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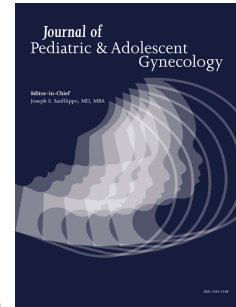
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## **Urban-rural inequities in the parental attitudes and beliefs towards Human papillomavirus infection, cervical cancer and HPV vaccine in Mysore, India**

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**ABSTRACT**

**Objective:** The aim of this study was to compare the parental attitudes and beliefs about HPV, cervical cancer and HPV vaccine between urban and rural areas, India.

**Design:** Cross sectional

**Setting:** Mysore, India

**Participants:** Parents of school going adolescent girls

**Intervention:** Parents completed a self-administered questionnaire

**Main outcome measures:** Attitudes and beliefs about HPV, cervical cancer and HPV vaccine

**Results:** A total of 1609 parents from urban (n=778) and rural (n=831) areas participated in this study. Majority of the parents had never heard about HPV (73.6%), did not know that their daughters could get an HPV infection (62.7%) or cervical cancer (64.1%) in the future, and believed that HPV vaccine was not effective (67.1%). Parents living in the urban area were more likely to believe that HPV infection (adjusted Odds Ratio [aOR] 2.69; 95%CI:1.43, 5.06) and cervical cancer (aOR 2.68; 95%CI:1.83, 3.91) could cause serious health problems than those living in the rural area. The odds of agreeing that HPV vaccination will make girls sexually active was lower among urban than rural parents (aOR 0.55; 95%CI:0.33, 0.94). There was no significant difference among parents in the urban and rural areas in their beliefs about susceptibility of their daughter to HPV infection or cervical cancer, and beliefs about the safety and ability of HPV vaccine to protect cervical cancer.

**Conclusions:** Rural parents might be reluctant to recommend behaviors that can help prevent HPV infection and cervical cancer such as HPV vaccination for their daughters.

**Key words:** Attitudes, Beliefs, Cervical Cancer, HPV infection, HPV vaccine, India

## INTRODUCTION

Globally, an estimated 528,000 or more women are diagnosed with cervical cancer and 275,000 die each year.<sup>1</sup> Almost 80% of these cases and 88% of the deaths occur in the developing world.<sup>1</sup> The age-standardized annual incidence of the disease was estimated to be higher in India (22 women per 100,000) than other South-Asian countries (19.3 women per 100,000) or the world (14 women per 100,000) in 2012.<sup>2</sup> Factors such as early age at marriage, early age at first sexual intercourse, early age at first full-term pregnancy, multiple pregnancies and long term use of hormonal contraceptives, which facilitate the progression for HPV infection to neoplastic cervical lesions, may contribute to the increased incidence of cervical cancer in India.<sup>3</sup> In addition, the cause for the increased incidence of cervical cancer in India could be the increased burden of high-risk HPV strains in the country, with HPV-18 & 16 being the most common.<sup>3</sup>

There are more than 170 different HPV strains, of which 40 can be sexually transmitted.<sup>4</sup> It is predicted that >75% of sexually active individuals will be infected with HPV during their lifetime.<sup>4,5</sup> While persistent infection with high-risk HPV strains (11, 16, 18, 33, 51, 52, 53, 58, 61) can potentially cause cancer or warts on or around the genitals, anus, mouth, or throat; most infections are asymptomatic and clear without any interventions within two years due to the body's own immune system.<sup>4,6</sup> HPV type 16 and 18 cause the majority of cervical and anal cancers, while type 6 and 11 cause 90% of genital warts.<sup>7</sup>

Currently, three types of HPV vaccines (Cervarix, Gardasil and Gardasil 9) are available for preventing HPV infections.<sup>8</sup> Gardasil prevents four strains of HPV (6, 11, 16, 18). Cervarix is effective against two strains (16 and 18) and Gardasil 9 is effective against nine strains of HPV

