3.954, df= 2, p= 0.091). Those who were non-adherent to a healthy diet were more non-adherent to their antihypertensive medication than those who were adherers (chi-square= 8.528, df= 1, p= 0.004). In addition, participants who regularly smoked were more non-adherent to their medicines than those who never smoked (chi-square= 7.456, df= 2, p= 0.023). Regarding exercise, those who reported never exercising or once in a while were more non-adherent to their medication than those who reported exercising daily or three times a week (chi-square= 12.507, df= 5, p= 0.026).

## 7.15 Summary of the findings

This chapter assessed the extent of adherence to medication among Emirati hypertensive patients and tested whether demographic, clinical variables or issues emerging from the qualitative interviews were associated with non-adherence to medications (See figure 5.1 for all the factors assessed in relation to medication non-adherence). All the factors shown to be associated with adherence/non-adherence to medication in the bivariate analysis were further entered into a logistic regression model to find the factors that were most predictive of medication non-adherence in this population.

Based on the Morisky Medication Adherence Scale (MMAS), approximately 65.7% of Emirati hypertensive patients were non-adherent to their antihypertensive medicines. Unintentional non-adherence was more common than intentional non-adherence (45.1% vs. 5.5%), although many participants had combined intentional and unintentional non-adherence to their antihypertensive medications (47.1%). Giving that unintentional non-adherence can occur to anyone at any point of time, it might be appropriate to collapse the figures for those who had intentional non-adherence and those who had combined intentional and unintentional non-adherence into one category, resulting in about 52.6% (n= 206) of intentional non-adherence among the sample in this study.

The role of demographic and clinical variables in association with adherence revealed that some significant associations were present. Of the demographic variables, there was a significant difference in age between adherers and non-adherers. Older age was associated with greater adherence to antihypertensive medications. Area of residence was also associated with adherence to medications. Participants who live in

urban areas were more adherent to their medicines than those who live in rural areas. As per the clinical variables, blood pressure control, comorbidity, number of antihypertensive tablets taken per day and duration of hypertension showed association with adherence to medication. A higher proportion of adherers had their blood pressure level controlled and a higher proportion of non-adherers had their blood pressure level uncontrolled. In addition, a higher proportion of adherers had other comorbidities compared to non-adherers. Adherent patients were taking more antihypertensive tablets per day compared to the non-adherent patients and had longer duration of hypertension.

The current study showed that beliefs about the necessity of taking medication and concerns about taking them were important in hypertensive patients in the UAE. Participants with strong necessity beliefs were more likely to be adherent to their medicines. Also, non-adherent patients had more concerns about taking their medicines compared to the adherent patients. Furthermore, the additional item about medication beliefs ("If I do not take my antihypertensive medicines occasionally, it will not matter") which was formulated based on data from the qualitative study, was associated with adherence to medication. Non-adherent patients had significantly higher beliefs that not taking their medications occasionally will not matter.

Illness perceptions were also associated with non-adherence to medication. Non-adherence to medication was related to personal control, treatment control, illness comprehensibility (understanding) and timeline beliefs. In this study, patients who thought that they could personally control their hypertension and those who thought that their treatment would control their hypertension were more likely to adhere to their medicines. Moreover, adherent patients reported a greater understanding of their illness

than non-adherent patients and were more likely to report perceptions of their hypertension being of a long duration.

Only a few participants (5.6%) reported currently using herbal remedies and most of the respondents thought that herbal medicines are less effective and less safe than their prescribed medicines. The beliefs about the effectiveness and safety of the herbal medicines were associated with medication adherence.

As per perceptions of healthcare provisions, the results revealed that those who were adherent to their antihypertensive medicines had significantly higher faith and trust in their healthcare providers than non-adherers. Also, those who were adherent to their medication were more satisfied with the amount of information provided to them from their healthcare providers than non-adherers. In addition, adherent participants reported more satisfaction with the services provided to them from their hospitals than non-adherent participants. Regarding the family and friends support, adherent patients reported more family and friends support compared to the non-adherent patients.

Around two thirds of participants were non-adherent to exercise or diet, whereas the majority were adherent to smoking cessation advice. Non-adherence to exercise and diet were more prevalent than non-adherence to medications. Lack of time and comorbidity were the two most commonly reported reasons for exercise non-adherence. Lack of motivation and lack of awareness were the most commonly reported reasons for diet non-adherence. Adherence to diet, exercise and smoking cessation were associated with medication adherence. Those who were non-adherent to healthy diet, exercise and smoked regularly were more non-adherent to their antihypertensive medication than those who were adherent.

Logistic regression modelling was used to develop a predictive model between the variables which were related to medication adherence in the bivariate analyses, and medication adherence. This final model included four variables that significantly predicted patients' non-adherence to medications: area of residence, blood pressure control, treatment control representations and specific concerns beliefs about medicines. This suggests that hypertensive patients with uncontrolled blood pressure who live in rural areas of the UAE and had negative treatment control perceptions of their illness and higher levels of concerns about their medicines were more non-adherent to their antihypertensive medication.

To conclude, according to the logistic regression model, non-adherence to medications was predicted by area of residence, blood pressure control, perceptions of treatment control and beliefs about the concerns of taking medicines. However, all the factors which were shown to be associated with non-adherence to medication in the bivariate analysis should also be considered when addressing medication adherence; although these factors did not add to the "predictive" power of the model, they are still "real" in terms of association with non-adherence to medication. The next chapter will discuss the results of this study and the interview study together and in relation to relevant studies in the literature.

# Section 4 - Discussion and conclusion

# CHAPTER 8 DISCUSSION

Research presented in this thesis is the first to explore non-adherence to medication among Emirati patients with hypertension. Only one quantitative study has addressed the problem of non-adherence to medications in the UAE (Fahey et al., 2006) and it was conducted among hypertensive patients; however, the reasons for non-adherence to medications were not explored. To date, there have been no studies, which included patients' perspectives of illness and medicines in the Middle Eastern region in general and specifically in the UAE. In the current study, the method employed allowed access to participants' views without using translators during both semi-structured interviews and a structured questionnaire survey, thereby enhancing the quality of the data.

In this thesis, semi-structured interviews were first conducted to explore barriers to adherence to medication and other self-care behaviours among Emirati hypertensive participants. The results of this part of the project were then used to aid the development of the questionnaire for the quantitative study. Following the development of the questionnaire, a cross-sectional quantitative survey was conducted with 391 patients randomly selected from all seven Emirates of the UAE. The aim of the quantitative study was to assess the rate of non-adherence and identify associated and predictive factors of non-adherence to antihypertensive medications in the UAE. These findings are important in order to make recommendations about the type of interventions that may be needed for improving adherence to medication and therefore health outcomes in this particular population.

This chapter will discuss how this thesis makes an original contribution to improving the understanding of medication adherence among hypertensive Emirati patients. It will highlight the main findings, limitations, implications for practice and policy, and recommendations for future research.

## 8.1 Main findings

### 8.1.1 Adherence to medication

This research suggested that approximately two thirds (n= 257, 66%) of Emirati hypertensive patients are non-adherent to their medicines. This is a worrying figure, given the definite benefits of antihypertensive medicines in reducing high blood pressure and significantly reducing the risk of cardiovascular illness (Chobanian et al., 2003).

Almost half (n= 116, 45%) of non-adherent Emirati hypertensive patients inadvertently did not take their antihypertensive medicines as prescribed (unintentional non-adherence). In these cases, forgetting was cited as the most common reason for this. Furthermore, approximately half (n= 135, 52.6%) of non-adherent Emirati hypertensive patients made a cognitive decision not to take their medications as prescribed (intentional non-adherence). Most of the time intentional non-adherence was related to feeling that the blood pressure is under control. This is an alarming figure, as the consequences of intentional non-adherence have the potential to be more serious than unintentional non-adherence because intentional non-adherence may involve altering or stopping the use of prescribed medicines, which can significantly impact on patients' health as well as resulting in greater waste of medicines. The reasons reported for intentionally and unintentionally non-adherence in the quantitative study is consistent with what was reported in the qualitative part of this research. In the

qualitative study, forgetting was the only reason reported for unintentional non-adherence, whereas feeling better was the most commonly reported reason for intentional non-adherence. Many patients (n= 121, 47%) reported being both intentionally and unintentionally non-adherent in the quantitative study and only a quarter reported the same in the qualitative study. This might be due to the different self-report methods used to measure medication adherence in the two studies. Data obtained from quantitative and qualitative analyses suggests that there are significant challenges to appropriate medications use among Emirati hypertensive patients and that healthcare providers must address the reasons for both intentional and unintentional non-adherence in order to achieve better medication adherence and therefore better health outcomes for patients.

### 8.1.2 Adherence: Association with demographic characteristics and clinical variables

The analyses of the role of demographic and clinical variables in association with adherence revealed that some significant associations were present. Of the demographic variables, there was a significant difference in age between adherers and non-adherers. Older age was associated with greater adherence to antihypertensive medications. The literature regarding the role of demographic variables in predicting adherence is mixed and inconsistent; however, association of adherence with older age has been reported (Ross et al., 2004; Horne et al., 2007; Rees et al., 2010).

Area of residence was also associated with adherence to medications as a difference in adherence was found between participants who lived in urban and rural areas. Participants who live in urban areas were more adherent to their medicines than those who live in rural areas. The literature has shown that marked differences exist

between urban and rural areas with respect to the distributions of health care providers and utilisation and inappropriate utilisation of health care is known to be associated with residing in rural areas (Blazer et al., 1995; Sheikh and Bullock, 2001). In the current study, the findings showed that living in rural areas of the UAE was related to various factors: lower level of education, less social support from family members and friends and less information provided by their healthcare providers. In addition, patients who lived in rural areas expressed certain beliefs, which could have been the motivator for their medication non-adherence behaviour such as low treatment control of their illness and more concerns regarding taking their medicines. It is feasible that beliefs may be different in people who live in rural areas than those who live in urban areas, due to the different health care services available and different educational/work opportunities that may result in different levels of education and knowledge, and information about their illness and treatment. Therefore, findings suggest that there are greater opportunities for improving the delivery of care in the rural districts than there are in urban regions or big cities. Healthcare policy makers should pay particular attention to these areas of the country in term of services, facilities and education.

In terms of the clinical variables, blood pressure control, comorbidity, number of antihypertensive tablets taken per day and duration of hypertension showed associations with adherence to medication. A higher proportion of adherers had their blood pressure level controlled and a higher proportion of non-adherers had their blood pressure level uncontrolled. In the literature, it has been shown that high adherence to antihypertensive medications was associated with higher odds of blood pressure control compared with those with medium or low levels of adherence (Bramley et al., 2006). In addition, in the current study, a higher proportion of adherers had other comorbidities compared to non-adherers. This is consistent with a study by Rees et al (2010) which found that adherers

were more likely to have other health conditions than the non-adherers. Moreover, adherent patients were taking more antihypertensive tablets per day compared to the non-adherent patients and had longer duration of hypertension. This suggests that the recently diagnosed patients with hypertension are the ones who are more likely to be at risk of being non-adherent to their medications. Studies from the literature showed similar results, as the incidence of non-adherence was greater with patients newly started on a chronic medication than patients with existing medication (Barber et al., 2004). A study by Clifford et al (2006) showed that intervention at an early stage of taking a new medicine can improve non-adherence to medication and is cost effective compared to usual care (Elliott et al., 2008). Based on these studies, a New Medicine Service (NMS) is due to be launched in October 2011 to improve adherence in patients newly prescribed medicines. The service will be implemented within community pharmacies in the UK and will initially include five clinical conditions: asthma, COPD, type 2 diabetes, antiplatelet/anticoagulant therapy and hypertension (Royal Pharmaceutical Society of Great Britain, 2011). Patients will be offered the service in pharmacies as they present with a prescription for a new medicine or referred to the service by their prescribers (Royal Pharmaceutical Society of Great Britain, 2011). Healthcare providers in the UAE can implement similar intervention to support newly diagnosed hypertensive patients in adhering to their medication.

### 8.1.3 Adherence: Association with illness and medication perceptions

This thesis showed that cognitive, emotional and behavioural factors influence patients' adherence to medication. The qualitative study showed that patients do sometimes self regulate their medicines as per their perceived need (and what makes sense to them). This is similar to Siegel et al (1999) who referred to patients as "naive

scientists", suggesting that patients formulate hypotheses by altering the dose(s) of their medicines or stopping them entirely in order to observe the effects.

In the quantitative study, the beliefs about illness and medicines were assessed for association with medication adherence. High adherence was associated with a number of health beliefs as measured by the self-regulatory model and the necessity-concerns framework, particularly specific-necessity, specific-concerns, timeline, personal control, treatment control and illness comprehensibility (understanding) perceptions, each of which will be explained below. This suggests the need for behavioural interventions to help change patients' perceptions of their illness and to emphasise the importance of their treatment in controlling the condition.

Belief in the necessity of antihypertensive medication was high in this patient population and was related to medication adherence. Also, concerns about taking medication were related to non-adherence to antihypertensive medication and was one of the predictors of non-adherence among this population. This is consistent with other studies in the literature which showed that patients engage in an implicit cost–benefit analysis in which beliefs about the necessity of their medication are weighed against concerns about the potential adverse effects of taking it and that these beliefs are related to medication adherence (Horne et al., 1999; Horne and Weinman, 1999; Ross et al., 2004; Gonzalez et al., 2007; Clifford et al., 2008). Overall, our findings were in line with those found in the literature among patients with chronic illnesses including hypertension (e.g. Horne et al., 1999; Horne and Weinman, 2002; Rees et al., 2010). Also, over half (n= 241, 62%) of Emirati hypertensive patients were concerned about the long-term adverse effects of their antihypertensive medicines, and a similar proportion were worried about becoming too dependent on their antihypertensive

medications (n= 215, 55%). This suggests a need for patient education and counselling about adverse effects of antihypertensive medicines (especially long-term adverse effects). Patients also need to be assured that antihypertensive medications do not cause dependency, but must be taken indefinitely to control the disease progression and prevent its complications. Furthermore, the additional item about medication beliefs ("If I do not take my antihypertensive medicines occasionally, it will not matter"), which was formulated based on data from the qualitative study, was associated with adherence to medication. Non-adherent patients had significantly higher beliefs that not taking their medications occasionally will not matter.

Illness perceptions were also associated with adherence to medication. Adherence to medication was related to personal control, treatment control, timeline and illness comprehensibility (understanding) beliefs. The IPQ scale differentiates between personal ability to control the illness and the ability of the treatment to do so. In this study, patients who thought that they could personally control their hypertension and those who thought that their treatment would control their hypertension were more likely to adhere to their medicines. Similar findings regarding the relationship between personal and treatment control and adherence to medication were reported in the literature (Ross et al., 2004).

Adherent participants were also more likely to report perceptions of their hypertension being of a long duration. This could suggest that a concept of the disease being chronic is essential for the continuation of taking the antihypertensive medicines. This is consistent with some studies which found an association between duration of hypertension and adherence to medication, for example, a study by Karaeren et al (2009) reported that hypertension duration of more than 5 years (OR= 0.446; 95% CI:

0.246-0.811, p= 0.006) was found to be related to adherence. However, other studies reported no associations such as Ross et al (2004).

Moreover, in the current study adherent patients reported a greater understanding of their illness than non-adherent patients. Studies in the literature showed that hypertensive patients who reported understanding their illness were more likely to be adherent to their medicines (Gonzales-Fernandez et al, 1990; Karaeren et al., 2009). This highlights the necessity of adequate communication between patients and healthcare providers. Previous studies (Kjellgren et al., 1998; Kjellgren et al., 2000) have reported that the discussion between patients and healthcare providers was frequently concerned about medicines as patients often talked about the effects the medicines had on them (usually unwanted effects). In addition, physicians almost invariably asked the patients whether they take their medicines, but usually questions were phrased in a closed manner that did not encourage any comments from patients (Kjellgren et al., 1998). In addition, Kjellgren et al (2000) reported that there was little evidence of any knowledge transfer from physicians to patients, and that patients usually assumed a passive role and initiated few topics of conversation. In the current study, non-adherent patients reported less understanding of their illness compared to adherers, therefore healthcare providers should make more active attempts to help patients gain a more adequate understanding of their hypertension and its treatment. In addition, they should realise that a patient's interpretation of information from health care providers may be reinforced by input from family and friends as in this study social support including advice provided from family and friends was reported by most of the patients.

Trust in healthcare providers was also associated with adherence to medication in the bivariate analysis of this study in which adherent patients reported more trust in their healthcare providers. Therefore, healthcare providers should try to gain patients' trust by building a partnership with their patients and try to acknowledge the active role of patients in making decisions regarding their illness and treatment. Literature has shown that involving patients in decision-making processes and acknowledging patients' views should lead to an improvement of patients' treatment outcomes (Pollock, 2001; Dowell et al., 2002; Jones, 2003).

### 8.1.4 Adherence: Association with beliefs about herbal medicines

The qualitative data results revealed that most of the participants were currently or previously using herbal medicines in addition to their prescribed medicines. This finding is consistent with previous qualitative studies in the literature which reported that taking herbal remedies was common among hypertensive patients (Roberson, 1992; Morgan, 1996). However, in the quantitative study, most of the respondents thought that herbal medicines are less effective and less safe than their prescribed medicines. This is inconsistent with a previous quantitative study (AlBraik et al., 2008) that measured beliefs about herbal medicines in the UAE, where UAE nationals have reported herbal products to be more effective and safer for use than western medicine in different aspects. AlBraik et al (2008) study revealed that 60% of the respondents had more confidence in herbal medicines than prescribed medicines, 42% believed that there is no problem in taking herbal medicines along with prescribed medicines, 85% believed that there is no side effects from the use of herbal medicines and 80% believed that herbal medicines are safe for use over allopathic medicines (AlBraik et al., 2008). There could be some possible reasons for the low reported beliefs about safety and effective of herbal medicines in the current quantitative study compared to AlBraik et al (2008).

Firstly, the current study is a national study, whereas AlBraik et al (2008) study was conducted in only one Emirate within the UAE. Secondly, more males (56.3%) were recruited in this study compared to AlBraik et al (2008) as the majority of the participants were females (70%). Thirdly, in the current study the mean age of the participants was (51.4) years, whereas the participants recruited in AlBraik et al (2008) study came from a wide age range that was skewed towards a younger age profile with over half being 25 years or younger. Finally, over half (55%) of the current study participants were illiterate or had primary or secondary school education compared to 273 participants (83%) who had either a high school or university education in AlBraik et al (2008) study.

### 8.1.5 Adherence: Association with healthcare provisions issues

Despite the key role played by doctors in providing hypertensive patient care in the UAE, data from the interview study suggests that healthcare providers such as doctors and pharmacists failed to provide sufficient support to Emirati patients with hypertension. Participants cited that the role of doctors was limited to prescribing medicines, whereas the role of pharmacists was to dispense medicines. Also, they reported a lack of information provided to them by their healthcare providers. Evidence from the quantitative study confirmed this finding, as only half of the participants (52%) reported that their healthcare providers provided them with all the information they need.

In addition, qualitative data results revealed that not all participants were involved in their treatment plans by doctors. Ignoring patients' perspective may lead them to not follow the healthcare providers' instructions. A report by McInnes (1999) reviewed the factors affecting patient adherence with antihypertensive treatment and the role these

factors play in the development of an integrated treatment plan. The relationship between the physicians and patients and the quality of communication and interaction between them have been shown to be an important determinant of the adherence of hypertensive patients to their medication. Successful integrated approaches to the management of hypertension must address all the factors that affect treatment acceptance. Therefore, the treatment is likely to be successful in reducing the blood pressure and improving patients' clinical outcomes if the patient accepts the treatment (McInnes, 1999).

Patients are usually seen by the same doctor in the clinical practice in the UAE; however discontinuity of care was seen as a concern by some participants in the qualitative study. These issues need to be addressed to ensure that patients do not miss opportunities for intervention by their doctors to solve any issues related to their medications and illness in general. Brookhart et al (2007) studied new users of statins in British Columbia, Canada, who had an extended period of non-adherence, defined as at least 90 days after the completion of 1 prescription in which no refill for any statin medication was obtained. Of patients who became non-adherent, most returned to regular use. The process of restarting statin therapy was strongly linked with a physician visit, particularly a visit with the physician who initiated the statin regimen. The study suggested that both increased physician follow- up and continuity of care could improve adherence to statin therapy by shortening or eliminating the frequent gaps in treatment.

Further evidence from the questionnaire revealed that those who were adherent to their antihypertensive medicines had significantly higher faith and trust in their healthcare providers than non-adherers. Faith in the health care providers and how these positive relationships have served to facilitate medication adherence has been reported

in the literature previously (Svensson et al., 2000; Remien et al, 2003; Kerse et al., 2004). Also, those who were adherent to their medication were more satisfied with the amount of information provided to them from their healthcare providers than non-adherers. Providing quality information about medicines that addresses patients information needs has been shown to play a role in supporting adherence (Kendrew et al., 2001). In addition, adherent participants reported more satisfaction with the services provided to them from their hospitals than non-adherent participants.

Although patients have the ultimate decision in whether they take their medicines or not, there are many healthcare provision factors that can also affect medication adherence. Regarding the healthcare services, during the interviews, patients reported that there was a lack of coordination and organisation in hypertension services provided to them by different healthcare providers within the Ministry of Health. Evidence from the literature suggests that improving care and outcomes for patients suffering from chronic diseases depend on reshaping and organising the healthcare system (Wagner et al., 1996; Wagner, 1998). As a result, patients should receive planned and regular interactions with their healthcare providers. The focus of these interactions would then be the prevention of the disease exacerbation and complications. In addition, the necessary components of an organised healthcare system, which would improve patients with chronic diseases care, should include systematic assessments of patients, supporting the patient's role as a self-manager, adherence of health care professionals to treatment guidelines and continuous follow-up (Wagner et al., 1996; Wagner, 1998). Also, there is a need to consider patients beliefs at diagnosis and during each consultation after that. In addition, there might be a need to provide carers who visit patients at home regularly especially if patients are suspected to be non-adherent and do not have anybody at home to provide the needed support.

In the qualitative study, hypertension care was provided in places, which were perceived to be inconveniently distanced from each other, and this was cited to present access difficulties especially in rural areas of the country (See section 8.1.2). In addition, the availability of equipment (e.g. home blood pressure monitors) and antihypertensive medications varied between different Emirates of the country (districts), with rural areas being perceived as disadvantaged in this regards. This was confirmed in the quantitative study, as area of residence was one of the predictors of non-adherence to antihypertensive medications. Patients who lived in rural areas reported more non-adherence to antihypertensive medicines than those who lived in urban areas. This could be due to shortage of healthcare providers specialised in the treatment of hypertension (e.g. cardiologist) in the rural areas in the UAE or lack of the availability of certain hypertension care services and procedures. In addition to this, although the Emirati population continues to grow at a rapid rate, the number of healthcare centres and hospitals has remained constant in the rural areas since the 1980s. This has inevitably increased the load and pressure on healthcare facilities within these areas in the UAE.

### 8.1.6 Adherence: Association with social support from family and friends

The qualitative interviews in this research highlighted that Emirati hypertensive patients' families were an important source of support for patients in term of managing hypertension and taking medications. This support helped participants to adhere to their medication, such as collecting their medicines for them from the hospital pharmacy or even providing them with each dose. Also, participants reported receiving advice from their family members and friends regarding their illness and treatments. Findings from the quantitative study confirmed this finding as almost one third of participants perceived a great or a good extent of family and friends support. Also, adherent patients

reported significantly more family and friends support compared to the non-adherent patients. Studies in the literature showed similar results and several sources of support for adherence have been identified, including relationship partners, children and parents (Remien et al., 2003; Munro et al., 2007). In these studies, family support, including financial assistance, collecting medication, and emotional support appeared to be a strong influence on patient medication adherence. In contrast, in a study by Munro et al (2007) some patients reported the negative effect from people in their lives who discourage them from adhering to their medicines.

### 8.1.7 Predictors of non-adherence to antihypertensive medications

A framework (See Figure 5.1) including all the issues, which were of importance to the study population from the literature review and the interviews data analysis, was used in order to find predictors of non-adherence among this population. Four variables significantly predicted patients' non-adherence to medication in the logistic regression model. The model showed that hypertensive patients with uncontrolled blood pressure who live in rural areas and who doubted the ability of the treatment to control their hypertension and had more concerns about their medicines were more likely to be non-adherent to their medication.

This model enables us to identify patients who are more likely to be non-adherent using the four predictors. However, the factors that were found to be associated with non-adherence to medication in the bivariate analysis, but not as predictors of non-adherence in the model, should still be taken into account when addressing issues related to medication adherence, as they are real in terms of association with adherence to medication. Furthermore, factors that were shown to be predictors of non-adherence in the model alone do not provide a full explanation of

patients' decisions and behaviours toward medication adherence; therefore, there is a need to combine these with those from the bivariate analysis.

This model satisfied all assumptions for the application to a population suggesting that results from the sample may be extrapolated to the hypertensive population from which the sample was drawn. All these factors should be used in guiding intervention strategies to improve patients' adherence to medication in the UAE.

### 8.1.8 Other hypertension self-care behaviours

As for adherence to exercise or diet, around two thirds of participants were non-adherent to exercise or diet. This finding is also in line with data from the qualitative interviews in chapter 5. In the questionnaire study, it was found that non-adherence to exercise and diet were more prevalent than non-adherence to medication. Lack of time and comorbidity were the two most commonly reported reasons for exercise non-adherence. Lack of motivation and lack of awareness were the most commonly reported reasons for diet non-adherence. This could suggest that participants may not have received education about the importance of such self-care behaviours in the management of hypertension by their healthcare providers. It could also be due to participants finding it difficult to adhere to these more demanding behavioural changes. Other researchers have highlighted that adherence is much lower for lifestyle changes and other more behaviourally demanding regimens than for medication (Haynes et al., 2002). As effective hypertension management rests upon patients' commitment to all of these behaviours, these findings suggest that non-adherence to medications may not be the sole issue which requires attention.

These findings suggest that interventions aimed at improving Emirati hypertensive patients' outcome must also target other aspects of the hypertension management including their lifestyle habits.

### 8.1.9 Reflections on instruments used

Self-reporting adherence scales (e.g. Morisky scale) were designed to provide a convenient, valid and reliable mechanism for identifying non-adherence. The results of this research suggest that the 8-item Morisky scale (Morisky et al., 2008) is a useful tool in assessing adherence to medication among this population. It showed a good internal reliability and was well correlated with the clinical outcome (blood pressure level). It also detected the most non-adherent patients compared to direct self-report. However, this scale was shown to be less useful for distinguishing the type of non-adherence, as it was insensitive to intentional non-adherence.

Furthermore, in this research, the Morisky scale was a more useful indicator for assessing non-adherence to medication compared to simple direct questioning of patients about whether their last episode of non-adherence occurred within the last week.

The Beliefs about Medicines Questionnaire (BMQ) and the brief Illness Perception Questionnaire (IPQ) showed good internal reliability and validity among this population and were useful in terms of identifying predictors for medication non-adherence.

The family and friends subscale from the CIRS was used to measure social support received by patients from their family and friends. The scale showed good internal reliability and validity among this population. Although, perceptions of family

and friends support were shown to be associated with adherence in the bivariate analysis, they were not predictive factors of medication non-adherence in the final model. However, they are real in terms of associations. This is supported by the majority of participants who highlighted during interviews that families are important source of moral and physical support in their disease management. Therefore, this should be considered when addressing adherence to medication in this particular population.

## 8.2 Limitations

### 8.2.1 Recruitment

Participants were recruited for both studies of the research as they attended their cardiology outpatient appointment. The sample of participants who accessed hospitals and agreed to take part in this study may not be representative of all hypertensive patients in the UAE. Those patients who attended their appointments may be more concerned about their health and thus more likely to adhere to their medication than those who did not attend their appointments. Therefore, an alternative recruitment method to include those who had stopped or skipped their appointments frequently, based on the hospital records, may have been more useful in identifying non-adherent patients.

### 8.2.2 Translation of the questionnaire

The purpose of the questionnaire translation was to make it more relevant for the population under investigation. The method used for translation was selected because this could be applied within the constraints of the study protocol and because this was deemed appropriate for the aim of the research. Thus a full validation of the translated questionnaire was not performed. The purpose of this research was not to validate the

translated questionnaire. However, efforts were made to make sure that the instrument used produced valid and reliable results. The reliability of the translated scales was measured during piloting and demonstrated good to high internal consistency, which allowed for their use. Also, these tests were repeated on the full dataset after finishing the data collection and still moderate to high internal consistency was found.

Time needed for the translation was underestimated in this study. This did not negatively affect the study itself, but it highlighted the importance of allowing sufficient time not only for the translation but also for the quality assurance aspects including the group validation and post validation processes.

### 8.2.3 Assessment of adherence/non-adherence

Medication adherence was assessed using a self-report method which runs the risk of obtaining socially desirable responses and underestimating the true level of adherence. However, careful attention was given to avoid this problem by phrasing the questions in a non-judgmental manner. The majority of the participants in the qualitative study reported non-adherence and the prevalence of non-adherence was 65.7% in the quantitative study, which indicated that patients might not have found it difficult to admit non-adherence to their medicines.

Furthermore, the Morisky scale was designed to produce 3 categories of adherence: low, medium and high. However, there were not enough patients in the "medium" category so therefore, the Morisky score was dichotomised into those with very high adherence (adherers) and those with medium or low adherence (non-adherers). Therefore, the discrimination between low and medium adherence was not possible.

Another limitation is that differences between intentional and unintentional non-adherence were not compared in this study. It was difficult to do this because of the problems with the MMAS in accurately identifying intentional and unintentional non-adherence. However, in the quantitative study, the types of non-adherence (unintentional, intentional and combined intentional and unintentional) were reported, but this was reported descriptively and was not used in the final comparison with the different variables within the study. The differences between unintentional and intentional non-adherence may necessitate different strategies for non-adherence prevention and may be predicted by different factors. For example, a study by Clifford et al (2008) reported that intentional non-adherers were significantly more likely to have stronger concerns about taking their medicines and to doubt their personal need for it compared to adherers. Conversely, unintentional non-adherers did not differ significantly from adherers in their beliefs about medication (Clifford et al., 2008). This suggests that intentional non-adherers may have different perceptions of illness and medicines that motivates their medication taking behaviour from unintentional non-adherers. Therefore, applying a perceptions based intervention may ineffectively target some patients.

### 8.2.4 Design of the study

This study was cross sectional in design, which means that non-adherence to antihypertensive medicines was assessed at a particular point of time, and it was not possible to confirm whether adherence would change over time. Similarly, beliefs about illness and medicines were only assessed at one point of time and it would be interesting to find out whether these perceptions would change over time and whether this would be associated with a change in participants' adherence to their medications. A longitudinal study design, with repeated assessments could allow the assessment of the

consistency of adherence/non-adherence and perceptions of illness and medicines over time. In this study, non-adherence was predicted by area of residence, blood pressure control, treatment control and specific concerns about taking medicines. The direction of causality could not be confirmed from the current study, and can only be ascertained with a longitudinal study design.

## 8.3 Implications for practice and policy

It is recommended that adherence-enhancing interventions need to be guided and formulated by research findings (MRC, 2008). Therefore, results of the current study can be used to provide the foundations of programme development and aid in the design of culturally tailored medication adherence interventions in the UAE. Findings of this research showed that non-adherence to antihypertensive medications was associated with poor blood pressure control. Therefore, it might be useful to adapt a preventive approach which focuses on improving patients' antihypertensive medication adherence prior to the development of hypertension complications. However, interventions to improve medication adherence must be preceded with an assessment of the type of non-adherence that is problematic, as different types of non-adherence might require different types of interventions. For example, patients who are intentionally non-adherent due to certain beliefs about their illness and treatment may benefit from intervention or counselling based on patients' beliefs about hypertension and its medicines, whereas patients who are unintentionally non-adherent due to forgetfulness may benefit more from reminders. This section describes the specific ways in which the health authorities in the UAE can improve medication adherence of hypertensive Emirati population in the short, medium and long term. These suggestions are relevant to the cultural, professional and individual contexts of the UAE. In addition, the

provided suggestions are feasible and would work in the UAE, as there are no economic, structural or legal barriers to any of them.

Results of the qualitative study suggest the need for strengthening the doctor-patient partnership by improving communication and allocating appropriate time for each individual patient. This is consistent with the findings of another study (Ibrahim, 2001) conducted in the UAE and reported that doctors employ a doctor-centred consultation style. Ibrahim (2001) reported that doctors tend to ask closed questions which give their patients very few opportunities to respond in their own way. Also, the study findings showed that doctors seldom ask about social and psychological history, or check understanding of their patients (Ibrahim, 2001). Therefore, there is a need for adopting a patient-centred approach in delivering hypertension care in the UAE. This approach has been recommended by studies in the literature (McInnes, 1999; Benson and Britten, 2002), where doctors involve patients as equal partners in all decisions about their illness and treatment management plans. Patients are likely to be successful in reducing blood pressure and improving outcome if they accept their treatment plan (McInnes, 1999).

With regards to patients' education, the results of the current research revealed that doctors may not always have enough time to perform this task adequately. Therefore, it might be more useful to prioritise information given to patients by providing the most needed information to know first after the diagnosis, and then set up multiple shorter appointments over the first weeks of a new treatment to provide the rest. This approach was recommended by Lautenschlager and Smith (2006) and could be applicable in clinical practice in the UAE.

Also, as this research revealed that doctors do not refer patients to other healthcare providers (e.g. dieticians), it might be useful to involve more healthcare professionals in the educational process. This can involve training pharmacists and/or nurses to provide one-to-one as well as telephone support to patients, especially over the first weeks of diagnosis supported by continuous follow up to emphasise and reiterate the information needed by the patients.

The qualitative study findings also suggested that the role of the pharmacist was limited in hypertension management among Emirati patients. There is a need for greater involvement of pharmacists in the care of Emirati hypertensive patients through patient education and counselling. Through patient counselling, pharmacists are in a great position of identifying non-adherent patients and the reasons for their medication non-adherence. In addition, they could correct any inaccurate beliefs patients might have by providing information and making sure they have a better understanding of their illness and medicines. This could reduce intentional non-adherence to antihypertensive medications. Pharmacists can also help in reducing unintentional non-adherence by providing practical supports such as using reminders, fixed dose combination pills, unit-of-use packaging with calendar labelling and special adjustment of dosage regimens to fit with each individual patient's lifestyle. However, health care facilitators should provide sufficient staff and a consultation room within the pharmacy in order to provide more time and space for such service.

Regarding labelling and dispensing medications, it is recommended to combine verbal and written information to achieve the best outcomes from patients counselling (Raynor, 1998). Pharmacists should provide clear oral information and reinforce this by clear labelling of medicines including at least the generic name, medicine strength and dosage instructions. Labels must be computer-generated where possible and unfamiliar

expressions and abbreviations should be avoided. However, as over half of the current study participants were illiterate or did not continue education after secondary school, this suggests the necessity to use some other counselling aids to reinforce communication and make sure that patients know how to manage their medicines. For example, medicine-related pictograms can be used when providing instructions to illiterate patients; these could be incorporated into the education handout and leaflets (Hameen-Anttila et al., 2004). This approach was supported in the literature, a study by Dowse and Ehlers (2005) assessed understanding of "text only" or "text plus pictogram" labels for antibiotics among low literacy female population. Adherence to medicines and understanding the medication instructions were improved in the group that received "text plus pictogram" compared to the group that received "text only" labels (Dowse and Ehlers, 2005).

One of the long terms suggestions to improve the services provided by pharmacists is to improve the educational system for pharmacy undergraduate students in the UAE. Currently, there are three schools of pharmacy in the UAE, in which the concept of medication adherence is covered in their undergraduate curriculum. Teaching method includes only lectures, but no practical or workshop sessions on medication adherence. It is crucial to ensure that pharmacists feel competent and skilled in delivering services to improve patients' medication adherence (Clifford et al., 2010). Therefore, pharmacy education needs to provide pharmacists with all the needed tools and knowledge for understanding the complexity of the adherence issue as well as the possible underlying reasons for non-adherence (Clifford et al., 2010). Further research is needed to investigate whether pharmacy education is commensurate with the roles that are available for pharmacists to provide medication adherence-related support.

Moreover, findings of the current qualitative study suggest that patients preferred being seen and followed by the same doctors, therefore regulations should be in place to ensure that continuity of care is offered to all hypertensive patients. Electronic databases for patients' medical records could be useful for allowing access and sharing information among all healthcare providers involved in the hypertension care. In addition, this could help in identifying patients who frequently miss their appointments and are more likely to be non-adherent to their medicines. These patients then could be supported via telephone reminders to improve their adherence to their medical appointments, which may lead to better medication adherence. A review of studies (Liu et al., 2008) aimed to assess the effects of reminder systems and late patient tracers on patients' adherence to medical advice and on clinical outcomes. The results showed better outcomes among those patients for whom reminders or late patient tracers were used.

Emirati patients showed that family constitutes a vital source of support in managing their hypertension. In the qualitative study, majority of patients have reported receiving different types of support from their family members including advice regarding illness and medicines. Findings of the current study support a family-centred approach where patients' family members could get involved with their consultation and treatment plan.

Furthermore, patients who are less likely to adhere to their medications could be identified and targeted for interventions before initiation of their treatment. As per the findings of this study, this would involve patients with an uncontrolled blood pressure who live in rural areas and have negative treatment control perceptions of hypertension and positive concerns beliefs about antihypertensive medicines. Moreover, the brief

IPQ scale could be used to elicit hypertension perceptions quickly in a brief interview with patients. Patients reporting non-adherence to antihypertensive medications during treatment might also be targeted. Interventions could involve counselling patients by hospital pharmacists regarding not only their medications, but also perceptions of hypertension and its treatment. In addition, targeted interventions must address patients' non-adherence to other hypertension self-care behaviours such as exercise and diet, in order to achieve a better control of hypertension and minimise the risk of developing complications. Healthcare providers including doctors must advocate and emphasise the importance of lifestyle changes in the management of hypertension. They must also identify the barriers to the implementation of such lifestyle changes, and provide advice and support to minimise these barriers.

Moreover, the establishment of a hypertensive patients' helpline to provide further information and education and home visits to patients with reduced morbidity could be beneficial. This is useful to ensure that patients can have access to medical advice throughout the day if needed. For example, qualified and well trained pharmacists with access to computer databases and drug resources could answer patients' medications information questions (Pohjanoksa-Mantyla and Airaksinen, 2004). In Finland since 1996, the university pharmacy that is operated by the University of Helsinki has run a pharmacist based national call centre where people can call for information 24 hours a day. In this unit, most of the calls come from lay consumers (75-80%) in which the numbers of calls has been steadily growing over years, the total number being 206,000 in year 2003 (Pohjanoksa-Mantyla and Airaksinen, 2004). Dial access services are beneficial to lay consumers especially in minimising potential serious drug related problems and thus in stimulating positive patients' outcomes (Melnyk et al., 2000). A study by Joseph et al (2004) showed that

using a medicines information telephone helpline in one of the UK hospitals provided accurate, timely and unbiased information to patients with potentially serious drug-related problems. It also showed that patients were generally satisfied with the information given, the service had a positive impact as two-third of the callers were able to avoid a problem as a result of the information received as well as most of the patients followed the given recommendations by the pharmacists. Implementing such a service in the UAE could be beneficial especially for those who live in rural areas where the access to health care is limited and they need to travel to other districts of the country to seek medical advice. However, implementing the twenty-four hours information services in the UAE through phone helpline to patients' will need training and resources.

Findings of the qualitative and the quantitative studies of the current research highlighted several implications for the health authorities responsible for planning and implementing health regulations in the UAE. In particular, the development of national guidelines for the appropriate management of hypertension including the evidence for the benefits of improving adherence to antihypertensive medications, and highlighting effective strategies to support patients medications adherence. In addition, health authorities might benefit from training different healthcare providers regarding the appropriate management of hypertension drawing from the international evidence. In these training courses, the importance of teamwork in optimising hypertensive patients' health outcome must be emphasised. This is because the findings of the qualitative part of this research suggest that there is a lack of teamwork and that doctors usually work in isolation of other healthcare professionals and do not refer patients to other healthcare providers (e.g. dieticians). In addition, these educational courses must illustrate strategies to ensure coordination of care and services by different healthcare providers.

A cluster randomised controlled trial by Qureshi et al (2007) was conducted in Karashi, Pakistan. It showed that a one day intensive training session of general practitioners in management of hypertension resulted in significantly higher adherence to antihypertensive medication of their patients. Therefore, patients were more likely to adhere to their antihypertensive medicines if healthcare professionals had knowledge and skills in improving adherence (Qureshi et al., 2007). Furthermore, the Ministry of Health in the UAE may benefit from organising public health campaigns for raising awareness regarding the management of hypertension, benefits of adherence to antihypertensive medicines, seriousness of hypertension complications and encouraging hypertensive patients to participate fully in discussions with different healthcare providers to clarify any misunderstood issues as recommended by the International Pharmaceutical Federation (International Pharmaceutical Federation, 2003).

Area of residence was one of the variables which showed association with non-adherence to medication among this population. Therefore, efforts must also be taken by the regulatory bodies to reduce disparity in access to healthcare and medicines between different Emirates (districts) in the UAE. This may involve increasing the number of hypertension clinics and/or hospitals, specialised healthcare providers and medication supplies in the rural areas of the country to meet the demands of a more rapidly growing population in these areas within the UAE. Also, the results of this study showed that living in rural areas was significantly associated with lower educational level, less social support from family members, lower treatment control beliefs of the illness and more concerns about taking medicines. Therefore, pharmacists might need to respond to patients in different ways in urban and rural areas in order to address different needs of the population groups. Pharmacists working in rural areas might need additional training and educational programs to be able to deliver hypertension care and promote

medication adherence among this particular population. Training in good communication skills should be provided to the pharmacists in order for them to be able to find out more about patients' perceptions of their illness and medicines and as a result can provide the information and consultation that best address individual patients' needs (James and Horne, 2000). See Table 8.1 for the summary of the recommendations for policy, service provision and patients' aspects.

***Table 8.1: Recommendations for policy, service provision and patient***

| Domain | Recommendations |
|---|---|
| Policy | ▪ There is a need for development a national guideline in the UAE on adherence to medication that is evidence-based. This would improve awareness of health care professionals on this important aspect of health.<br>▪ Research on adherence should be promoted to identify issues related to non-adherence. A review on adherence studies in the Middle Eastern countries (chapter 3 of this thesis) showed that there is a need for more research on this area as well as a need for improving the quality of these researches. Also, research should be developed around a suitable theoretical framework as recommended by medical research council guidelines' (Campbell et al., 2000) to help in understanding how different factors interact to influence adherence which would provide direction and the necessity infrastructure for the development of the best interventions to enhance adherence.<br>▪ Public information campaigns on the benefit of adherence should be conducted. Patients should be encouraged to fully participate in discussion with relevant health care professionals to ensure maximum benefit from medication.<br>▪ Prioritise adherence to medication in the health care agenda. Adherence should be recognised as an integral aspect of the whole process of clinical care and hence a core subject in medical, pharmacy and nursing education and training (undergraduate and graduate phases). The importance of teamwork in optimising patient's health outcome must be emphasised.<br>▪ Health care providers should be sensitive to the needs of their patients. Therefore, health policy makers should provide on-going training and support to health care professionals in different styles of consultation. This would ensure that they have the needed knowledge and tools to improve adherence to medications.<br>▪ There is a need to assess the current pharmaceutical care in the UAE and evaluate the role of pharmacists in the management of chronic illness. This will help in understanding the possible barriers that pharmacists face when managing and/or promoting adherence. In addition, health care policy should increase the role of pharmacists in the chronic disease management and develop pharmacy-based disease management programme.<br>▪ Health policy maker in the UAE should set regulations to provide incentives to health care professionals involved in the promotion of adherence. This should be done as a way of encouraging health care professionals to make medication adherence an essential part and a clear priority in the treatment plan.<br>▪ This research showed that adherence to lifestyle modification is less than adherence to medicines. Therefore, there is a need to target adherence to lifestyle as well as adherence to medicines in order to optimise the treatment outcomes. |

***Table 8.1: Recommendations for policy, service provision and patient Cont.***

| Domain | Recommendations |
|---|---|
| Service provision | ▪ This research as well as many in the international literature showed how beliefs about illness and medicines are the most important motivators for adherence to medicines. Therefore, there is a need to start developing or adopting interventions based on patients' beliefs about illness and medicines (e.g. Clifford et al., 2006).<br>▪ Providing patients-centred consultations using a suitable framework. Physicians as well as other health care professionals such as pharmacists should follow a suitable consultation framework which provide a clear structure to the consultation and describe key activities and behaviours associated with each stage of the consultation process e.g. medication related consultation framework (Abdel-Tawab et al., 2011).<br>▪ Providing high quality tailored information for patients when they need it both verbal and written forms. In some cases where the patients are illiterate or have low literacy rate pictogram should be provided.<br>▪ Considering cultural beliefs and lifestyle modification when addressing adherence to medication is important to understand a patient as a whole. Therefore, recommend the right and effective treatment that does not conflict with patients cultural issues and can be easily incorporated in their daily life.<br>▪ Pharmacists should provide medication use review to patients. Pharmacists provide a structured review of patients' medication use that helps patients to manage their medicines more effectively. During this review pharmacists also can provide patients with appropriate information and advice about their medicines. This service can benefit both doctors and patients. Pharmacists can provide patients' medicines-related information to their doctors that can be discussed at their next doctor appointments. In addition, this service can benefit patients by improving their knowledge and understanding of their condition and treatment.<br>▪ Telephone helpline service to provide further information and Education could be beneficial. This is useful to ensure that patients can have access to medical advice throughout the day if needed. This could be more useful to patients who live in rural areas of the UAE due to lack of access to health care. |
| Patient | ▪ Patients should be encouraged to take part in their treatment plan management and not rely totally on the doctors in order to help to change the practice towards a patient-centred approach rather than the current doctors-centred consultation style.<br>▪ This study showed that marked differences exist in the UAE between urban and rural areas with respect to the distributions of health care providers and services. Patients in the rural areas of the country should be provided with the needed services, facilities and education as this research showed that these were lacking among this particular population. |

***Table 8.1: Recommendations for policy, service provision and patient Cont.***

| Domain | Recommendations |
|---|---|
| Patient continued | ▪ Family support and its influence on patients' beliefs and behaviours was evidence in this research. Patients reported that family members are an important source of information to them as they provide them with advice about their illness and treatment which could be sometimes inaccurate. Therefore, it could be beneficial to include patients' family members in their disease management plans.<br>▪ Patients' decisions about the use of medicines could be influenced by their beliefs of the available alternatives e.g. herbal remedies. In this research patients reported using herbal remedies in parallel with prescribed medicines and for the treatment of the same illness. Non-adherence may arise in these situations where use of prescribed medicines conflicts with other aspects of patients culture and beliefs. Therefore, these issues should be considered by healthcare professionals during consultation and when addressing adherence to medication.<br>▪ The current study results showed high illiteracy rate among the study participants especially in older patients. Therefore, issues to do with illiteracy should be taken into account especially among elderly people. Health care professionals should make sure that their patients understand the medical instructions by providing verbal, written and in some cases pictograms. Thus, help patients with different educational level to understand the medical advice therefore, adhere better to the therapeutic recommendation.<br>▪ In this research, patients reported limiting access to health care (e.g. lacking continuity of provider care, making appointments difficult to schedule, unavailability of certain drugs formularies and strength) which could be a potential barrier to medication adherence. The provision of appropriate health care facilities is crucial to enable patients to access to health services at all levels. These issues should be taken into account as facilitating access to health care resources is important in order to preserve or improve patients' health. |

## 8.4 Recommendations for future research

In order to facilitate patient recruitment for future research, careful attention must be given as extensive paperwork may reduce the response rate as it can cause patients to become anxious and reluctant to take part in the study. Although this did not negatively affect the current study as the response rate was 84%, but the responders commented on the length of the questionnaire. In addition, researchers should be aware that due to high illiteracy rates in the UAE, especially among elderly patients, researchers might often be asked to administer the questionnaire to the patients, as occurred in this study, which is time consuming. In the current study, just over half of the participants preferred the researcher to read the questionnaire and complete it for them based on their responses, whereas some completed parts of the questionnaire on their own and needed the researcher's help to complete the other parts. Only 13% of the participants completed the questionnaire on their own without any help. Moreover, for the purpose of qualitative studies, tape or digital recording might be intimidating. In the current study, two female participants were anxious about the digital recording for cultural reasons, as they were not sure who would listen to their voices. However, the researcher reassured them that she would be the only one to listen to the recording. Therefore, when doing further research in the UAE, researchers should assure confidentiality of data to the patients and explain the reason for recording as well as addressing any concerns to ensure good response rate and to obtain patients honest views.

Moreover, further research could be conducted over a longer period of time with medication adherence assessed longitudinally. Repeated measurement would allow the assessment of the consistency of beliefs about illness and medicines, and adherence to medication over time. This is useful as beliefs and behaviours are not fixed and would allow considering the impact of appraisal on medication adherence behaviour.

The findings of this research suggest that using the brief IPQ and BMQ scales were a useful approach to assess illness and medication perceptions among this population as treatment control perceptions and concerns about taking medicines were shown to be predictors of non-adherence to antihypertensive medications in the logistic regression analysis. For the purpose of future research, full validation for these scales might be useful among this population as this research provided a preliminary support for the benefit of these scales in assessing illness and medications perceptions among Emirati hypertensive patients.

Identity representation of illness has been found to be an important component of the self-regulatory model in previous research of adherence among various illness conditions (LIewellyn et al., 2003; Whitmarsh et al., 2003). A study (Baumann and Leventhal, 1985) showed that self-predictions of blood pressure were most strongly associated with reported symptoms, next with reported moods, and least with actual blood pressure. Therefore, hypertensive patients should not be encouraged to believe they can successfully treat blood pressure elevations by monitoring symptoms related to blood pressure change due to the asymptomatic nature of the illness (Baumann and Leventhal, 1985). The limited results in the current study may relate to the asymptomatic nature of hypertension, as patients do not experience many symptoms related to their illness and therefore place less importance on symptom identity. Alternatively, there could have been a problem with using only a single question to measure identity representation within the brief IPQ scale. Further research would be useful to clarify these issues, for example, focusing on patients' perceptions of the most significant symptoms.

The influence of perceptions of the cause of hypertension on medication adherence could not be assessed in this research due to the low response to the causal representation question on the brief IPQ scale. Future research would be useful to assess the relationship between cause perceptions and adherence to antihypertensive medicines among this population.

The findings of this research provided evidence to support the association between illness and medicines perceptions and medication adherence, however future research could focus on the mediating role of health beliefs in adherence to medication. For example, in the current study, age was associated with medication adherence using bivariate analysis but not shown to be a predictor of adherence in the logistic regression model, therefore, it would be interesting to explore whether age influences health beliefs, which may explain the current findings.

As patient-health care provider relationship was shown to be an issue in the qualitative study, future research could focus on exploring the type and quality of communication and consultation between patients and providers. Findings can then be used to inform the design of interventions targeted at improving patients-providers relationship. The impact of such interventions on antihypertensive medication adherence and patients' clinical outcomes could then be assessed.

Future research could also focus on interventions based on patients reported perceptions. A randomised control trial (Petrie et al., 2002) demonstrated the effectiveness of this method as counselling based on patients beliefs about myocardial infarction was found to benefit patients in better informing them about their illness and also increased the likelihood of swifter return to work. Therefore, this intervention approach could be similarly applied for motivating adherence management in

hypertension. Conducting further research would be needed to assess whether these types of interventions are measurable and have a clinically favourable impact on patient adherence among Emirati population. In addition, in a study by Clifford et al (2006), the self-regulatory model theory and the necessity-concerns framework were used to guide the development of a pharmacy-led adherence intervention as adherence can be influenced by patients' beliefs about their illness and treatment. This theory was used in training pharmacists to adopt a patient-centred approach in communicating with patients. A pharmacist telephoned patients two weeks after they started a new medicine for a chronic condition. The results showed that at 4 weeks follow up non-adherence was significantly lower in the intervention group when compared to the control group (9% vs. 16%, p= 0.032). The intervention was shown to be less costly and more effective; the mean total patient costs at 2-month follow up were £187.7 in intervention group and £282.8 in control group ($p < 0.0001$) (Elliott et al., 2008). Applying similar interventions could be highly beneficial in enhancing Emirati hypertensive patients' medication adherence; however, it would require training of staff involved in performing these interventions.

# CHAPTER 9 CONCLUSIONS

This thesis provided evidence that non-adherence to antihypertensive medications among Emirati patients is a significant problem of a striking magnitude. About two-thirds (66%) of the Emirati hypertensive patients are non-adherent to their medications. The underlying reasons that discourage or motivate patients to adhere to their antihypertensive medicines are complex and often inter-linked. Furthermore, this research showed that adherence to other hypertension self- care behaviours (e.g. diet and exercise) is even lower than adherence to medications. Therefore, the benefits of these on the hypertension control should be emphasised, as hypertensive patients should implement lifestyle changes as well as taking medication to manage their hypertension.

Four factors have been identified to significantly predict non-adherence to medication in this particular population. These factors include area of residence, blood pressure level, perception of treatment to control hypertension and concerns about taking antihypertensive medicines. The self-regulatory model and necessity-concerns framework using the brief IPQ and BMQ questionnaires have shown to be applicable to the study of adherence in the UAE. Our findings add to the current knowledge about patients' perceptions of the illness and beliefs about the treatment being predictors of medication adherence and showed that these beliefs play an important role in non-adherence to medication.

This research provided evidence that support from healthcare providers, including pharmacists was suboptimal; therefore, there is a need for a more patient-centred approach with more involvement of patients in their hypertension management targets and strategies. This will help the healthcare providers to understand their patients' perspective regarding their illness and treatment, and therefore provide the

needed help, information and support tailored to the individual patient. Moreover, support from family members showed to have influence on medication adherence among this population, therefore it could be beneficial in practice to include patients family members in patients' disease management plans.

The health policy makers in the UAE should work towards developing a guideline on medication adherence based on a review of the available relevant evidence. This should emphasise the importance of adherence to medication to maintain optimal health in people with chronic illnesses. In addition, education and training should be provided to healthcare professionals on consultation skills, developing skills to explore the beliefs and views underlying patients' medication use as well as all the needed tools to promote adherence to medication.

This research is the first to explore non-adherence to medications and other hypertension self-care behaviours among Emirati hypertensive patients. It is also the first to assess patients' beliefs about hypertension and its treatment in association to medication adherence using the self-regulatory model and the specific necessity-concerns framework among this particular population. This research provided important data in this regard which could serve as the basis and frame of reference for future intervention studies aiming to improve medication adherence in the UAE.

## REFERENCES

Abdulle, A.M., Nagelkerke, N.J.D., Abouchacra, S., Pathan, J.Y., Adem, A. and Obineche, E.N. (2006). Under-treatment and under-diagnosis of hypertension: a serious problem in the United Arab Emirates. *BMC Cardiovascular Disorders* **6**, 1-7. DOI: 10.1186/1471-2261-6-24 [Accessed: 15 January 2011].

Abraham, C., Clift, S. and Grabowski, P. (1999). Cognitive predictors of adherence to malaria prophylaxis regimens on return from a malarious region: a prospective study. *Social Science and Medicine* **48**, 1641-1654.

Adams, C.R. (2003). Lessons learned from urban Latinas with type 2 diabetes mellitus. *Journal of Transcultural Nursing* **14**, 255-265.

Ajzen, I. (1991). The theory of Planned Behaviour. *Organizational Behavior and Human Decision Processes* **50**, 179-211.

AlBraik, F.A., Rutter, P.M. and Brown, D. (2008). A cross-sectional survey of herbal remedy taking by United Arab Emirate (UAE) citizens in Abu Dhabi. *Pharmacoepidemiology and Drug Safety* **17**, 725-732.

Alexander, S.C., Sleath, B., Golin, C.E. and Kalinowski, C.T. (2006). Provider-Patient Communication and Treatment Adherence. In Patient Treatment Adherence: Concepts, Interventions, and Measurement, H.B.Bosworth, E.Z.Oddone and M.Weinberger, eds. New Jersey: Lawrence Erlbaum Associates, Inc, pp. 329-372.

Al-Faris, E., Abdulghani, H.M., Mahdi, A.H., Salih, M.A. and Al-Kordi, A.G. (2002). Compliance with appointments and medications in a pediatric neurology clinic at a University Hospital in Riyadh, Saudi Arabia. *Saudi Medical Journal* **23**, 969-974. Available at: http://www.smj.org.sa/PDFFiles/Aug02/Compliance.pdf [Accessed: 9 February 2009].

Al-Jahdali, H., Al-Zahrani, A., Al-Qtaibi, S., Hassan, I., Al-Moamary, M., Al-Duhaim, A., Al-Shimemeri, A. and Al-Dawood, A. (2007). Perception of the role of inhaled corticosteroids and factors affecting compliance among asthmatic adult patients. *Saudi Medical Journal* **28**, 569-568. Available at: http://www.smj.org.sa/PDFFiles/Apr07/11Perception20061013.pdf [Accessed: 10 March 2009].

Aljasem, L.I., Peyrot, M., Wissow, L. and Rubin, R.R. (2001). The impact of barriers and self-efficacy on self-care behaviours in type 2 diabetes. *The Diabetes Educator* **27**, 393-404.

Al-Qazaz, H.K., Hassali, M.A., Shafie, A.A., Sulaiman, S.A., Sundram, S. and Morisky, D.E. (2010). The eight-item Morisky Medication Adherence Scale MMAS: Translation and validation of the Malaysian version. *Diabetes Research and Clinical Practice* **90**, 216-221.

Al-Saffar, N., Deshmukh, A., Eid, S. and Carter, P. (2003). Health beliefs and drug compliance of depressed patients in Kuwait. *Journal of Social and Administrative Pharmacy* **20**, 142-150.

Al-Saffar, N., Deshmukh, A., Carter, P. and Adib, S.M. (2005). Effect of information leaflets and counselling on antidepressant adherence: Open randomised controlled trial in a psychiatric hospital in Kuwait. *International Journal of Pharmacy Practice* **13**, 123-131.

Al-Sowielem, L.S. and Elzubier, A.G. (1998). Compliance and knowledge of hypertensive patients attending PHC centers in Al-Khobar, Saudi Arabia. *Eastern Mediterranean Health Journal* **4**, 301-307. Available at: http://www.emro.who.int/publications/emhj/0402/13.htm [Accessed: 20 March 2009].

Artstein, R. and Poesio, M. (2008). Inter-coder agreement for computational linguistics. *Association for Computational Linguistics* **34**, 555-596.

Azlin, B., Hatta, S., Norzila, Z. and Ezat, S. (2007). Health Locus of Control Among Non-compliance Hypertensive Patients Undergoing Pharmacotherapy. *Malaysian Journal of Psychiatry* **6**, 20-39. Available at: http://www.mjpsychiatry.org/index.php/mjp/article/view/6 [Accessed: 6 April 2011].

Badrinath, P., Al-Shboul, Q.A., Zoubeidi, T., Gargoum, A.S., Ghubash, R. and El-Rufaie, O.E. (2002). Measuring the health of the nation: United Arab Emirates Health and Lifestyle Survey 2000. Faculty of Medicine and Health Sciences and College of Business and Economics, Al Ain. Available at: http://www.fmhs.uaeu.ac.ae/cmd/UAEHALS2000.htm [Accessed: 20 June 2011].

Bailey, J.E., Lee, M.D., Somes, G.W. and Graham, R.L. (1996). Risk factors for antihypertensive medication refill failure by patients under Medicaid managed care. *Clinical Therapeutics* **18**, 1252-1262.

Baker, R. (1990). Development of a questionnaire to assess patients' satisfaction with consultations in general practice. *British Journal of General Practice* **40**, 487–490.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioural change. *Psychological Review* **84**, 191-215.

Bane, C., Hughes, C.M. and McElnay, J.C. (2006). The impact of depressive symptoms and psychosocial factors on medication adherence in cardiovascular disease. *Patient Education and Counseling* **60**, 187-193.

Bane, C., Hughes, C.M., Cupples, M.E. and McElnay, J.C. (2007). The journey to concordance for patients with hypertension: a qualitative study in primary care. *Pharmacy World and Science* **29**, 534-540.

Barber, N., Parsons, J., Clifford, S., Darracott, R. and Horne, R. (2004). Patients' problems with new medication for chronic conditions. *Quality and Safety in Health Care* **13**, 172-175. DOI: 10.1136/qshc.2003.005926 [Accessed: 20 April 2010].

Bassili, A., Zaki, A., El-Sawy, I.H., Bedwani, R. and Tognoni, G. (1998). Current health care of childhood bronchial asthma in Alexandria, Egypt. *Eastern Mediterranean Health Journal* **4**, 575-584. Available at: http://www.emro.who.int/publications/emhj/0403/4321.htm [Accessed: 12 April 2001].

Baumann, L.J. and Leventhal, H. (1985). I can tell when my blood pressure is up, can't I?. *Health Psychology* **4**, 203-218.

Baune, B.T., AlJeesh, Y.I. and Bender, R. (2004). The impact of non-compliance with the therapeutic regimen on the development of stroke among hypertensive men and women in Gaza, Palestine. *Saudi Medical Journal* **25**, 1683-1688. Available at: http://www.smj.org.sa/ContentList.asp?ContentRef=3#2145 [Accessed: 16 March 2009].

Beaton, D.E., Bombardier, C.M., Guillemin, F.M. and Ferraz, M. (2000). Guidelines for the Process of Cross-Cultural Adaptation of Self-Report Measures. *Spine* **25**, 3186-3191.

Becker, M.H. (1985). Patient adherence to prescribed therapies. *Medical Care* **23**, 539-555.

Becker, M.H. and Maiman, L.A. (1975). Sociobehavioral determinants of compliance with health and medical care recommendations. *Medical Care* **13**, 10-24.

Becker, M.H., Maiman, L.A., Kirscht, J.P., Haefner, D.P. and Drachman, R.H. (1977). The health belief model and prediction of dietary compliance: a field experiment. *Journal of Health and Social Behavior* **18**, 348-366.

Behling, O. and Law, K. (2000). Translating questionnaires and other research instruments: problems and solutions. London: Sage Publications, Inc.

Bennett, P., Rowe, A. and Katz, D. (1998). Reported adherence with preventive asthma medication: a test of protection motivation theory. *Psychology, Health and Medicine* **3**, 354.

Benson, J. and Britten, N. (2002). Patients' decisions about whether or not to take antihypertensive drugs: qualitative study. *British Medical Journal* **325,** 873-876. DOI: 10.1136/bmj.325.7369.873 [Accessed: 5 September 2010].

Blazer, D.G., Landerman, L.R., Fillenbaum, G. and Horner, R. (1995). Health services access and use among older adults in North Carolina urban vs rural residents. *American Journal of Public Health* **85**, 1384-1390.

Bloom, B.S. (1998). Continuation of initial antihypertensive medication after 1 year of therapy. *Clinical Therapeutics* **20**, 671-681.

Boer, H. and Seydel, E.R. (1996). Protection motivation theory. In Predicting Health Behaviour, M.Conner and P.Norman, eds. Buckingham: Open University Press, pp. 95-120.

Bosworth, H.B. (2006). Medication treatment adherence. In Patient Treatment Adherence: Concepts, Interventions and Measurement, H.B.Bosworth, E.Z.Oddone and M.Weinberger, eds. Mahwah (New Jersey): Lawrence Erlbaum Associates, Inc, pp. 147-182.

Bosworth, H.B. and Voils, C.I. (2006). Theoretical models to understand treatment adherence. In Patient Treatment Adherence: Concepts, Interventions and Measurement, H.B.Bosworth, E.Z.Oddone and M.Weinberger, eds. Mahwah (New Jersey): Lawrence Erlbaum Associates, Inc, pp. 13-46.

Bosworth, H.B., Dudley, T., Olsen, M.K., Voils, C.I., Powers, B., Goldstein, M.K. and Oddone, E.Z. (2006). Racial differences in blood pressure control: Potential explanatory factors. *The American Journal of Medicine* **119**, e9-e15.

Boudes, P. (1998). Drug compliance in therapeutic trials: A review. *Controlled Clinical Trials* **19,** 257-268.

Bovet, P., Burnier, M., Madeleine, G., Waeber, B. and Paccaud, F. (2002). Monitoring one-year compliance to antihypertension medication in the Seychelles. *Bulletin of the World Health Organisation* **80**, 33-39. Available at: http://www.who.int/bulletin/archives/80(1)33.pdf [Accessed: 6 June 2010].

Bowling, A. (2002). Research Methods in Health: Investigating Health and Health Services. 2nd ed. Buckingham: Open University Press.

Bramley, T.J., Gerbino, P.P., Nightengale, B.S. and Frech-Tamas, F. (2006). Relationship of blood pressure control to adherence with antihypertensive mono-therapy in 13 managed care organisations. *Journal of Managed Care Pharmacy* **12**, 239-245.

Broadbent, E., Petrie, K.J., Main, J. and Weinman, J. (2006). The Brief Illness Perception Questionnaire. *Journal of Psychosomatic Research* **60**, 631-637.

Brookhart, M.A., Patrick, A.R., Schneeweiss, S., Avorn, J., Dormuth, C., Shrank, W., van Wijk, B.G., Cadarette, S.M., Canning, C.F. and Solomon, D.H. (2007). Physician Follow-up and Provider Continuity Are Associated With Long-term Medication Adherence: A Study of the Dynamics of Statin Use. *Archives of Internal Medicine* **167**, 847-852.

Brown, C., Battist, D.R., Bruehlman, R., Sereika, S.S., Thase, M.E. and Dunbar-Jacob, J. (2005). Beliefs about antidepressant medications in primary care patients: relationship to self-reported adherence. *Medical Care* **43**, 1203-1207.

Burman, W.J., Cohn, D.L., Rietmeijer, C.A., Judson, F.N., Sbarbaro, J.A. and Reves, R.R. (1997). Noncompliance with directly observed therapy for tuberculosis: epidemiology and effect on the outcome of treatment. *Chest* **111**, 1168-1173. Available at: http://chestjournal.chestpubs.org/content/111/5/1168.full.pdf [Accessed: 13 February 2009].

Burt, V.L., Whelton, P., Roccella, E.J., Brown, C., Cutler, J.A., Higgins, M., Horan, M.J. and Labarthe, D. (1995). Prevalence of hypertension in the US adult population: results from the third national health and nutrition examination survey, 1988-1991. *Hypertension* **25**, 305-313. Available at: http://hyper.ahajournals.org/content/25/3/305.full [Accessed: 9 August 2009].

Campbell, M., Fitzpatrick, R., Haines, A., Kinmonth, A.L., Sandercock, P., Spiegelhalter, D. and Tyrer, P. (2000). Framework for design and evaluation of complex interventions to improve health. *British Medical Journal* **321,** 694-696. Available at: http://www.bmj.com/content/321/7262/694 [Accessed: 5 January 2009].

Caro, J.J., Speckman, J.L., Salas, M., Raggio, G. and Jackson, J.D. (1999). Effect of initial drug choice on persistence with antihypertensive therapy: the importance of actual practice data. *Canadian Medical Association Journal* **160**, 41-46.

Catz, S.L., Kelly, J.A., Bogart, L.M., Benotsch, E.G. and McAuliffe, T.L. (2000). Patterns, correlates, and barriers to medication adherence among persons prescribed new treatments for HIV disease. *Health Psychology* **19**, 124-133.

Chlebowy, D.O. and Garvin, B.J. (2006). Social Support, Self-efficacy, and Outcome Expectations: Impact on Self-care Behaviors and Glycemic Control in Caucasian and African American Adults with Type 2 Diabetes. *The Diabetes Educator* **32**, 777-786.

Chobanian, A.V., Bakris, G.L., Black, H.R., Cushman, W.C., Green, L.A., Izzo, J.L., Jones, D.W., Materson, B.J., Oparil, S., Wright, J.T. and Roccella, E.J. (2003). The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. *Journal of the American Medical Association* **289**, 2560-2571.

Christensen, D.B., Williams, B., Goldberg, H.I., Martin, D.P., Engelberg, R. and Logerfo, J.P. (1997). Assessing compliance to antihypertensive medications using computer-based pharmacy records. *Medical Care* **35**, 1164-1170.

Clark, N.M., Gong, M. and Kaciroti, N. (2001). A model of self-regulation for control of chronic disease. *Health Education and Behavior* **28**, 769-782.

Claxton, A.J., Cramer, J. and Pierce, C. (2001). A systematic review of the associations between dose regimens and medication compliance. *Clinical Therapeutics* **23**, 1296-1310.

Clifford, S., Barber, N., Elliott, R., Hartlry, E. and Horne, R. (2006). Patient-centered advice is effective in improving adherence to medicines. *Pharmacy World and Science* **28**, 165-170.

Clifford, S., Barber, N. and Horne, R. (2008). Understanding different beliefs held by adherers, unintentional nonadherers, and intentional nonadherers: application of the necessity-concerns framework. *Psychosomatic Research* **64**, 41-46.

Clifford, S., Garfield, S., Eliasson, L. and Barber, N. (2010). Medication adherence and community pharmacy: a review of education, policy and research in England. *Pharmacy Practice (Internet)* **8**, 77-88. Available at: http://www.pharmacypractice.org/vol08/pdf/077-088.pdf [Accessed: 9 September 2011].

Coleman, V.R. (1985). Physician behaviour and compliance. *Journal of Hypertension Supplement* **3**, S69-S71.

Conlin, P.R., Fox, J., Gerth, W.C. and Boccuzzi, S.J. (2002). Losartan/angiotensin II antagonists have greater persistence than other antihypertensive agents/classes. *American Journal of Hypertension* **15** (supplement 2), 29.

Conner, M. and Armitage, C.J. (1998). Extending the theory of planned behavior: a review and avenues for further research. *Journal of Applied Social Psychology* **28**, 1429-1464.

Conner, M. and Norman, P. (2005). Predicting health behaviour: a social cognition approach. In Predicting health behaviour, M.Conner and P.Norman, eds. Maidenhead: Open University Press, pp. 1-27.

Conner, M. and Sparks, P. (2005). The theory of planned behaviour and health behaviour. In Predicting health behaviour, M.Conner and P.Norman, eds. Maidenhead: Open University Press, pp. 170-222.

Cramer, J.A. (1999). Practical Issues in medication compliance. *Transplantation Proceedings* **31**(4A), 7S-9S.

Cramer, J.A. (2004). A systematic review of adherence with medications for diabetes. *Diabetes Care* **27**, 1218-1224.

Cramer, J.A., Roy, A., Burrell, A., Fairchild, C.J., Fuldeore, M.J., Ollendorf, D.A. and Wong, P.K. (2008). Medication compliance and persistence: Terminology and definitions. *Value in Health* **11,** 44–47.

Daniel, M. and Messer, L.C. (2002). Perceptions of disease severity and barriers to self-care predict glycemic control in Aboriginal persons with type 2 diabetes mellitus. *Chronic Diseases in Canada* **23**, 130-138.

DiMatteo, M.R. (2004a). Variations in patient's adherence to medical recommendations: a Quantitative review of 50 years of research. *Medical Care* **42**, 200-209.

DiMatteo, M.R. (2004b). Social support and patient adherence to medical treatment: a meta-analysis. *Health Psychology* **23**, 207-218.

DiMatteo, M.R. and Hays, R. (1980). The significance of patients' perceptions of physician conduct: a study of patient satisfaction in a family practice center. *Journal of Community Health* **6**, 18-34.

DiMatteo, M.R., Lepper, H.S. and Croghan, T.W. (2000). Depression is a risk factor for noncompliance with medical treatment: meta-analysis of the effects of anxiety and depression on patient adherence. *Archives of Internal Medicine* **160**, 2101-2107.

DiMatteo, M.R., Giordani, P.J., Lepper, H.S. and Croghan, T.W. (2002). Patient adherence and medical treatment outcomes: A Meta-Analysis. *Medical Care* **40**, 794-811.

Dishman, R.K. (1982). Compliance/adherence in health-related exercise. *Health Psychology* **1**, 237-267.

Dodds, F., Brown, A.R. and Parsons, S. (2000). A systematic review of randomized controlled trials that attempt to identify interventions that improve patient compliance with prescribed antipsychotic medication. *Clinical Effectiveness in Nursing* **4**, 47-53.

Donovan, J.L. (1995). Patient decision making: the missing ingredient in compliance research. *International Journal of Technology Assessment in Health Care* **13**, 443-455.

Dowell, J., Jones, A. and Snadden, D. (2002). Exploring medication use to seek concordance with non-adherent patients: a qualitative study. *British Journal of General Practice* **52**, 24-32.

Dowse, R. and Ehlers, M. (2005). Medicine labels incorporating pictograms: do they influence understanding and adherence?. *Patient Education and Counseling* **58**, 63-70.

Eakin, E.G., Reeves, M.M., Bull, S.S., Riley, K.M., Floyd, S. and Glasgow, R.E. (2007). Validation of the Spanish-language version of the chronic illness resources survey. *International Journal of Behavioral Medicine* **14**, 76-85.

Earp, J. and Ory, M. (1979). The effects of social support and health professional home visits on patient adherence to hypertension regimens. *Preventive Medicine* **8**, 155–62.

Ekedahl, A. and Mansoon, N. (2004). Unclaimed prescriptions after automated prescription transmittals to pharmacies. *Pharmacy World and Science* ***26***, 26-31.

Elliott, R.A., Barber, N., Clifford, S., Horne, R. and Hartley, E. (2008). The cost effectiveness of a telephone-based pharmacy advisory service to improve adherence to newly prescribed medicines. *Pharmacy World and Science* **30**, 17-23.

El Mugamer, I.T., Zayat, A.S., Hossain, M.M. and Pugh, R.N. (1995). Diabetes, obesity and hypertension in urban and rural people of bedouin origin in the United Arab Emirates. *Journal of Tropical Medicine and Hygiene* **98**, 407-415.

El-Shahat, Y.I.M., Bakir, S.Z., Farjou, N., Hashim, T., BoHaliga, A., Al-Hossani, H. and Jaffar, A.R. (1999). Hypertension in UAE Citizens-Preliminary Results of a Prospective Study. *Saudi Journal of Kidney Diseases and Transplantation* **10**, 376-381. Available at: http://www.sjkdt.org/temp/saudijkidneydistranspl103376-777476_213547.pdf [Accessed: 21 November 2010].

El-Shazly, M., Abdel-Fattah, M., Zaki, A., Bedwani, R., Assad, S., Tognoni, G. and Nicolucci, A. (2000). Health care for diabetic patients in developing countries: a case from Egypt. *Public Health* **114**, 276-281.

Elzubier, A.G., Husain, A.A., Suleiman, I.A. and Hamid, Z.A. (2000). Drug compliance among hypertensive patients in Kassala, Eastern Sudan. *Eastern Mediterranean Health Journal* **6**, 100-105. Available at: http://www.emro.who.int/publications/emhj/0601/13.htm [Accessed: 13 April 2009].

Fahey, M., Abdulmajeed, A. and Sabra, K. (2006). Measurement of adherence to anti-hypertensive medication as perceived by doctors and patients. *Qatar Medical Journal* **15**, 1-11. Available at: http://www.hmc.org.qa/qmj/qmj2006/JUNE2006/original_studies/org8.htm [Accessed: 10 March 2009].

Fairley, C.K., Permana, A. and Read, T.R. (2005). Long-term utility of measuring adherence by self-report compared with pharmacy record in a routine clinic setting. *HIV Medicine* **6**, 366-369.

Farmer, K.C. (1999). Methods for measuring and monitoring medication regimen adherence in clinical trials and clinical practice. *Clinical Therapeutics* **21**, 1074-1090.

Ficke, D.L. and Farris, K.B. (2005). Use of the Transtheoretical Model in the medication use process. *The Annals of Pharmacotherapy* **39**, 1325-1330.

Fido, A. and Husseini, A. (1998). Noncompliance with treatment among psychiatric patients in Kuwait. *Medical Principles and Practice* **7**, 28-32. Available at: http://content.karger.com/ProdukteDB/produkte.asp?Aktion=ShowPDF&ArtikelNr=26019&ProduktNr=226203&filename=26019.pdf [Accessed 11 March 2009].

Field, A. (2009). Logistic regression. In Discovering statistics using SPSS. 3rd ed. London: Sage.

Fishbein, M. and Ajzen, I. (1975). Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research. New York: Wiley.

Forette, F., Seux, M.L., Staessen, J.A., Thijs, L., Babarskiene, M.R., Babeanu, S., Bossini, A., Fagard, R., Extremera, B.G., Laks, T., Kobalava, Z., Sarti, C., Tuomilehto, J., Vanhanen, H., Webster, J., Yodfat, Y. and Birkenhager, W.H. (2002). The prevention of dementia with antihypertensive treatment. *Archives of Internal Medicine* **162**, 2046-2052.

Gao, X. and Nau, D.P. (2000). Congruence of three self-report measures of medication adherence among HIV patients. *Annals of Pharmacotherapy* **34**, 1117-1122.

Garber, M.C., Nau, D.P., Erickson, S.R., Aikens, J.E. and Lawrence, J.B. (2004). The concordance of self-report with other measures of medication adherence: a summary of the literature. *Medical Care* **42**, 649-652.

Gascon, J.J., Sanchez-Ortuno, M., Llor, B., Skidmore, D. and Saturno, P.J. (2004). Why hypertensive patients do not comply with the treatment: Results from a qualitative study. *Family Practice* **21**, 125–30. Available at: http://fampra.oxfordjournals.org/content/21/2/125.full [Accessed: 10 November 2010].

Gazmararian, J.A., Baker, D.W., Williams, M.V., Parker, R.M., Scott, T.L., Green, D.C., Fehrenbach, S.N., Ren, J. and Koplan, J.P. (1999). Health literacy among medicare enrollees in a managed care organization. *Journal of American Medical Association* **281**, 545-551.

Geisinger, K.F. (1994). Cross-cultural normative assessment: translation and adaptation issues influencing the normative interpretation of assessment instruments. *Psychological Assessment* **6**, 304-312.

Glasgow, R.E., Strycker, L.A., Toobert, D.J. and Eakin, E. (2000). A social-ecologic approach to assessing support for disease self-management: the Chronic Illness Resources Survey. *Journal of Behavioral Medicine* **23**, 559-583.

Gonzalez, J.S., Penedo, J.F., Llabre, M.M., Durán, R.E., Antoni, M.H., Schneiderman, N. and Horne, R. (2007). Physical symptoms, beliefs about medications, negative mood, and long-term HIV medication adherence. *Annals of Behavioral Medicine* **34**, 46-55.

Gonzalez-Fernandez, R.A., Rivera, M., Torres, D., Quiles, J. and Jackson, A. (1990). Usefulness of a systemic hypertension in-hospital educational program. *American Journal of Cardiology* **65**, 1384-6.

Gordis, L., Markowitz, M. and Lilienfeld, A.M. (1969). The inaccuracy in using interviews to estimate patient reliability in taking medications at home. *Medical Care* **7**, 49-54.

Greenhalgh, T., Helman, C. and Chowdhury, A.M. (1998). Health beliefs and folk models of diabetes in British Bangladeshis: a qualitative study. *British Medical Journal* **316**, 978-983. Available at: http://www.bmj.com/content/316/7136/978.full.pdf [Accessed: 12 February 2010].

Grogan, S., Conner, M., Norman, P., Willits, D. and Porter, I. (2000). Validation of a questionnaire measuring patient satisfaction with general practitioner services. *Quality in Health Care* **9**, 210-215.

Gulbay, B.E., Dogan, R., Yildiz, O.A., Gurkan, O.U., Acican, T., Saryal, S., Karabiyikoglu, G. and Kose, K. (2006). Patient's adherence to treatment and knowledge about chronic obstructive pulmonary disease. *Saudi Medical Journal* **27**, 1427-1429. Available at: http://www.smj.org.sa/PDFFiles/Sep06/Brief.pdf [Accessed: 16 April 2009].

Hagger, M.S. and Orbell, S. (2003). A meta-analytic review of the Common-sense Model of illness Representations. *Psychology and Health* **18**, 141-184.

Hamilton, G.A. (2003). Measuring adherence in a hypertension clinical trial. *European Journal of Cardiovascular Nursing* **2**, 219-228.

Hambleton, R.K. and Bollwark, J. (1991). Adapting tests for use in different cultures: Technical issues and methods. *International Test Bulletin* **32**, 3-32.

Hambleton, R.K. and Patsula, L. (1998). Adapting tests for use in multiple languages and cultures. *Social Indicators Research* **45**, 153-171.

Hameen-Anttila, K., Kemppainen, K., Enlund, H., Bush, P.J. and Airaksinen, M. (2004). Do pictograms improve children's understanding of medicines leaflet information?. *Patient Education and Counseling* **55**, 371-378.

Hashmi, S.K., Afridi, M.B., Abbas, K., Sajwani, R.A., Saleheen, D., Frossard, P.M., Ishaq, M., Ambreen, A. and Ahmad, U. (2007). Factors associated with adherence to anti-hypertensive treatment in Pakistan. *PLoS ONE* **2**, e280. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1805684/ [Accessed: 11 March 2009].

Haynes, R.B. (1976). A critical review of the "determinants" of patient compliance with therapeutic regimens. In Compliance with Therapeutic Regimens, D.L.Sackett and R.B.Haynes, eds. Baltimore and London: The Johns Hopkins University Press, pp. 26-39.

Haynes, R.B., McDonald, H.P. and Garg, A.X. (2002). Helping patients follow prescribed treatment. *Journal of American Medical Association* **288**, 2880-2883.

Haynes, R.B., Ackloo, E., Sahota, N., McDonald, H.P. and Yao, X. (2008). Interventions for enhancing medication adherence. Cochrane Database of Systematic Reviews **4**, 1-106. Available at: http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD000011.pub3/pdf [Accessed: 12 January 2009].

Herdman, M., Fox-Rushby, J. and Badia, X. (1998). A model of equivalence in the cultural adaptation of HRQol instruments: the universalist approach. *Quality of Life Research* **7**, 323-335.

Hernandez, C.A. (1997). The development and pilot testing of the diabetes activities questionnaire (TDAQ): an instrument to measure adherence to the diabetes regimen. *Applied Nursing Research* **10**, 202-211.

Hershey, J.C., Morton, B.G., Davis, J.B. and Reichgott, M.J. (1980). Patient compliance with antihypertensive medication. *American Journal of Public Health* **70**, 1081-1089.

Holman, R., Turner, R., Stratton, I., Cull, C., Frighi, V., Manley, S., Matthews, D., Neil, A., Kohner, E., Wright, D., Hadden, D. and Fox, C. (1998). Efficacy of atenolol and captopril in reducing risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 39. *British Medical Journal* **317**, 713-720. Available at: http://www.bmj.com/content/317/7160/713.full?sid=e8b8f179-6e48-4f1f-afa9-c911f93a8907 [Accessed: 23 April 2009].

Hong, T.B., Oddone, E.Z., Dudley, T.K. and Bosworth, H.B. (2006). Medication barriers and anti-hypertensive medication adherence: the moderating role of locus of control. *Psychology, Health and Medicine* **11**, 20-28.

Horne, R. (1997). Representation of medication and treatment: Advances in theory and measurement. In Perceptions of Health and Illness: Current Research and Applications, K.J.Petrie and J.A.Weinman, eds. Amsterdam: Harwood Academic Publishers, pp. 155-188.

Horne, R. (2001). Compliance, adherence and concordance. In Pharmacy Practice, K.Taylor and G.Harding, eds. London: Taylor and Francis, pp. 166-184.

Horne, R. (2003). Treatment perceptions and self-regulation. In The Self-Regulation of Health and Illness Behaviour, L.D.Cameron and H.Leventhal, eds. London: Routledge, pp. 138-153.

Horne, R. (2006). Compliance, adherence, and concordance: implications for asthma treatment. *Chest* **130**, 65S-72S. Available at: http://chestjournal.chestpubs.org/content/130/1_suppl/65S.long [Accessed: 11 May 2009].

Horne, R. and Weinman, J. (1998). Predicting treatment adherence: an overview of theoretical models. In Adherence to Treatment in Medical Conditions, L.B.Myers and K.Midence, eds. Amsterdam: Harwood Academic publishers, pp. 25-50.

Horne, R. and Weinman, J. (1999). Patients' beliefs about prescribed medicines and their role in adherence to treatment in chronic physical illness. *Journal of Psychosomatic Research* **47**, 555-567.

Horne, R. and Weinman, J. (2002). Self-regulation and self-management in asthma: exploring the role of illness perceptions and treatment beliefs in explaining non-adherence to preventer medication. *Psychology and Health* **17**, 17-32.

Horne, R., Weinman, J. and Hankkins, M. (1999). The beliefs about medicines questionnaire: the development and evaluation of a new method for assessing the cognitive representation of medication. *Psychology and Health* **14**, 1-24.

Horne, R., Clatworthy, J., Polmear, A. and Weinman, J. (2001). Do hypertensive patients' beliefs about their illness and treatment influence medication adherence and quality of life?. *Journal of Human Hypertension* **15**, S65-S68.

Horne, R., Buick, D.L., Fisher, M., Leake, H., Cooper, V. and Weinman, J. (2004). Doubts about necessity and concerns about adverse effects: identifying the types of beliefs that are associated with non-adherence to HAART. *International Journal of STD and AIDS* **15**, 38-44.

Horne, R., Weinman, J., Barber, N., Elliott, R., Morgan, M., Cribb, A. and Keller, I. (2005). Concordance, Adherence and Compliance in Medicine Taking: Report for the National Co-ordinating Centre for NHS Service Delivery and Organisation R & D (NCCSDO). Available at: http://www.medslearning.leeds.ac.uk/pages/documents/useful_docs/76-final-report%5B1%5D.pdf [Accessed: 1 December 2008].

Horne, R., Cooper, V., Gellaitry, G., Date, H.L. and Fisher, M. (2007). Patients' perceptions of highly active antiretroviral therapy in relation to treatment uptake and adherence. *Epidemiology and Social Science* **45**, 334-341.

Ibrahim, Y. (2001). Doctor and patient questions as a measure of doctor-centredness in UAE hospitals. *English for specific purposes* **20**, 331-344.

International Pharmaceutical Federation. (2001). FIP Guidelines for the Labels of Prescribed Medicines. Available at: http://www.fip.org/www/uploads/database_file.php?id=256&table_id= [Accessed: 13 September 2010].

International Pharmaceutical Federation. (2003). FIP Statement of Professional Standards on the Role of the Pharmacist in Encouraging Adherence to Long-term Treatments. Available at: http://www.fip.org/www/uploads/database_file.php?id=217&table_id= [Accessed: 13 September 2010].

Inui, T.S., Carter, W.B. and Pecoraro, R.E. (1981). Screening for noncompliance among patients with hypertension: is self-report the best available measure. *Medical Care* **19**, 1061-1064.

Jabbar, M.A. and Al-Shammari, S.A. (1993). Compliance in Saudi epileptic patients: Determinants of compliance in Saudi epileptic patients. *Annals of Saudi Medicine* **13**, 60-63.

Jackson, K.C., Sheng, X., Nelson, R.E., Keskinaslan, A. and Brixner, D.I. (2008). Adherence with multiple combination antihypertensive pharmacotherapies in a US managed care database. *Clinical Therapeutics* **30**, 1558-1563.

James, D. and Horne, R. (2000). The role of patients' perceptions of illness in care-seeking behaviour. In A behavioural approach to pharmacy practice, P.Gard, ed. Oxford: Blackwell Science, pp. 91-110.

Johnson, M. and Folkman, S. (2004). Side effect and disease related symptom representations among HIV+ adults on anti-retroviral therapy. *Psychology, Health and Medicine* **9**, 139-148.

Johnson, M., Williams, M. and Marshall, E.S. (1999). Adherent and nonadherent medication-taking in elderly hypertensive patients. *Clinical Nursing Research* **8**, 318-335.

Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. (1997). The sixth report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Archives of Internal Medicine* **157**, 2413-2446.

Jones, G. (2003). Prescribing and taking medicines. *British Medical Journal* **327**, 819-820. Available at: http://www.bmj.com/content/327/7419/819.full [Accessed: 14 August 2011].

Joseph, A., Franklin, B.D. and James, D. (2004). An evaluation of a hospital-based patient medicines information helpline. *The Pharmaceutical Journal* **272**, 126-129.

Kamel, N.M., Badawy, Y.A., El-Zeiny, N.A. and Merdan, I.A. (1999). Sociodermographic determinants of management behaviour of diabetic patients. Part I. Behaviour of patients in relation to management of their disease. *Eastern Mediterranean Health Journal* **5**, 967-973. Available at: http://www.emro.who.int/publications/emhj/0505/14.htm [Accessed: 21 February 2009].

Kaona, F.A., Tuba, M., Siziya, S. and Sikaona, L. (2004). An assessment of factors contributing to treatment adherence and knowledge of TB transmission among patients on TB treatment. *BMC Public Health* **4**, 68. Available at: http://www.biomedcentral.com/1471-2458/4/68 [Accessed: 5 August 2010].

Karaeren, H., Yokusoglu, M., Uzun, S., Baysan, O., Koz, C., Kara, B., Kyrylmaz, A., Naharcy, Y., Pynar, M., Yylmaz, M. and Uzun, M. (2009). The effect of the content of the knowledge on adherence to medication in hypertensive patients. *Anadolu Kardiyol Derg* **9**, 183-8. Available at: http://www.anakarder.com/sayilar/53/183-188.pdf [Accessed: 11 September 2011]

Kelly, G.R., Mamon, J.A. and Scott, J.E. (1987). Utility of the health belief model in examining medication compliance among psychiatric outpatients. *Social Science and Medicine* **25**, 1205-1211.

Kendrew, P., Ward, F., Buick, D., Wright, D. and Horne, R. (2001). Satisfaction with information and its relationship with adherence in patients with chronic pain. *The International Journal of Pharmacy Practice* **9**: R5.

Kerse, N., Buetow, S., Mainous, A.G., Young, G., Coster, G. and Arroll, B. (2004). Physician-Patient Relationship and Medication Compliance: A Primary Care Investigation. *Annals of Family Medicine* **2**, 455-461.

Khalil, S.A. and Elzubier, A.G. (1997). Drug compliance among hypertensive patients in Tabuk, Saudi Arabia. *Journal of Hypertension* **15,** 561-565.

Khattab, M.S., Abolfotouh, M.A., Khan, M.Y., Humaidi, M.A. and AlKaldi, Y.M. (1999). Compliance and control of diabetes in a family practice setting, Saudi Arabia. *Eastern Mediterranean Health Journal* **5**, 755-765. Available at: http://www.emro.who.int/publications/emhj/0504/13.htm [Accessed: 21 January 2009].

Kirscht, J.P. and Rosenstock, I.M. (1977). Patient adherence to antihypertensive medical regimens. *Journal of Community Health* **3**, 115-124.

Kjellgren, K.I., Ahlner, J. and Saljo, R. (1995). Taking antihypertensive medication-controlling or co-operating with patients?. *International Journal of Cardiology* **47**, 257-268.

Kjellgren, K.I., Svensson, S., Ahlner, J. and Saljo, R. (1998). Antihypertensive medication in clinical encounters. *International Journal of Cardiology* **64**, 161-169.

Kjellgren, K.I., Svensson, S., Ahlner, J. and Saljo, R. (2000). Antihypertensive treatment and patient autonomy-the follow-up appointment as a resource for care. *Patient Education and Counseling* **40**, 39-49.

Kramer, H., Han, C., Post, W., Goff, D., Diez-roux, A., Cooper, R., Jinagouda, S. and Shea, S. (2004). Racial/ethnic differences in hypertension and hypertension treatment and control in the multi-ethnic study of atherosclerosis (MESA). *American Journal of Hypertension* **17**, 963-970.

Kvale, S. (1996). Interviews: An Introduction to Qualitative Research Interviewing. London: Sage publications.

Lautenschlager, L. and Smith, C. (2006). Low-income American Indians' perceptions of diabetes. *Journal of Nutrition Education and Behavior* **38**, 307-315.

Law, G.U., Kelly, T.P., Huey, D. and Summerbell, C. (2002). Self-management and well-being in adolescents with diabetes mellitus: do illness representations play a regulatory role?. *Journal of Adolescent Health* **31**, 381-385.

Levenson, H. (1973). Multidimensional locus of control in psychiatric patients. *Journal of Consulting and Clinical Psychology* **41**, 397-404.

Leventhal, H. (1993). Theories of compliance, and turning necessities into preferences: application to adolescent health action. In Development Aspects of Health Compliance Behaviour, N.Krasnegor, L.Epstein, S.Johnson and S.Yaffe, eds. Hillsdale, NJ: Laurence Erlbaum Associates.

Leventhal, H., Diefenbach, M. and Leventhal, E.A. (1992). Illness cognition: using common sense to understand treatment adherence and affect cognition interactions. *Cognitive Therapy and Research* **16**, 143-163.

Leventhal, H., Leventhal, E.A. and Contrada, R.J. (1998). Self-regulation, health, and behavior: a perceptual-cognitive approach. *Psychology and Health* **13**, 717-733.

LIewellyn, C.D., Miners, A.H., Lee, C.A., Harrington, C. and Weinman, J. (2003). The illness perceptions and treatment beliefs of individuals with severe haemophilia and their role in adherence to home treatment. *Psychology and Health* **18**, 185-200.

Liu, Q., Abba, K., Alejandria, M.M., Balanag, V.M., Berba, R.P. and Lansang, M.A.D. (2008). Reminder systems and late patient tracers in the diagnosis and management of tuberculosis. Cochrane Database of Systematic Reviews **4**, 1-37. Available at: http://www.thecochranelibrary.com/userfiles/ccoch/file/CD006594.pdf [Accessed: 11 May 2009].

Lutfey, M., Della-Latta, P., Kapur, V., Palumbo, L.A., Gurner, D., Stotzky, G., Brudney, K., Dobkin, J., Moss, A., Musser, J.M. and Kreiswirth, B.N. (1996). Independent origin of mono-rifampin-resistant Mycobacterium tuberculosis in patients with AIDS. *American Journal of Respiratory and Critical Care Medicine* **153**, 837-840.

Lynam, I., Catley, D., Goggin, K., Rabinowitz, J., Gerkovich, M.M., Williams, K. and Wright, J. (2009). Autonomous Regulation and Locus of Control as Predictors of Antiretroviral Medication Adherence. *Journal of Health Psychology* **14**, 578-586.

Mannion, A.F., Junge, A., Fairbank, J.C.T., Dvorak, J. and Grob, D. (2006). Development of a German version of the oswestry disability index. Part 1: cross-cultural adaptation, reliability, and validity. *European Spine Journal* **15**, 55-65.

Martin, L.R., Williams, S.L., Haskard, K.B. and DiMatteo, M.R. (2005). The challenge of patient adherence. *Therapeutics and Clinical Risk Management* **1**, 189-199.

McInnes, G.T. (1999). Integrated approaches to management of hypertension: promoting treatment acceptance. *American Heart Journal* **138** (3 part 2), S252-S255.

Meichenbaum, D. and Turk, D.C. (1987). Factors affecting adherence. In facilitating Treatment Adherence: A Practitioner's Guidebook, D.Meichenbaum and D.C.Turk, eds. New York and London: Plenum Press, pp. 41-68.

Melnyk, P., Shevchuk. and Remillard, A. (2000). Impact of the dial access drug information service on patient outcome. *Annals of Pharmacotherapy* **34**, 585-591.

Meyer, D., Leventhal, H. and Gutmann, M. (1985). Common-sense models of illness: the example of hypertension. *Health Psychology* **4**, 115-135.

Michie, S., Miles, J. and Weinman, J. (2003). Patient-centredness in chronic illness: what is it and does it matter?. *Patient Education and Counseling* **51**, 197-206.

Ministry of Health of the United Arab Emirates. (2004). Annual report of year 2004. Available at: www.moh.gov.ae [Accessed: 13 May 2009].

Molassiotis, A., Nahas-Lopez, V., Chung, W.Y., Lam, S.W., Li, C.K. and Lau, T.F. (2002). Factors associated with adherence to antiretroviral medication in HIV-infected patients. *International Journal of STD and AIDS* **13**, 301-310.

Monane, M., Bohn, R.L., Gurwitz, J.H., Glynn, R.J., Levin, R. and Avorn, J. (1996). Compliance with antihypertensive therapy among elderly Medicaid enrolees: the roles of age, gender, and race. *American Journal of Public Health* **86**, 1805-1808.

Monane, M., Bohn, R.L., Gurwitz, J.H., Glynn, R.J., Levin, R. and Avorn, J. (1997). The effects of initial drug choice and comorbidity on antihypertensive therapy compliance. *American Journal of Hypertension* **10**, 697-704.

Morgan, M. (1996). Perceptions and use of anti-hypertensive drugs among cultural groups. In modern medicine: Lay perspectives and experiences, S.J.Williams and M.Calnan, eds. London: UCL Press.

Morisky, D.E., Green, L.W. and Levine, D.M. (1986). Concurrent and predictive validity of a self-reported measure of medication adherence. *Medical Care* **24**, 67-74.

Morisky, D.E., Ang, A., Krousel-Wood, M. and Ward, H. (2008). Predictive Validity of a Medication Adherence Measure for Hypertension Control. *Journal of Clinical Hypertension* **10**, 348-354.

MRC. (2008). Developing and evaluating complex interventions: new guidance. A report by the Medical Research Council, London. Available at: http://www.sphsu.mrc.ac.uk/Complex_interventions_guidance.pdf [Accessed: 11 March 2011].

MRC working party. (1992). Medical research council trial of treatment of hypertension in older adults: principal results. *British Medical Journal* **304**, 405-412. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1995577/ [Accessed: 1 June 2009].

Moss-Morris, R., Weinman, J., Petrie, K.J., Horne, R., Cameron, L.D. and Buick, D. (2002). The revised illness perception questionnaire (IPQ-R). *Psychology and Health* **17**, 1-16.

Munger, M.A. (2000). Critical overview of antihypertensive therapies: what is preventing us from getting there?. *American Journal of Managed Care* **6,** S211-S221.

Munro, S.A., Lewin, S.A., Smith, H.J., Engel, M.E., Fretheim, A. and Volmink, J. (2007). Patient Adherence to Tuberculosis Treatment: A Systematic Review of Qualitative Research. *PLoS Medicine* **4**(7), e238. Available at: http://www.plosmedicine.org/article/info:doi/10.1371/journal.pmed.0040238 [Accessed: 10 June 2011].

Myers, L. and Myers, F. (1999). The relationship between control beliefs and self-reported adherence in adults with cystic fibrosis. *Psychology, Health and Medicine* **4**, 387–391.

Naik, A.D., Kallen, M.A., Walder, A. and Street, R.L. (2008). Improving hypertension control in diabetes mellitus: the effect of collaborative and proactive health communication. *Circulation* **117**, 1361-1368. Available at: http://circ.ahajournals.org/content/117/11/1361.full [Accessed: 4 November 2008].

Nelson, E., Stason, W., Neutra, R. and Solomon, H. (1980). Identification of the noncompliant hypertensive patient. *Preventive Medicine* **9,** 504–517.

Norman, P. and Bennett, P. (1996). Health locus of control. In Predicting Health Behaviour, M.Conner and P.Norman, eds. Buckingham: Open University Press, pp. 62-94.

Nuesch, R., Schroeder, K., Dieterle, T., Martina, B. and Battegay, E. (2001). Relation between insufficient response to antihypertensive treatment and poor compliance with treatment: a prospective case-control study. *British Medical Journal* **323**, 142-146. DOI: 10.1136/bmj.323.7305.142 [Accessed: 13 June 2009].

Okano, G.J., Rascati, K.L., Wilson, J.P., Remund, D.D., Grabenstein, J.D. and Brixner, D.I. (1997). Patterns of antihypertensive use among patients in the US department of defense database initially prescribed an angiotensin-converting enzyme inhibitor or calcium channel blocker. *Clinical Therapeutics* **19**, 1433-1445.

Oppenheim, A.N. (1993). Questionnaire design, interviewing and attitude measurement. 2nd ed. New York, London: Printer Publishers Ltd.

O'Rorke, J.E. and Richardson, W.S. (2001). Evidence based management of hypertension: what to do when blood pressure is difficult to control. *British Medical Journal* **322**, 1229-1232. Available at: http://www.bmj.com/content/322/7296/1229.full [Accessed 11 August 2009].

Palardy, N., Greening, L., Ott, J., Holderby, A. and Atchison, J. (1998). Adolescents' health attitudes and adherence to treatment for insulin-dependent diabetes mellitus. *Journal of Developmental and Behavioral Pediatrics* **19**, 31–37.

Partridge, A.H., Avorn, J., Wang, P.S. and Winer, E.P. (2002). Adherence to therapy with oral antineoplastic agents. *Journal of the National Cancer Institute* **94**, 652-661.

Patel, R.P. and Taylor, S.D. (2002). Factors affecting medication adherence in hypertensive patients. *The Annals of Pharmacotherapy* **36**, 40-45.

Patton, M.Q. (1990). Qualitative evaluation and research methods. London: Sage Publications.

Peng, C.J., Lee, K.L. and Ingersoll, G.M. (2002). An introduction to logistic regression analysis and reporting. *The Journal of Educational Research* **96**, 3-14.

Peterson, J.C., Adler, S., Burkart, M., Greene, T., Hebert, L.A., Hunsicker, L.G., King, A.J., Klahr, S., Massry, S.G. and Seifter, J.L. (1995). Blood pressure control, proteinuria, and the progression of renal disease. *Annals of Internal Medicine* **123**, 754-762.

Petrie, K. J., Cameron, L. D., Ellis, C. J., Buick, D. and Weinman, J. (2002). Changing illness perceptions after myocardial infarction: an early intervention randomized controlled trial. *Psychosomatic Medicine* **64**, 580-586.

Pham, H.T., Gause, D. and Frech, F. (2001). Discontinuation, switching and adding among antihypertensive drug classes. *American Journal of Hypertension* **14** (supplement 2), 112.

Piette, J.D., Heisler, M. and Wagner, T.H. (2004). Problem paying out-of-pocket medication costs among older adults with diabetes. *Diabetes Care* **27**, 384-391.

Pimm, T.J. and Weinman, J. (1998). Applying Leventhal's self-regulation model to adaptation and intervention in rheumatic disease. *Clinical Psychology and Psychotherapy* **5**, 62-75.

Pohjanoksa-Mantyla, M. and Airaksinen, M. (2004). Drug information via telepharmacy- Whom to serve?. *International Pharmacy Journal* **18**, 16-18.

Pollock, K. (2001). 'I've not asked him, you see, and he's not said: understanding lay explanatory models of illness is a pre-requisite for concordant consultations. *International Journal of Pharmacy Practice* **9**, 105-117.

Pound, P., Britten, N., Morgan, M., Yardley, L., Pope, C., Daker-White, G. and Campbell, R. (2005). Resisting medicines: a synthesis of qualitative studies of medicine taking. *Social Science and Medicine* **61**, 133-155.

Prochaska, J.O. and DiClemente, C.C. (1984). The transtheoretical approach: crossing the traditional boundaries of therapy. Homewood, IL: Irwin.

Prochaska, J.O., DiClemente, C.C. and Norcross, J.C. (1992). In search of how people change: Applications to addiction behaviors. *American Psychologist* **47**, 1102-1114.

Prochaska, J.O., DiClemente, C.C., Velicer, W.F. and Rossi, J.S. (1993). Standardized, individualized, interactive, and personalized self-help programs for smoking cessation. *Health Psychology* **12**, 399-405.

Prochaska, J.O., Velicer, W.F., Rossi, J.S., Goldstein, M.G., Marcus, B.H., Rakowski, W., Fiore, C., Harlow, L.L., Redding, C.A., Rosenbloom, D. and Rossi, S.R. (1994). Stages of change and decisional balance for 12 problem behaviors. *Health Psychology* **13**, 39-46.

Qureshi, N.N., Hatcher, J., Chaturvedi, N. and Jafar, T.H. (2007). Effect of general practitioner education on adherence to antihypertensive drug: cluster randomised controlled trial. *British Medical Journal* **335**, 1030. Available at: http://www.bmj.com/content/335/7628/1030 [Accessed 12 July 2011].

Rao, G.G. (1998). Risk factors for the spread of antibiotic-resistant bacteria. *Drugs* **55**, 323-330.

Rashid, A. (1982). Do patients cash prescriptions?. *British Medical Journal* (Clinical research ed.) ***284***, 24-26. DOI: 10.1136/bmj.284.6308.24 [Accessed: 11 November 2008].

Raynor, D.K. (1998). The influence of written information on patient knowledge and adherence to treatment. In Adherence to treatment in medical condition, L.B. Myers and K. Midence, eds. Amsterdam: Harwood Academic Publishers, pp. 83-112.

Rees, G., Leong, O., Crowston, J.G. and Lamoureux, E.L. (2010). Intentional and unintentional nonadherence to ocular hypotensive treatment in patients with glaucoma. *Ophthalmology* **117**, 903-908.

Reid, L.D. and Christensen, D.B. (1988). A psychosocial perspective in the explanation of patients' drug-taking behavior. *Social Science and Medicine* **27**, 277-285.

Reid, L.D., Oleen, M.A., Martinson, O.B. and Pluhar, R. (1985). Explaining intention to comply with antihypertensive regimens: the utility of health beliefs and the theory of reasoned action. *Journal of Social and Administrative Pharmacy* **3**, 42-52.

Remien, R.H., Hirky, E.A., Johnson, M.O., Weinhardt, L.S., Whittier, D. and Le, G.M. (2003). Adherence to Medication Treatment: A qualitative Study of Facilitators and Barriers among a Diverse Sample of HIV+ Men and Women in Four U.S. Cities. *AIDS and Behavior* **7**, 61-72.

Ritchie, J. and Spencer, L. (1994). Qualitative data analysis for applied policy research. In Analyzing Qualitative Data, A.Bryman and R.G.Burgess, eds. London: Routledge, pp. 173-194.

Rizzo, J.A. and Simons, W.R. (1997). Variations in compliance among hypertensive patients by drug class: implications for health care costs. *Clinical Therapeutics* **19**, 1446-1457.

Roaeid, R.B. and Kablan, A.H.A. (2007). Profile of diabetes health care at Benghazi Diabetes Centre, Libyan Arab Jamahiriya. *Eastern Mediterranean Health Journal* **13**, 168-176. Available at: http://www.emro.who.int/publications/emhj/1301/article20.htm [Accessed: 11 March 2009].

Roberson, M.H.B. (1992). The meaning of compliance: patient perspectives. *Qualitative Health Research* **2**, 7-26.

Rogers, R.W. (1975). A protection motivation theory of fear appeals and attitude change. *The Journal of Psychology* **91**, 93-114.

Rosenstock, I.M. (1966). Why people use health services. *Milbank Memorial Fund Quarterly* **44** (supplement 3), 94-127.

Ross, S., Walker, A. and Macleod, M. J. (2004). Patient compliance in hypertension: role of illness perceptions and treatment beliefs. *Journal of Human Hypertension* **18**, 607-613.

Rotter, J.B. (1954). Social Learning and Clinical Psychology. New York: Prentice-Hall.

Rotter, J.B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs* **80**, 1-28.

Royal Pharmaceutical Society of Great Britain. (1997). From compliance to concordance: achieving shared goals in medicine taking. London: Royal Pharmaceutical Society of Great Britain.

Royal Pharmaceutical Society of Great Britain. (2011). Support for New Medicine Service. London: Royal Pharmaceutical Society of Great Britain. Available at: http://www.rpharms.com/nhs-community-pharmacy-contract-england/new-medicine-service.asp [Accessed: 15 September 2011]

Saberi, M. (2009). Hypertension affecting 36% of UAE population, Gulf News. Available at: http://gulfnews.com/news/gulf/uae/health/hypertension-affecting-36-of-uae-population-1.531980 [Accessed: 13 May 2011].

Sabri, S., Bener, A., Eapen, V., Abu Zeid, M.S.O., Al-Mazrouei, A.M. and Singh, J. (2004). Some risk factors for hypertension in the United Arab Emirates. *Eastern Mediterranean Health Journal* **10**, 610-619. Available at: http://www.emro.who.int/publications/emhj/1004_5/Some.htm [Accessed: 16 May 2009].

Sackett, D.L. (1976a). Introduction. In Compliance with Therapeutic Regimens, D.L Sackett and R.B.Haynes, eds. Baltimore: The Johns Hopkins University Press, pp. 1-6.

Sackett, D.L. (1976b). The magnitude of compliance and non-compliance. In Compliance with Therapeutic Regimens, D.L.Sackett and R.B.Haynes, eds. Baltimore: The Johns Hopkins University Press, pp. 9-25.

Sakthong, P., Chabunthom, R. and Charoenvisuthiwongs, R. (2009). Psychometric Properties of the Thai Version of the 8-item Morisky Medication Adherence Scale in Patients with Type 2 Diabetes. *The Annals of Pharmacotherapy* **43**, 950-957.

Saounatsou, M., Patsi, O., Fasoi, G., Stylianou, M., Kavga, A., Economou, O., Mandi, P. and Nicolaou, M. (2001). The influence of the hypertensive patient's education in compliance with their medication. *Public Health Nursing* **18**, 436-442.

Schafheutle, E.I., Hassell, K., Noyce, P.R. and Weiss, M.C. (2002). Access to medicines: cost as an influence on the views and behaviour of patients. *Health and Social Care in the Community* **10**, 187-195.

Schroeder, K., Fahey, T. and Ebrahim, S. (2004). Interventions for improving adherence to treatment in patients with high blood pressure in ambulatory settings. Cochrance Database Systematic Reviews: 1-31. Available at: http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD004804/abstract [Accessed: 22 October 2009].

Schroeder, K., Fahey, T., Hay, A.D., Montgomery, A. and Peters, T.J. (2006). Adherence to antihypertensive medication assessed by self-report was associated with electronic monitoring compliance. *Journal of Clinical Epidemiology* **59,** 650-651.

Schwarzer, R. and Fuchs, R. (1996). Self-efficacy and health behaviours. In Predicting Health Behaviour, M.Conner and P.Norman, eds. Buckingham: Open University Press, pp. 163-196.

Sharkness, C.M. and Snow, D.A. (1992). The patients view of hypertension and compliance. *American Journal of Preventive Medicine* **8,** 141-146.

Sheeran, P. and Abraham. (1996). The Health Belief Model. In Predicting Health Behaviour, M.Conner and P.Norman, eds. Buckingham: Open University Press, pp. 23-61.

Sheikh, K. and Bullock, C. (2001). Urban-Rural Differences in the Quality of Care for Medicare Patients with Acute Myocardial Infarction. *Archives of Internal Medicine* **161**, 737-743.

Shemesh, E., Shneider, L., Savitzky, J.K., Arnott, L., Gondolesi, G.E., Krieger, N.R., Kerkar, N., Magid, M.S., Stuber, M.L., Schmeidler, J., Yehuda, R. and Emre, S. (2004). Medication adherence in paediatric and adolescent liver transplant recipients. *Pediatrics* **113**, 825-832.

Siegel, K., Schrimshaw, E.W. and Dean, L. (1999). Symptom interpretation and medicine adherence among late middle age and older HIV infected adults. *Journal of Health Psychology* **4**, 247-257.

Skelly, A.H., Marshall, J.R., Haughey, B.P., Davis, P.J. and Dunford, R.G. (1995). Self-efficacy and confidence in outcomes as determinants of self-care practices in inner-city, African-American women with non-insulin-dependent diabetes. *The Diabetes Educator* **21,** 38-46.

Smith, F. (2002). Research Methods in Pharmacy Practice. London: Pharmaceutical Press.

Stanton, A.L. (1987). Determinants of adherence to medical regimens by hypertensive patients. *Journal of Behavioral Medicine* **10**, 377–394.

Stephenson, B.J., Rowe, B.H., Haynes, R.B., Macharia, W.M. and Leon, G. (1993). Is this patient taking the treatment as prescribed?. *Journal of American Medical Association* **269**, 2779-2781.

Stevenson, F.A., Cox, K., Britten, N. and Dundar, Y. (2004). A systematic review of the research on communication between patients and health care professional about medicines: the consequences for concordance. *Health Expectations* **7**, 235-245.

Straka, R.J., Fish, J.T., Benson, S.R. and Suh, J.T. (1997). Patient self-reporting of compliance does not correspond with electronic monitoring: an evaluation using isosorbide dinitrate as a model drug. *Pharmacotherapy* **17**, 126-132.

Sumartojo, E. (1993). When tuberculosis treatment fails. A social behavioural account of patient adherence. *American Review of Respiratory Disease* **147**, 1311-1320.

Svensson, S., Kjellgren, K.I., Ahlner, J. and Saljo, R. (2000). Reasons for adherence with antihypertensive medication. *International Journal of Cardiology* **76**, 157-163.

The NHS Information Centre for health and social care. (2008). National Quality and Outcomes Framework Statistics for England 2007/08. Available at: http://www.ic.nhs.uk/webfiles/QOF/2007-08/QOF%20200708%20Statistical%20Bulletin.pdf [Accessed: 1 August 2009].

The World Bank. (2011a). Rural population (% of total population). Available at: http://data.worldbank.org/indicator/SP.RUR.TOTL.ZS [Accessed: 17 July 2011].

The World Bank. (2011b). The Road Not Travelled: Education Reform in the Middle East and North Africa (investment in Education, part 1). Available at: http://go.worldbank.org/JLMVU0I6R0 [Accessed: 9 September 2011]

Theunissen, N.C., deRidder, D.T., Bensing, J.M., and Rutten, G.E. (2003). Manipulation of patient-provider interaction: discussing illness representations or action plans concerning adherence. *Patient Education and Counseling* **51**, 247-258.

Twinn, S. (1994). An exploratory study of the health status and health behaviours of women in Hong Kong: the implications for nursing practice. *Asian Journal of Nursing studies* **1**, 30-36.

Twinn, S. (1997). An exploratory study examining the influence of translation on the validity and reliability of qualitative data in nursing research. *Journal of Advanced Nursing* **26**, 418-423.

Van Der Wal, M.H.L., Jaarsma, T. and Van Veldhuisen, D.J. (2005). Non-compliance in patients with heart failure; how can we manage it?. *European Journal of Heart Failure* **7**, 5-17.

Van Es, S.M., Kaptein, A.A., Bezemer, P.D., Nagelkerke, A.F., Colland, V.T. and Bouter, L.M. (2002). Predicting adherence to prophylactic medication in adolescents with asthma: an application of the ASE-model. *Patient Education and Counseling* **47**, 165-171.

Vermeire, E., Hearnshaw, H., Van, R.P. and Denekens, J. (2001). Patient adherence to treatment: three decades of research: a comprehensive review. *Journal of Clinical Pharmacy and Therapeutics* **26**, 331-342.

Vermeire, E., Van Royen, P., Coenen, S., Wens, J. and Denekens, J. (2003). The adherence of type 2 diabetes patients to their therapeutic regimens: a qualitative study from the patient's perspective. *Practical Diabetes International* **20**, 209-214.

Vitolins, M.Z., Rand, C.S., Rapp, S.R., Ribisl, P.M. and Sevick, M.A. (2000). Measuring adherence to behavioural and medical interventions. *Controlled Clinical Trials* **1**, 188S-194S.

Wagner, E.H. (1998). Chronic disease management: what will it take to improve care for chronic illness?. *Effective Clinical Practice* **1**, 2-4.

Wagner, E.H., Austin, B.T. and Von, K.M. (1996). Organizing care for patients with chronic illness. *The Milbank Quarterly* **74**, 511-544.

Wallston, B.D. and Wallston, K.A. (1978). Locus of control and health: a review of the literature. *Health Education Monographs* **6**, 107-117.

Wallston, K.A., Kaplan, G.D. and Maides, S.A. (1976). Development and validation of the health locus of control (HLC) scale. *Journal of Consulting and Clinical Psychology* **44**, 580-585.

Wallston, K.A., Stein, M.J. and Smith, C.A. (1994). Form C of the MHLC scales: A condition-specific measure of locus of control. *Journal of Personality Assessment* **63**, 534-553.

Walsh, J.C., Lynch, M., Murphy, A.W. and Daly, K. (2004). Factors influencing the decision to seek treatment for symptoms of acute myocardial infarction: an evaluation of the Self-Regulatory Model of illness behaviour. *Journal of Psychosomatic Research* **56**, 67-73.

Wang, P.S., Bohn, R.L., Knight, E., Glynn, R.J., Mogun, H. and Avorn, J. (2002). Noncompliance with antihypertensive medications: the impact of depressive symptoms and psychological factors. *Journal of General Internal Medicine* **17**, 504-511.

Wang, P.S., Avon, J., Brookhart, A., Mogun, H., Schneeweiss, S., Fischer, M.A. and Glynn, R.J. (2005). Effects of noncardiovascular comorbidities on antihypertensive use in elderly hypertensives. *Hypertension* **46**, 273-279. DOI: doi:10.1161/01.HYP.0000172753.96583.e1 [Accessed: 24 May 2009].

Waterhouse, D.M., Calzone, K.A., Mele, C. and Brenner, D.E. (1993). Adherence to oral tamoxifen: a comparison of patient self-report, pill counts, and microelectronic monitoring. *Journal of Clinical Oncology* **11**, 1189-1197.

Weinman, J., Petrie, K.L., Moss-Morris, R. and Horne, R. (1996). The illness perception questionnaire: a new method for assessing the cognitive representation of illness. *Psychology and Health* **11**, 431-445.

Weiss, M.C., Montgomery, A.A., Fahey, T. and Peters, T.J. (2004). Decision analysis for newly diagnosed hypertensive patients: a qualitative investigation. *Patient Education and Counseling* **53**, 197-203.

Werner, O. and Campbell, D.R. (1970). Translating, working through interpreters and problems of decentring. In A handbook of method in cultural anthropology, R.Naroll and R.Cohen, eds. New York: Columbia University Press, pp. 389-420.

Wetzels, G.E.C., Nelemans, P.J., Schouten, J.S., Van Wijk, B.L.G. and Prins, M.H. (2006). All that glisters is not gold: a comparison of electronic monitoring versus filled prescriptions-an observational study. *BMC Health Services Research* **6**, 1-6. Available at: http://www.biomedcentral.com/1472-6963/6/8 [Accessed: 19 June 2010].

Whitmarsh, A., Koutantji, M. and Sidell, K. (2003). Illness perceptions, mood and coping in predicting attendance at cardiac rehabilitation. *British Journal of Health Psychology* **8**, 209-221.

WHO. (1999). International society of hypertension guidelines for the management of hypertension. *Journal of Hypertension* **17**, 151-83.

WHO. (2003). Adherence to long-term therapies: evidence for action. Geneva (Switzerland). Available at: http://www.who.int/chp/knowledge/publications/adherence_report/en/ [Accessed: 12 November 2008].

WHO. (2006). Country Cooperation Strategy for WHO and the United Arab Emirates (2005- 2009). Regional Office for the Eastern Mediterranean (Cairo). Available at: http://www.who.int/countryfocus/cooperation_strategy/ccs_are_en.pdf [Accessed: 13 January 2011].

WHO. (2011). Global health observatory (GHO): Raised blood pressure. Available at: http://www.who.int/gho/ncd/risk_factors/blood_pressure_prevalence_text/en/index.html [Accessed: 5 May 2011].

WHO/EMRO (Regional office for the Eastern Mediterranean). (2005). Clinical guidelines for the management of hypertension. EMRO Technical Publications Series 29 (Cairo). Available at: http://www.emro.who.int/dsaf/dsa234.pdf [Accessed: 6 August 2011].

WHO/ISH. (2003). world health organization (WHO)/International society of hypertension (ISH) statement on management of hypertension. *Journal of Hypertension* **21**, 1983-1992.

Williams, B., Poulter, N.R., Brown, M.J., Davis, M., McInnes, G.T., Potter, J.F., Sever, P.S. and Thom, S. (2004). British hypertension society guidelines for hypertension management 2004 (BHS-IV): summary. *British Medical Journal* **328**, 634-926. Available at: http://www.bmj.com/content/328/7440/634.full [Accessed: 12 April 2009].

Wing, R.R., Phelan, S. and Tale, D. (2002). The role of adherence in mediating the relationship between depression and health outcomes. *Journal of Psychosomatic Research* **53**, 877-881.

Wogen, J., Kreilick, C.A., Livornese, R.C. and Frech, F. (2001). A population-based study of compliance and persistency with cardiovascular agents used in hypertension management. *American Journal of Hypertension* **14** (supplement 2), 112A.

Wolf, M.H., Putnam, S.M., James, A.J. and Stiles, W.B. (1978). The medical interview satisfaction scale: development of a scale to measure patient perceptions of physician behavior. *Journal of Behavioral Medicine* **1**, 391–401.

Wright, J.M. (2000). Choosing a first-line drug in the management of elevated blood pressure: what is the evidence? 1: thiazide diuretics. *Canadian Medical Association Journal* **163**, 57-60.

Wroe, A.L. (2002). Intentional and unintentional non-adherence: a study of decision making. *Journal of Behavioral Medicine* **25**, 355-372.

Yin, X., Savage, C., Toobert, D., Wei, P. and Whitmer, K. (2008). Adaptation and testing of instruments to measure diabetes self-management in people with type 2 diabetes in mainland China. *Journal of Transcultural Nursing* **19**, 234-242.

Youssef, R. and Moubarak, I.I. (2002). Patterns and determinants of treatment compliance among hypertensive patients. *Eastern Mediterranean Health Journal* **8**, 1-12. Available at: http://www.emro.who.int/publications/emhj/0804_5/Patterns.htm [Accessed: 11 January 2009].

Zaghloul, S.S. and Goodfield, M.J.D. (2004). Objective assessment of compliance with psoriasis treatment. *Archives of Dermatology* **140**, 408-414.

# Appendices

## APPENDIX 1: INTERVIEW TOPIC GUIDE (ENGLISH AND ARABIC VERSIONS)

Participant number: Date:

**Interview with patient**

| Notes to interviewer |
| --- |
| To be spoken out loud (standard) |
| **Things for the interviewer to remember (bold)** |
| Prompts to be used as needed (*italic*) |

Patients have identified several issues regarding their medication-taking behaviour and we are interested in your experiences. The purpose of this study is to find out how hypertensive patients, like yourself, feel about their antihypertensive medications. You have the right not to participate in the study or withdraw at any time later. However if you participate, you will help us improving the quality of care given to hypertensive patients in the UAE.

Please feel free to tell us about your experiences and views regarding the use of medicines. There are no right or wrong answers; we are only interested in your personal views.

**Assure confidentiality of the information provided by the patient, and that the quality of care they receive will not be affected by any information they provide.**

**Request permission to tape-record**

**Ensure consent form is completed**

---

1. Do you know what medicines you are taking at present? I am interested in all medicines you are using. ☐

Please could you tell me what you know about the medicine [NAME] that you take?

**Ask about all of the medication and get detail of each.**

**For each, ask:** *What do you take this for?*

*How many times do you take this and how?*

2. Could you tell me whether you are taken any herbal medication? ☐

**If yes,** *what herbal medicine do you take, please provide the name(s)?*

*What do you take [NAME] for?*

*How often do you take it?*

3. What do you believe your medicines do? ☐

*Can you describe your experience of taking your medicines?*

**Is it positive or negative,** *Could you explain more please?*

4. Can you remember a time where you have not taken your medication as prescribed by your doctor? ☐

**If yes,** *can you tell me what happened?*

5. Some people alter the use of their medication, and find their own way of using them for many reasons. Can you think of a time when you have done that? ☐

**If yes,** *can you tell me more about that?*

6. Some people want to take their medication as prescribed by their doctors but fail to do that for a reason or another. Have you been in that situation? ☐

**If yes,** *can you explain more?*

7. What kind of relationship do you have with your healthcare providers such as doctors, pharmacist and nurses? ☐

*Can you tell me more about it?*

**Request for more details so a full picture is obtained about the degree of patient satisfaction's with the healthcare providers.**

8. Why do you think people have blood pressure? ☐

*Any more reasons?*

*Which one do you think applied to you?*

9. In your opinion, how should hypertension best be treated? ☐

*Is there any other ways that you can think off?*

*10. What about diet and exercise?* ☐

*11. Do you attend all your appointments on time?* ☐

*If, no*

*The reasons for that?*

12. Can you think of any problems that prevent you from taking your medication as prescribed? ☐

*Would you talk a bit more about these problems?*

*How do you usually overcome them?*

13. Do you get any help from your family or friends with your medication? ☐

**If yes,** *what type of help do you get?*

*What about the supply of medicines, any help with that?*

*Any help at home, like reminding you of taking medicines?*

**If yes,** *how and who?*

*Does anyone of your family and friends advice you or talk to you about your disease and/or medicines?*

***If yes**, can you explain more please?*

14. Is there anything else you think might be relevant that you wanted to say? ☐

*Is there anything else?*

**Do not forget to thank the patient for participating in the study**

التاريخ: شارك:

**مقابلة مع مريض**

**<u>ملاحظات للمذيع</u>**

**أن يتحدث بصوت عال (المستوى)**
**أشياء على المذيع أن يتذكرها (بلون داكن)**
**تستخدم العلامات حسب الحاجة (خط مائل)**

**لقد حدد المرضى العديد من القضايا فيما يتعلق بأسلوب أخذهم للعلاج ونحن نهتم بتجربتك. الغرض من هذه الدراسة هو اكتشاف ما يشعر به مرضي ارتفاع ضغط الدم، مثلك، تجاه الأدوية المضادة لارتفاع ضغط الدم. ولك الحق في المشاركة في الدراسة أو الانسحاب في أي وقت فيما بعد. على الرغم من ذلك ، في حالة مشاركتك سوف تساعدنا على تحسين جودة الرعاية المقدمة لمرضى ارتفاع ضغط الدم في دولة الإمارات العربية المتحدة.**

**لك الحرية في إخبارنا عن تجاربك ووجهات نظرك فيما يتعلق باستخدام الأدوية. لا توجد إجابات صحيحة أو خاطئة؛ نحن فقط نهتم بوجهات نظرك الشخصية.**

**اضمن سرية المعلومات التي يدلي بها المريض، وأن جودة الرعاية التي يتلقونها سوف لا تتأثر بأي معلومات يدلون بها.**

**أطلب إذن بالسجيل على شريط**

**اضمن إتمام نموذج الموافقة**

---

**هل تعرف ما هي الأدوية التي تتناولها في الوقت الحاضر؟ إنني متهم بكل ما تتناوله من أدوية.**

**من فضلك، هل من الممكن أن تخبرني عن الدواء الذي تتناوله (الاسم)؟**

**اسأل عن جميع الأدوية واحصل عن تفاصيل عن كل دواء.**

**وبالنسبة لكل دواء، اسأل: ما الغرض من تناوله؟**
**كم مرة وكيف تتناول هذا الدواء؟**

**هل من الممكن أن تخبرني ما إذا كنت تتناول أي علاج عشبي؟**

**إذا كانت الإجابة نعم، ماهو الدواء العشبي الذي تتناوله، الرجاء ذكر الاسم (الأسماء)؟**
**ما هو الغرض من تناول (الاسم)؟**
**كم مرة تتناوله؟**

**في اعتقادك ما هو تأثير الأدوية الخاصة بك؟**
**هل من الممكن أن تقوم بوصف تجربتك الخاصة بتناول الأدوية خاصتك؟**
**هل هي إيجابية أو سلبية، هل من الممكن أن توضح أكثر من فضلك؟**

**هل تتذكر مرة لم تتناول فيها دوائك حسب إرشاد طبيبك؟**
**إذا كانت الإجابة نعم، هل من الممكن أن تخبرني ماذا حدث؟**

بعض الناس يغيرون استخدامات أدويتهم ويجدون طرقهم الخاصة لاستخدام الأدوية لعديد من الأسباب. هل تتذكر مرة قمت فيها بعمل ذلك؟
إذا كانت الإجابة نعم، أخبرني المزيد عن ذلك؟

بعض الناس يريدون تناول أدويتهم حسب وصف أطبائهم ولكنهم يفشلون في عمل ذلك لسبب أو آخر.
هل تعرضت لهذا الموقف قبل ذلك؟
إذا كانت الإجابة نعم هل من الممكن المزيد من التوضيح؟
ما هي علاقتك بالمسئولين عن توفير الرعاية الصحية لك مثل الأطباء، الصيادلة والممرضين؟
ها من الممكن أن تخبرني المزيد عنها؟

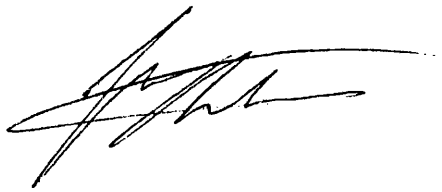
اطلب المزيد من التفاصيل حتى يكمن تكوين صورة كاملة عن درجة رضاء المريض عن مقدمي الرعاية الصحية.

في اعتقادك لماذا يصاب الناس بضغط الدم؟
هل من المزيد من الأسباب؟
في اعتقادك ما هو السبب الذي يطبق على حالتك؟
في رأيك، ما هو أفضل علاج لارتفاع ضغط الدم؟
هل تفكر فيه أي طرق أخرى ؟
هل تفكر في أي مشكلات تمنعك من تناول أدويتك كما هي موصوفة؟
هل ستتكلم أكثر بعض الشيء عن هذه المشكلات؟
هل يوجد أي شيء آخر تعتقد أن له صلة بالموضوع تود ذكره؟
هل يوجد أي شيء آخر؟

لا تنسي شكر المريض على مشاركته في الدراسة.

## APPENDIX 2: ETHICS APPROVAL DOCUMENTS

**DPP Confirmation of independent ethical peer-review**

| |
|---|
| ***Title of project:** Adherence to antihypertensive medication in the UAE |
| ***Name of applicant(s):** Ayesha Ahmad Rashid AlQasem |
| ***Name of supervisor (if student applicant):** Professor Felicity Smith<br>Dr Sarah Clifford |
| ***Date of submission:** 29/4/2009 |
| **Name of reviewer: Dr Jane Clatworthy** |
| **Date of review: 6th May 2009** |
| **Outcome of review:**<br>☐ Approved√<br>☐ Approved with minor revision (as below)<br>☐ Resubmission required |
| **Comments:**<br>I think you have demonstrated a thorough understanding of the ethical issues relating to the project and have addressed these appropriately. |
| **Reviewer signature and date**<br>  <br>**6th May 2009** |

UNITED ARAB EMIRATES
MINISTRY OF HEALTH

دولة الإمارات العربية المتحدة
وزارة الصحة

June 18, 2009

# Al Qassimi Hospital
# Research Ethics Committee

Dear Ms Ayesha Alqasem,

The Research Ethics Committee has reviewed the revision of your research project proposal titled "**Adherence to antihypertensive medications in the UAE**".

The Committee has approved this research to be done in the following hospitals:

Al-Baraha Hospital ( Dubai ).
Al-Qassimi Hospital (Al-Sharjah)
Saqr Hospital (Ras Al-Khaimah)
Khalifa bin Zayed Hospital ( Ajman )
Al-Fujairah Hospital (Al-Fujairah)
Umm Al-Quwain Hospital (Umm Al-Quwain Hospital )

Sincerely,

وزارة الصحة - منطقة الشارقة الطبية
مستشفى القاسمي
لجنة أخلاقيات البحث العلمي
RESEARCH ETHICS COMMITTEE
AL QASSIMI HOSPITAL

Dr Gheda Al Tajir, PhD, IBCLC,
Chairperson,
Research Ethics Committee,
Al Qassimi Hospital,
Sharjah, UAE.
Tel: (971 6) 5188 340
Fax: (971 6) 5384365
e-mail: sharjahrc@yahoo.com

## APPENDIX 3: PATIENT INFORMATION LEAFLET AND CONSENT FORM IN ENGLISH AND ARABIC LANGUAGES (THE EXPLORATORY STUDY)

[redacted]

Contact for further information

If you have any questions or would like to discuss any aspect of the study, please contact;

Miss Ayesha AlQasem

Tel:

Email:

[redacted]

[redacted]

The SCHOOL OF PHARMACY
UNIVERSITY OF LONDON
and
MINISTRY OF HEALTH (U.A.E)
And
ZAYED HOSPITAL (U.A.E)

**Adherence to antihypertensive medication in the U.A.E (part1)**
**THANK YOU FOR TAKING THE TIME TO READ THIS**

I would like to invite you to participate in a research study. Before deciding whether to participate, it is important to understand the reason for conducting this research and also what it will involve. Please take your time to read the provided information carefully and do not hesitate to contact me if you would like to discuss any aspect of the study or would like more information.

[redacted]

What is the purpose of this study?

Some patients may experience problems when taking their medications. To learn more about this, pharmacists at U.A.E are working together with pharmacists at the School of Pharmacy in London on a research project to understand how hypertensive patients like yourself feel about taking their medications and the barriers they may face whilst doing so. The results of this research will help us to uncover any difficulties you may face so that we can plan services to help you take your medication more easily so that you can expect better outcomes of your therapy.

Why have I been chosen?

We are contacting patients attending cardiology clinics in hospitals around the U.A.E and inviting them to take part. We want to include patients receiving medicines for high blood pressure.

What will happen if I take part?

You will be asked to take part in interview with a researcher. In this interview, she will ask you some questions about your condition and your use of medicines. The interview will be held at a place of your convenience and the time will not be limited (you will be allowed to talk freely for as long as you wish). However, we estimate that it will take 20-30 minutes. We will ask to tape-record to ensure that we are not missing anything you tell us and to help us analyse the information more effectively and it will be wiped once it has been transcribed.

Is the study confidential?

Yes. We will protect the confidentiality of any information you share with us. All the information you give us will be private and we will not

Include your name or any identifying information on any of the report about this project. The information you give us will not be part of your medical record or shared with your doctor or anyone else in the clinic.

Who is organising this study?

The research is being carried out by the Ministry of health (U.A.E), Zayed Hospital (U.A.E) and the School of Pharmacy, University of London. These are not commercial organisation, but public and governmental bodies, involved in health care, research, and education.

The study has been approved by the Research Ethics Committee of the school of pharmacy university of London and the Ministry of Health of the UAE.

Do I Have To Take Part?

No, you do not have to take part and you can withdraw at any time. Whether or not you take part does not affect the health care you are receiving at this clinic.

**Thank you for taking the time to read this.**

كلية الصيدلة بجامعة لندن

و

وزارة الصحة (الإمارات العربية المتحدة)

و

مستشفى زايد (الإمارات العربية المتحدة)

**الالتزام بأدوية ارتفاع ضغط الدم في دولة الإمارات العربية المتحدة (الجزء الأول)**

يسرني أن أدعوك للمشاركة في دراسة بحثية. ولكن قبل أن تقرر المشاركة، من الأهمية بمكان أن تفهم السبب الباعث على إجراء هذا البحث وكذلك ما سوف يتضمنه. فأرجو قراءة المعلومات المتاحة بتأن وعناية، وألا تتردد في الاتصال بي إذا كنت ترغب في مناقشة أي جانب من جوانب الدراسة أو في الحصول على المزيد من المعلومات.

**شكراً جزيلاً على منحنا بعضاً من وقتك لقراءة هذه المعلومات.**

الاتصال للحصول على المزيد من المعلومات

إذا كانت لديك أية أسئلة أو استفسارات أو ترغب في مناقشة أي جانب من جوانب الدراسة فيُرجى الاتصال على:

السيدة/ عائشة راشد
هاتف:
بريد إلكتروني:

ما الغرض من هذه الدراسة؟
قد يواجه بعض المرضى مشاكل عندما يتعاطون دواءهم. ولكي يعلم الصيادلة في دولة الإمارات العربية المتحدة ذلك فإنهم يعملون مع الصيادلة في كلية الصيدلة بلندن في مشروع بحثي لفهم ما يشعر به المرضى الذين يعانون من ارتفاع ضغط الدم مثلك حيال تعاطي أدويتهم والعوائق التي قد يواجهونها أثناء ذلك. وسوف تساعدنا النتائج التي نتوصل إليها من هذا البحث في كشف أية صعوبات أو معوقات قد تواجهك، وبذا يمكننا تصميم الحلول التي تساعدك على تعاطي أدويتك بمزيد من السهولة واليسر فتمكنك من أن تتوقع محصلات أفضل لعلاج ارتفاع ضغط الدم.

لماذا تم اختياري؟
نحن نتواصل مع المرضى الذين يحضرون إلى عيادات القلب في المستشفيات بجميع أرجاء دولة الإمارات وندعوهم للمشاركة في هذا البحث. إننا نرغب في مشاركة مرضى ارتفاع ضغط الدم ممن يواجهون مشاكل في الالتزام بتعاطي الأدوية أو قد لا يواجهونها. فذلك سيساعدنا على معرفة المزيد عن خبراتك مع المرض والعلاج حتى يتكشف لنا ما إذا كنت تعاني من صعوبات أو تواجهك معوقات في تعاطي أدويتك، ومن ثم نتمكن من إيجاد الحلول لمساعدتك.

ماذا سيحدث إن شاركت؟
إن اخترت أن تشارك في هذا المشروع فسنطلب منك قضاء بعض الوقت في الإجابة على أسئلة عن مرضك والأدوية التي تتعاطاها خلال مقابلة. تُعقد في مكان تختاره على راحتك ولن نلتزم بوقت معين (ستتاح لك الفرصة أن تتكلم بحرية بالوقت الذي ترغب فيه). وعلى أية حال، تقديرنا هو أن ذلك سيستغرق حوالي 20 إلى 30 دقيقة. وسيتم تسجيل المقابلات للتأكد من أنه لم يفتنا شيء مما تخبرنا به ولمساعدتنا في تحليل المعلومات بطريقة أكثر فعالية، ثم نقوم بمسحها بمجرد كتابة نصها.

هل المعلومات بهذه الدراسة سرية؟
نعم. إننا سوف نحافظ على سرية أية معلومات تزودنا بها. وجميع هذه المعلومات ستكون خصوصية ولن ندرج اسمك أو أي معلومات تحدد هويتك في أي من التقارير التي نعدها عن هذا المشروع. ولن تكون المعلومات التي تزودنا بها جزءاً من سجلك الطبي، ولن نتقاسمها مع طبيبك أو أي شخص آخر في العيادة.

مَن ينظم هذه الدراسة؟
يُجري هذه الدراسة وزارة الصحة (دولة الإمارات العربية المتحدة) ومستشفى زايد (دولة الإمارات العربية المتحدة) وكلية الصيدلة بجامعة لندن. وهي ليست منظمات تجارية بل هيئات عامة وحكومية تقديم الرعاية الصحية والبحوث والتعليم والدعم الاجتماعي.

اعتمدت لجنة البحوث بكلية الصيدلة بجامعة لندن هذه الدراسة و_____ الرقم المرجعي - _____

هل أنا ملزم بالمشاركة؟
لا. إن قرارك بالمشاركة في هذا المشروع البحثي قرار اختياري طوعي. إذ يمكنك أن تقرر عدم المشاركة في هذا المشروع، كما يمكنك أن تقرر الانسحاب من المقابلة في أي وقت تشعر فيه أنك غير مستريح. ولن تؤثر هذه الدراسة في الرعاية الصحية التي تحصل عليها بالعيادة.

شكراً جزيلاً على منحنا بعضاً من وقتك لقراءة هذه المعلومات

Patient Identification Number for this study:

**Adherence to Medications in Emirati Patients with hypertension (part1)**

**Name of Researcher:** Ayesha AlQasem, MSc. Clinical Pharmacy, International Practice and Policy, School of Pharmacy University of London.
**Co-researchers:** Prof. Felicity Smith (School of Pharmacy, London), Dr. Sarah Clifford (School of Pharmacy, London), Dr. Abdullah Al-Naimi (Zayed Hospital, U.A.E).

*CONSENT FORM*

Please tick box

| | | |
|---|---|---|
| 1. | I confirm that the study has been explained to me and I have read the information for the above study, and have had the opportunity to ask questions. | |
| 2. | I understand that I am invited to take part in the study above, which involves participating in an interview to be arranged at a time and location convenient for me. | |
| 3. | I understand that the interviews will be audio-recorded and that interview tapes and/or transcripts will be accessible to the researchers involved in the study. | |
| 4. | I understand that my participation is voluntary and that I am free to refuse to participate or even withdraw at any time without the care I receive being affected. | |
| 5. | I agree to take part in the above study. | |

| | | |
|---|---|---|
| Name of participant | Date | Signature |
| Name of researcher | Date | Signature |

رقم الدراسة: هوية المريض في هذه الدراسة:

**التزام مرضى ارتفاع ضغط الدم بالأدوية في دولة الإمارات العربية المتحدة (الجزء الأول)**

**اسم الباحث:** عائشة راشد، ماجستير ( الصيدلية الإكلينيكية والممارسة الدولية) /كلية الصيدلة بجامعة لندن.
**الباحثون المشاركون:** بروفيسور/ فيليستي سميث (كلية الصيدلة، لندن) - دكتورة/ سارة كليفورد (كلية الصيدلة، لندن) - دكتور/ عبدالله النعيمي (مستشفى زايد، دولة الإمارات العربية المتحدة)

*نموذج موافقة*

الرجاء وضع علامة

| | | |
|---|---|---|
| 1. | أقر بأنه قد تم شرح الدراسة المبينة لي وقرأت المعلومات المتعلقة بها، وأتيحت لي الفرصة لتوجيه الأسئلة. | |
| 2. | أدرك أنني مدعو للمشاركة في الدراسة المبينة وهي تتضمن المشاركة في مقابلة يتم ترتيبها في زمان ومكان مناسبين لي. | |
| 3. | أدرك أنه سوف يتم تسجيل المقابلات صوتياً، وأنه سيكون بمقدور الباحثين المشاركين في هذه الدراسة الوصول إلى شرائط تسجيل هذه المقابلات و/ أو نصوصها المكتوبة. | |
| 4. | أدرك أن مشاركتي اختيارية طوعية وأن لي حرية رفض المشاركة أو حتى الانسحاب في أي وقت دون تأثر الرعاية التي أحصل عليها. | |
| 5. | أوافق على المشاركة في الدراسة. | |

| | | |
|---|---|---|
| _____ | _____ | _____ |
| اسم المريض المشارك | التاريخ | التوقيع |
| _____ | _____ | _____ |
| اسم الباحث | التاريخ | التوقيع |

## APPENDIX 4: EXAMPLE SECTION OF A MATRIX USED FOR CHARTING AND SUMMARISING INTERVIEW DATA (FRAMEWORK ANALYSIS)

| No | 2. Herbal Medicines 2.1 Use of herbal medicines | 2.2 Knowledge about the used herbs | 2.3 Beliefs about herbal medicines | 2.4 Effectiveness and safety | 2.5 Trust in traditional healer |
|---|---|---|---|---|---|
| No 1 | Pt uses an ointment and drinks a mixtures of herbs, all prepared by the traditional healer. (24, 28) | Pt takes the herbs for the treatment of vitiligo, but does not know what they are. Pt: "He mixes the herbs in the water and gives it to me to drink, he knows what they are, I don't". (22, 24) | | | Pt trusts the traditional healer as he takes the herbs as per his instructions. (24) |
| No 2 | Pt used a herb for 3 weeks last year. (57) | It was sent to him from Yemen by his aunt, but he does not know what this herb is. (59) | | Useful, but he had to stop it because it caused him chronic diarrhoea. His weight dropped from 85 to 74 kg in 3 weeks while using this herb. (63) | |
| No 3 | Pt does not take any herbal medicines. | | Pt thinks that using herbal medicines is wrong because it might lower the pressure or increase it in a very unhealthy way. In addition, he thinks that the doctor knows the treatment better than him so why should he start herbs without his doctor's recommendation. (20) | | |
| No 4 | Pt used to take herbal medicines long time ago. (33) | | | Stopped because they were useless. (33) | |
| No 5 | Pt started taking a herbal medicine a week ago. (30) | She grounds the leaves into powder, boil it then drinks it once a day after breakfast for joints and legs pain. (30,37, 36 ) Does not know the name of it, but knows that these leaves are from a tree in which its fruit is used in making Indian curry. (32) She heard about it from some friends. (37) | | Feels better after using this herb. (36, 37). | |

## APPENDIX 5: PATIENT INFORMATION LEAFLET AND CONSENT FORM IN ENGLISH AND ARABIC LANGUAGES (THE SURVEY STUDY)

Contact for further information

If you have any questions or would like to discuss any aspect of the study, please contact;

Miss Ayesha AlQasem

Tel:

Email:

The SCHOOL OF PHARMACY
UNIVERSITY OF LONDON
and
MINISTRY OF HEALTH (U.A.E)
And
ZAYED HOSPITAL (U.A.E)

**Adherence to antihypertensive medication in the U.A.E (part2)**

I would like to invite you to participate in a research study. Before deciding whether to participate in this study, it is important to understand the reason for conducting this research and also what it will involve. Please take your time to read the provided information carefully and do not hesitate to contact me if you would like to discuss any aspect of the study or would like more information.

**THANK YOU FOR TAKING THE TIME TO READ THIS**

What is the purpose of this study?

Some patients may experience problems when taking their medications. To learn more about this, pharmacists in the U.A.E are working together with pharmacists at the School of Pharmacy in London on a research project to estimate the percentage of Emirati patients with hypertension who have difficulties when taking their medications. The results of this research will help us provide a better service for patients with hypertension in the U.A.E.

Why have I been chosen?

We are contacting patients attending cardiology clinics in hospitals around the U.A.E and inviting them to take part. We want to include patients receiving medicines for high blood pressure.

What will happen if I take part?

You will be asked to take part in this project, there will be two parts. First, we will ask you to spend about 10 minutes answering questions about the way you take your medications. Second, we will check your medical records for the results of your blood tests to see how controlled your blood pressure is.

Is the study confidential?

Yes. All the information you give us will be private and we will not include your name or any identifying information on any of the reports about this project. Also, the information you give us will not be part of your medical record or shared with your doctor or anyone else in the clinic.

Who is organising this study?

The research is being carried out by the Ministry of health (U.A.E),

Zayed Hospital (U.A.E) and the School of Pharmacy, University of

London. These are not commercial organisation, but public and governmental bodies, involved in health care, research and education.

The study has been approved by the Research Ethics Committee of the school of pharmacy university of London and the Ministry of Health of the UAE.

Do I Have To Take Part?

No, you do not have to take part and you can withdraw at any time. Whether or not you take part does not affect the health care you are receiving at this clinic.

**Thank you for taking the time to read this.**

[redacted]

الاتصال للحصول على المزيد من المعلومات

إذا كانت لديك أية أسئلة أو استفسارات أو ترغب في مناقشة أي جانب من جوانب الدراسة فيُرجى الاتصال على:

السيدة/ عائشة راشد
هاتف:
بريد إلكتروني:

[redacted]

كلية الصيدلة بجامعة لندن
و
وزارة الصحة (الإمارات العربية المتحدة)
و
مستشفى زايد (الإمارات العربية المتحدة)

**الالتزام بأدوية ارتفاع ضغط الدم في دولة الإمارات العربية المتحدة (الجزء الثاني)**

يسرني أن أدعوك للمشاركة في دراسة بحثية. ولكن قبل أن تقرر المشاركة، من الأهمية بمكان أن تفهم السبب الباعث على إجراء هذا البحث وكذلك ما سوف يتضمنه. فأرجو قراءة المعلومات المتاحة بتأن وعناية، وألا تتردد في الاتصال بي إذا كنت ترغب في مناقشة أي جانب من جوانب الدراسة أو في الحصول على المزيد من المعلومات.

**شكراً جزيلاً على منحنا بعضاً من وقتك لقراءة هذه المعلومات.**

[redacted]

ما الغرض من هذه الدراسة؟
قد يواجه بعض المرضى مشاكل عندما يتعاطون دواءهم. ولكي نعلم المزيد عن ذلك، يعمل الصيادلة في دولة الإمارات العربية المتحدة مع الصيادلة في كلية الصيدلة بلندن في مشروع بحثي لتقدير نسبة المرضى الإماراتيين الذين يعانون من ارتفاع ضغط الدم ممن يواجهون صعوبات أثناء تعاطيهم أدويتهم. وسوف تساعدنا النتائج التي نتوصل إليها في هذا البحث في تقديم خدمة أفضل لهؤلاء المرضى في دولة الإمارات العربية المتحدة.

لماذا تم اختياري؟
نحن نتواصل مع المرضى الذين يحضرون إلى عيادات القلب في المستشفيات بجميع أرجاء دولة الإمارات وندعوهم للمشاركة في هذا البحث. إننا نرغب في مشاركة مرضى ارتفاع ضغط الدم ممن يواجهون مشاكل في الالتزام بتعاطي الأدوية أو قد لا يواجهونها، إذ نرغب في معرفة نسبة مرضى ارتفاع ضغط الدم الذين يواجهون صعوبات في تعاطي أدويتهم بهدف مساعدتهم على تحسين التزامهم بتعاطي الأدوية وتحسين حالتهم المرضية

ماذا سيحدث إن شاركتُ؟
إن اخترت أن تشارك في هذا المشروع فهناك جزءان: أولاً، سنطلب منك قضاء حوالي 10 دقائق في الإجابة على أسئلة عن الطريقة التي تتعاطى بها أدويتك. ثانياً، سوف نراجع سجلاتك الطبية للاطلاع على نتائج اختبارات الدم التي أجريت لك لمعرفة مدى السيطرة على ضغط الدم لديك.

هل المعلومات بهذه الدراسة سرية؟
نعم. إن جميع المعلومات التي تزودنا بها ستكون خصوصية ولن ندرج اسمك أو أي معلومات تحدد هويتك في أي من التقارير التي نعدها عن هذا المشروع. وإضافة إلى ذلك، لن تكون هذه المعلومات جزءاً من سجلك الطبي، ولن نتقاسمها مع طبيبك أو أي شخص آخر في العيادة.

مَن ينظم هذه الدراسة؟
يُجري هذه الدراسة وزارة الصحة (دولة الإمارات العربية المتحدة) ومستشفى زايد (دولة الإمارات العربية المتحدة) وكلية الصيدلة بجامعة لندن. وهي ليست منظمات تجارية بل هيئات عامة وحكومية تقديم الرعاية الصحية والبحوث والتعليم والدعم الاجتماعي.

اعتمدت لجنة البحوث بكلية الصيدلة بجامعة لندن هذه الدراسة و_____ الرقم المرجعي - _____

هل أنا ملزم بالمشاركة؟
لا. إن قرارك بالمشاركة في هذا المشروع البحثي قرار اختياري طوعي، إذ يمكنك أن تقرر عدم المشاركة في هذا المشروع، كما يمكنك أن تقرر التوقف عن المشاركة في أي وقت دون أن يؤثر ذلك على الرعاية الصحية التي تتلقاها في هذه العيادة.

شكراً جزيلاً على منحنا بعضاً من وقتك لقراءة هذه المعلومات

Study Number: Patient Identification Number for this study:

**Adherence to Medications in Emirati Patients with hypertension (part 2)**

**Name of Researcher:** Ayesha Rashid, MSc. Clinical Pharmacy, International Practice and Policy, School of Pharmacy University of London.

**Co-researchers:** Prof. Felicity Smith (School of Pharmacy, London), Dr. Sarah Clifford (School of Pharmacy, London), Dr. Abdullah Al-Naimi (Zayed Hospital, U.A.E).

*CONSENT FORM*

Please tick box

| | | |
|---|---|---|
| 1. | I confirm that the study has been explained to me and I have read the information for the above study, and have had the opportunity to ask questions. | |
| 2. | I understand that I am invited to take part in the study above and that the relevant sections of my medical notes will be looked at by the researcher. I give permission for the researcher to have access to my records. | |
| 3. | I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care being affected. | |
| 4. | I agree to take part in the above study. | |

| | | |
|---|---|---|
| Name of participant | Date | Signature |
| Name of researcher | Date | Signature |

رقم الدراسة: رقم هوية المريض في هذه الدراسة:

**التزام مرضى ارتفاع ضغط الدم بالأدوية في دولة الإمارات العربية المتحدة (الجزء الثاني)**

**اسم الباحث:** عائشة راشد، ماجستير ( الصيدلية الإكلينيكية والممارسة الدولية) /كلية الصيدلة بجامعة لندن.
**الباحثون المشاركون:** بروفيسور/ فيليستي سميث (كلية الصيدلة، لندن) - دكتورة/ سارة كليفورد (كلية الصيدلة، لندن) - دكتور/ عبد الله النعيمي (مستشفى زايد، دولة الإمارات العربية المتحدة)

*نموذج موافقة*

الرجاء وضع علامة

| | | |
|---|---|---|
| | أقر بأنه قد تم شرح الدراسة المبينة لي وقرأت المعلومات المتعلقة بها، وأتيحت لي الفرصة لتوجيه الأسئلة | 1 |
| | أدرك أنني مدعو للمشاركة في الدراسة المبينة وأن الباحث سوف يطلع على الأقسام ذات الصلة من المدونات الطبية الخاصة بي. وأمنح بموجب هذا الإذن للباحث بالوصول إلى هذه السجلات. | 2 |
| | أدرك أن مشاركتي اختيارية طوعية وأن لي حرية الانسحاب في أي وقت دون إبداء أي سبب، وبدون أن تتأثر الرعاية الطبية التي أحصل عليها. | 3 |
| | أوافق على المشاركة في الدراسة المبينة. | 4 |

| | | |
|---|---|---|
| اسم المريض المشارك | التاريخ | التوقيع |
| اسم الباحث | التاريخ | التوقيع |

## APPENDIX 6: THE DATA COLLECTING TOOL FOR THE SURVEY STUDY (ENGLISH AND ARABIC VERSIONS)

Patient code number: Date:

**The SCHOOL OF PHARMACY**

UNIVERSITY OF LONDON

**Patients' views about their antihypertensive medicines**

The information you provide by filling in this questionnaire will help us to gain a better understanding of patients' views of their antihypertensive medicines.

All of the information you provide will be completely confidential. Please answer all of the questions.

**Please remember that there are no rights or wrong answers. We are interested in your personal views.**

**Using your antihypertensive medication**

People often miss taking doses of their medicines, for a whole range of reasons. Thinking of your antihypertensive medicines, when was the last time you missed taking a dose of this medicine(s)?

[ ] days ago [ ] never

If less than 7 days ago:

On how many occasions over the past week have you missed doses of this/these medicine(s)?

[ ] times

On the occasions that you have missed taking doses, why did you miss these doses?

.....
.....
.....
.....
.....

Below are some ways in which other people have said they use their medications. For each of the statements, please tick the box that best applies to you.

| | **No** | **Yes** |
|---|---|---|
| 1. Do you sometimes forget to take your antihypertensive pills? | | |
| 2. People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not take your antihypertensive medicine? | | |
| 3. Have you ever cut back or stopped taking your medication without telling your doctor, because you felt worse when you took it? | | |
| 4. When you travel or leave home, do you sometimes forget to bring along your antihypertensive medication? | | |
| 5. Did you take your antihypertensive medicines yesterday? | | |
| 6. When you feel like your blood pressure is under control, do you sometimes stop taking your medicine? | | |
| 7. Taking medication every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your blood pressure treatment plan? | | |

8. How often do you have difficulty remembering to take all your blood pressure medications?

**(Please circle the correct number)**

Never/Rarely.....0

Once in a while.....1

Sometimes.....2

Usually.....3

All the time.....4

**Your views about your antihypertensive medicines**

| Statements others have made | Strongly agree | Agree | Uncertain | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| My health, at present, depends on my antihypertensive medicines | | | | | |
| Having to take antihypertensive medicines worries me | | | | | |
| My life would be impossible without my antihypertensive medicines | | | | | |
| I sometimes worry about long-term effects caused by my antihypertensive medicines | | | | | |
| Without my antihypertensive medicines I would be very ill | | | | | |
| My antihypertensive medicines are a mystery to me | | | | | |
| My health in the future will depend on antihypertensive my medicines | | | | | |
| My antihypertensive medicines disrupt my life | | | | | |
| I sometimes worry about becoming too dependent on my antihypertensive medicines | | | | | |
| My antihypertensive medicines protect me from becoming worse | | | | | |
| If I do not take my antihypertensive medicines occasionally, it will not matter | | | | | |

**Satisfaction with your cardiologist and health care services provided by hypertension clinic**

| Statements other have made | Not at all | To a little extent | A moderate amount | To a good extent | To a great extent |
|---|---|---|---|---|---|
| I have a lot of faith and trust in my healthcare providers | | | | | |
| My healthcare providers provide me with all the information I need to know about my medicines and disease | | | | | |
| I'm satisfied with the services provided to me from my hospital | | | | | |

**Social support**

Do you get any help with your medication? Yes ☐ No ☐

**If yes**, then answer the question below:

What type of help do you receive?

☐ Providing advice regarding medicines or lifestyle changes

☐ Helping with medicines supply (e.g. ordering your medicines, collecting your medicines from the hospital pharmacy etc.)

☐ Driving you to the hospital

☐ Measuring your blood pressure level

☐ Preparing your pill boxes

☐ Providing every single dose to you on time

☐ Reminding you of taking your medicines

☐ Others (please specify).....

**About your family and friends (Over the last three months)**

| | Not at all | A little | A moderate amount | A good deal | A great deal |
|---|---|---|---|---|---|
| Have family or friends exercised with you? | | | | | |
| Have family or friends listened carefully to what you had to say about your illness? | | | | | |
| Have your family or friends encouraged you to do the things you need to do for your illness? | | | | | |
| Have your family or friends selected or requested healthy food choices when you ate with them? | | | | | |
| Have you shared healthy low-fat recipes with friends or family members? | | | | | |
| Have family or friends helped you remember to take your medicine? | | | | | |
| Have family or friends bought food or prepared food for you that was especially healthy or recommended? | | | | | |

## Beliefs about hypertension

For the following questions, please circle the number that best corresponds to your

How much does your illness affect your life?

| 0 no affect at all | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 severely affect my life |
|---|---|---|---|---|---|---|---|---|---|---|

How long do you think your illness will continue?

| 0 a very short time | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 forever |
|---|---|---|---|---|---|---|---|---|---|---|

How much control do you feel you have over your illness?

| 0 absolutely no control | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 extreme amount of control |
|---|---|---|---|---|---|---|---|---|---|---|

How much do you think your treatment can help your illness?

| 0 not at all | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 extremely helpful |
|---|---|---|---|---|---|---|---|---|---|---|

How much do you experience symptoms from your illness?

| 0 no symptoms at all | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 many severe symptoms |
|---|---|---|---|---|---|---|---|---|---|---|

How concerned are you about your illness?

| 0 not at all concerned | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 extremely concerned |
|---|---|---|---|---|---|---|---|---|---|---|

How well do you feel you understand your illness?

| 0 don't understand at all | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 understand very clearly |
|---|---|---|---|---|---|---|---|---|---|---|

How much does your illness affect you emotionally? (E.g., does it make you angry, scared, upset or depressed?)

| 0 not at all affected emotionally | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 extremely affected emotionally |
|---|---|---|---|---|---|---|---|---|---|---|

Please list in rank- order the three most important factors that you believe caused <u>your illness.</u>

The most important causes for me:-

1. .....
2. .....
3. .....

## Your hypertension self-care activities

### Diet

Have you been given information about healthy diet? Yes ☐ No ☐

Do you follow the healthy diet plan you have been given? Yes ☐ No ☐

**If you don't,** what are the barriers which prevented you?

.....

### Exercise

Have you been given information about exercise? Yes ☐ No ☐

How often do you exercise in a week?

.....

**If you do not,** what are the barriers that prevented you?.....

.....

### Self blood pressure monitoring

When was the last time you measured your blood pressure?

.....

**If never then,** what are the barriers which prevented you?

.....

### Smoking

Do you smoke? Regularly ☐ Occasionally ☐ Never ☐

**If you do smoke then,**

What do you smoke?.....

What is your daily average of smoking?.....

## Information about yourself

**It would be helpful if you could tell us a little about yourself.**

Please tick the appropriate boxes:

Are you:

Male ☐

Female ☐

What's your year of birth? 19.....

Where do you live?..... (Urban/Rural)

What is your educational level?

Cannot read and write ☐

Primary school ☐

Secondary school ☐

Diploma ☐

University ☐

Post graduate ☐

How long have you been taking anti-hypertensive medications?.....

Have you used any herbal remedies for treating hypertension?

Currently ☐ Previously ☐ Never ☐

If using or used previously, please answer the following questions:

Specify the name/s.....

How effective do you think your herbal remedies for hypertension are compared to the prescribed medicines?

Less effective ☐ More effective ☐ The same ☐

How safe do you think your herbal remedies for hypertension are compared to the prescribed medicines?

Less safe ☐ Safer than prescribed medicines ☐ The same ☐

***Thank you for taking the time to fill in this questionnaire***

رقم المريض: التاريخ:

## آراء المرضى حول أدويتهم الخافضة لارتفاع ضغط الدم

المعلومات التي ستزودنا بها عن طريق ملء هذا الاستبيان، سوف يساعدنا في فهم آراء المرضى حول أدويتهم الخافضة لارتفاع ضغط الدم.

المعلومات التي سوف تزودنا بها، ستكون سرية بشكل كامل. الرجاء الإجابة على جميع الأسئلة

**تذكر أنه لا توجد إجابات صحيحة وإجابات خاطئة. فنحن نهتم برأيك الشخصي.**

## استخدام أدوية خفض ضغط الدم الخاصة بك

غالبًا ما يفوت بعض الناس تناول جرعات أدويتهم ويكون ذلك لعدة أسباب. بالنسبه لادويه خفض ضغط الدم الخاصه بك، متى كانت آخر مرة لم تتناول فيها جرعتك من هذا الدواء (الأدوية)؟

[ ] لم يحدث مطلقاً [ ] منذ أيام

إذا كانت المدة أقل من 7 أيام مضت:

كم عدد المرات خلال الأسبوع الماضي، التي نسيت فيها تناول جرعاتك من هذا الدواء/هذه الأدوية؟

[ ] مرات

في المرات التي لم تتناول فيها الجرعات، ماذا كان سبب عدم تناولك لها؟

.....

.....

.....

.

يوجد أدناه بعض الطرق، التي ذكرها أشخاص عن كيفية تناولهم لأدويتهم. عند كلٍ من الإفادات التالية، قم من فضلك بوضع علامة عند الصندوق الذي ينطبق عليك أكثر.

| | لا | نعم |
|---|---|---|
| 1. هل تنسى في بعض الأحيان تناول اقراص ادويه خفض ارتفاع ضغط الدم الخاصه بك؟ | | |
| 2. بعض الأشخاص لا يأخذون أدويتهم لأسباب غير النسيان. خلال الأسبوعين الماضيين، هل كان هنالك أية أيام لم تتناول فيها دواء خفض ضغط الدم الخاص بك؟ | | |
| 3. هل سبق أن انقطعت أو توقفت عن تناول ادويتك دون إخبار الطبيب، نظرًا لأنك شعرت بأن حالتك قد ساءت عن ذي قبل؟ | | |
| 4. عندما تسافر أو تترك المنزل، هل تنسى أحيانًا أن تأخذ معك أدوية خفض الدم الخاصة بك؟ | | |
| 5. هل تناولت أدوية خفض ضغط الدم الخاصة بك أمس؟ | | |
| 6. عندما تشعر أن ضغط دمك تحت السيطرة، فهل تتوقف أحيانًا عن تناول الدواء؟ | | |

| | | |
|---|---|---|
| 7. إن تناول الدواء بصورة يومية قد يكون غير ملائمًا لبعض الأشخاص. فهل سبق أن شعرت بالانزعاج بسبب الالتزام بخطة علاج ضغط الدم الخاصة بك؟ | | |

8. ما مدى الصعوبة التي تواجها في تذكر تناول جميع ادويه خفض ضغط الدم الخاصه بك؟

**(من فضلك ضع دائرة حول الرقم الصحيح)**

أبداً/نادراً.....0

مرة كل فترة طويله.....1

أحياناً.....2

عادة.....3

دائماً.....4

**آرائك حول أدويتك الخافضة لارتفاع ضغط الدم**

| الإفادات التي أدلى بها الآخرون | اوافق بشدة | اوافق | غير متأكد | اختلف | اختلف بشدة |
|---|---|---|---|---|---|
| تعتمد صحتي في الوقت الحالي على ادويتي | | | | | |
| يقلقني وجوب تناول الأدوية الخافضة لارتفاع ضغط الدم | | | | | |
| حياتي قد تكون مستحيلة بدون تناول الأدوية الخاصه بي | | | | | |
| أحيانًا ينتابني شعور بالقلق بسبب الآثار التي قد تسببها أدوية خفض ضغط الدم على المدى الطويل | | | | | |
| دون تناول أدويتي فإنني سوف أكون مريضًا جدًا | | | | | |
| ادويتي التي اتناولها هي لغز بالنسبة لي | | | | | |
| تعتمد حالتي الصحية مستقبلاً على أأدويتي | | | | | |
| أأدوية خفض االرتفاع ضغط الدم تعكر و تنغص حياتي | | | | | |
| يساورني القلق أحيانًا بشأن الاعتماد بشكل مطلق على أدوية خفض ضغط الدم | | | | | |
| تعمل أدويتي على حمايتي من تدهور حالتي الصحيه | | | | | |
| عدم تناول أدويتي من وقت لآخر لن يؤثر سلبا علي صحتي . | | | | | |

**الرضا عن خدمات الرعاية الصحية التي تقدمها عيادة ضغط الدم في المستشفي**

| الإفادات التي أدلى بها الآخرون | كلا على الإطلاق | إلى حد بسيط | بنسبة معتدلة | إلى حد جيد | الى حد كبير |
|---|---|---|---|---|---|
| لديه الكثير من الإيمان والثقة في مقدمي الرعاية الصحية لي في المستشفي | | | | | |
| مقدمي الرعاية الصحية يقومون بتزويدي بكل المعلومات التي أحتاجها، عن أدويتي والمرض الذي أعاني منه | | | | | |
| انني راضي عن الخدمات التي تقدمها لي المستشفى. | | | | | |

**الدعم الاجتماعي من الاهل و الاصدقاء**

هل تتلقى أي مساعدة من الاهل و الاصدقاء بخصوص ادويتك؟ ☐ نعم ☐ لا

**لو الإجابة بنعم**، إذن قم بإجابة السؤال التالي:

ما هو نوع المساعدة التي تتلقاها؟

تقديم النصيحة فيما يتعلق بالأدوية أو تغير أسلوب الحياة ☐

المساعدة في توفير الأدوية (على سبيل المثال، شراء أدويتك، استلام أدويتك من صيدلية المستشفى، وما إلى ذلك) ☐

توصيلك إلى المستشفى ☐

قياس مستوى ضغط الدم لك ☐

تحضير علب أقراص دوائك ☐

تقديم كل جرعه دواء اليك في موعدها ☐

تذكيرك بتناول أدويتك ☐

أخرى (من فضلك حدد).....

| | كلا على الإطلاق | إلى حد بسيط | بنسبة معتدلة | إلى حد جيد | إلى حد كبير |
|---|---|---|---|---|---|
| هل مارس أفراد عائلتك أو أصدقائك التمرينات الرياضيه معك؟ | | | | | |
| هل استمع أفراد عائلتك أو أصدقائك بعناية، لما لديك لتقوله عن مرضك؟ | | | | | |
| هل شجعك أفراد عائلتك أو أصدقائك على القيام بما يجب عليك فعله تجاه مرضك؟ | | | | | |
| هل قام أفراد عائلتك أو أصدقائك بانتقاء أو طلب اختيارات الطعام الصحي، عندما كنت تتناول الطعام معهم؟ | | | | | |
| هل سبق أن شاركك أفراد عائلتك أو أصدقائك في تناول طعام صحي قليل الدسم؟ | | | | | |
| هل ساعدك أفراد عائلتك أو أصدقائك في تذكيرك بتناول دوائك؟ | | | | | |
| هل قام أفراد عائلتك أو أصدقائك بشراء أو تحضير الطعام الصحي أو الموصى به لك؟ | | | | | |

## معتقداتك عن ارتفاع ضغط الدم

للأسئلة التالية، من فضلك ضع دائرة حول الرقم الذي ينطبق بصوره افضل علي حالتك

الي اي مدى يؤثر مرضك على حياتك؟

| 0 لا يؤثر على الإطلاق | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 يؤثر بشده على حياتي |
|---|---|---|---|---|---|---|---|---|---|---|

إلى متى تظن أن مرضك سيستمر؟

| 0 لمدة قصيرة جداً | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 للأبد |
|---|---|---|---|---|---|---|---|---|---|---|

إلى أي مدى تظن أنك تسيطر على مرضك؟

| 0 لا سيطرة على الإطلاق | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 قدر كبير من السيطرة |
|---|---|---|---|---|---|---|---|---|---|---|

إلى أي مدى تظن أن دوائك سيساعدك في علاج مرضك؟

| 0<br>لن يساعد على الإطلاق | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10<br>سيساعد إلى أبعد حد |
|---|---|---|---|---|---|---|---|---|---|---|

إلى أي مدى تعاني من أعراض متعلقة بمرضك؟

| 0<br>لا أعراض على الإطلاق | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10<br>أعراض عديدة وحادة |
|---|---|---|---|---|---|---|---|---|---|---|

ما مدى انشغال بالك بمرضك؟

| 0<br>لا يشغلني على الإطلاق | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10<br>مشغول به إلى أبعد حد |
|---|---|---|---|---|---|---|---|---|---|---|

إلى أي حد تحس بأنك تفهم مرضك؟

| 0<br>لا أفهمه على الإطلاق | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10<br>أفهمه بكل وضوح |
|---|---|---|---|---|---|---|---|---|---|---|

ما مدى تأثير مرضك عليك من الناحية النفسية؟ (على سبيل المثال، يجعلك غاضباً، أو خائفاً، أو حزيناً، أو محبطاً؟)

| 0<br>لا يوجد تأثير نفسي على الإطلاق | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10<br>أتأثر به نفسياً إلى أبعد حد |
|---|---|---|---|---|---|---|---|---|---|---|

من فضلك اذكر قائمة حسب الاولويه لأهم ثلاث عوامل تظن أنها كانت السبب في مرضك (ضغط الدم).

أكثر الأسباب أهمية، هم:-

.....

.....

.....

## أنشطة العناية الذاتية المتعلقة بارتفاع ضغط الدم

**الحمية الغذائية**

هل سبق وأن تم إعطائك معلومات عن الحمية الغذائية الصحية؟ نعم ☐ لا ☐

هل تقوم باتباع خطة الحمية الغذائية الصحية التي تم وضعها لك؟ نعم ☐ لا ☐

**إذا كانت الإجابة لا**، فما هي العوائق التي منعتك؟

.....

.....

**ممارسة التمرينات**

هل سبق وأن تم إعطائك معلومات عن ممارسة التمرينات الرياضيه؟ نعم ☐ لا ☐

كم مرة تقوم بممارسة التمرينات في الأسبوع؟

.....

.....

**إذا كنت لا يقوم بممارسه الرياضه**، فما هي العوائق التي منعتك؟.....

.....

.....

**قياس ضغط الدم**

متى كانت آخر مرة، قمت فيها بقياس ضغط دمك؟

.....

.....

**إن لم يحدث هذا على الإطلاق**، فما هي العوائق التي منعتك؟

.....

.....

**التدخين**

هل تدخن؟ بانتظام ☐ من حين لآخر ☐ لا أبداً ☐

**إذا كنت تدخن،إذن**

ما الذي تقوم

بتدخينه؟.....

ما هو معدلك اليومي للتدخين؟.....

**معلومات عن نفسك**

**سيكون من المفيد لو أخبرتنا قليلاً عن نفسك**

قم من فضلك بوضع علامة عند الصندوق المناسب:

في الواقع: ما هي السنه التي ولدت فيها؟ .....19

ذكر ☐

أنثى ☐

ما هو محل إقامتك؟..... (الحضر/الريف)

ما هو مستواك التعليمي؟

لا استطيع القراءه و الكتابه ☐

تعليم اساسي (ابتدائية\ اعداديه) ☐

الثانوية ☐

دبلوم ☐

جامعي ☐

دراسات عليا ☐

منذ متى وأنت تتناول أدوية لخفض ضغط الدم؟.....

هل سبق أن تناولت وصفات عشبية لعلاج ارتفاع ضغط الدم؟

حالياً ☐ في السابق ☐ لا أبداً ☐

إذا كنت تستخدمها حاليا أو استخدمتها سابقاً، فمن فضلك أجب على الأسئلة التالية:

حدد

الاسم/الأسماء.....

.....

في رأيك، ما مدى فاعلية الوصفات العشبية لعلاج ارتفاع ضغط الدم مقارنة بالأدوية التي يصفها الطبيب؟

أقل تأثيراً ☐ أكثر تأثيراً ☐ نفس الشئ ☐

في رأيك، ما مدى سلامة الوصفات العشبية لعلاج ارتفاع ضغط الدم مقارنة بالأدوية التي يصفها الطبيب؟

أقل سلامة ☐ أكثر سلامة من الأدوية التي يصفها الطبيب ☐ نفس الشئ ☐

***شكرًا لك على الوقت الذي قضيته في استكمال هذا الاستبيان***

## APPENDIX 7: PUBLICATIONS

Alqasem, A.A., Smith, F. and Clifford, S. (2011). Adherence to medication among chronic patients in Middle Eastern countries: review of studies. *Eastern Mediterranean Health Journal* **17**(4), 356-363. Available at: http://www.emro.who.int/publications/emhj/17/04/article15.htm

Alqasem, A.A., Smith, F. and Clifford, S. (2010). Barriers facing hypertensive patients in the United Arab Emirates when adhering to their medication: a qualitative study. *International Journal of Pharmacy Practice* **18** (supplement 2), 70-71.