(6, 11, 16, 18, 31, 33, 45, 52, and 58).<sup>8,9</sup> The three vaccines are safe and effective (90% to 100%).<sup>8,9</sup> Cervarix and Gardasil potentially prevent 75% of cervical cancers related to HPV 16 and 18, and Gardasil9 prevents 89% of cancers related to HPV 16, 18, 31, 33, 45, 52 and 58.<sup>10</sup> In addition, Gardasil potentially prevents 47% pre-cancerous lesions related to HPV 6, 11, 16, 18 and Gardasil9 prevents 82% of pre-cancerous lesions related to HPV 16, 18, 31, 33, 45, 52 and 58.<sup>10</sup>

Although HPV vaccines have been shown to be safe and effective; the rate of uptake among at-risk individuals is not as high as anticipated, lowering its potential public health impact. HPV vaccination was even suspended in India until recently after being approved in 2008.<sup>11</sup> The factors that contributed to the suspension of HPV vaccination in India included lack of knowledge and misinformation about HPV, cervical cancer and HPV vaccine; negative attitudes and beliefs about HPV, cervical cancer and HPV vaccine; and sociodemographic and cultural factors.<sup>11</sup> Indeed, health behavior theories indicate that knowledge, sociodemographic and cultural factors affect attitudes and beliefs of people to a disease pathogenesis, treatment and prevention measures.<sup>12,13</sup> The attitudes and beliefs of individuals towards a disease, in turn influences the behavior of individuals to prevent a disease.<sup>12,13</sup>

As the economic and education level of populations, and the nature of socio-cultural and physical environments, tend to vary between urban and rural areas,<sup>14</sup> we hypothesized that the attitudes and beliefs of individuals towards HPV infection, cervical cancer and HPV vaccine are not similar among residents in urban and rural areas. However, evidence is limited to support this notion. Understanding the attitudes and beliefs of individuals about HPV infection, cervical cancer and HPV vaccine will help to inform the design of appropriate public health programs to prevent cancer. The information will be particularly important in rural areas, where 68.4% of the

Indian population lives, and death rates due to cervical cancer are high.<sup>15</sup> Given that previous studies have focused mostly on urban populations,<sup>16,17</sup> the objective of this study was to compare parental attitudes and beliefs about HPV infection, cervical cancer and HPV vaccine between urban and rural areas in Mysore district, India.

## METHODS

### *Study area*

A cross-sectional study was conducted among parents of school going adolescent girls who were living in urban and rural regions in Mysore district, India. Data from urban parents were collected between February, 2010 and January, 2011, and data from rural parents were collected between September and October, 2011. Mysore district is located in the southern part of the state of Karnataka, south west India. It ranks third in terms of population size (3,001,127, density: 450/km<sup>2</sup>) among 30 districts in the state.<sup>18</sup> (Fig 1). Majority of the population (1,755,714) in Mysore district live in the rural areas.<sup>18</sup> Age-standardized annual cervical cancer mortality rate in Karnataka was 16.5 per 100, 000 in 2010.<sup>15</sup>

[Insert figure 1 here]

### *Sampling techniques*

A total of 1,609 parents (778 urban and 831 rural) were involved in this study. Twelve schools (five government, four private and three religious) in Mysore city and 11 schools (10 government and 1 private) in rural Mysore *Taluk* were selected based on probability proportionate to size. First a program announcement was sent home with all girls attending 7<sup>th</sup> through 10<sup>th</sup> grades in the selected schools explaining the study and inviting eligible parents to

participate. Then all girls aged 11 to 15 years in these schools were enumerated and 1631 female students randomly selected and provided with a questionnaire to take to their parents, who filled them out and returned within seven days. Only one parent in a family filled out the questionnaire. Only 2.7% of parents in the urban area and 2.2% parents in the rural area failed to return the completed questionnaire along with the signed consent form.

### *Questionnaire and measures*

A self-administered questionnaire in English and *Kannada* was used to collect information about the socio-demographic characteristics, awareness about HPV, source of information about HPV vaccine, attitude and beliefs of parents about HPV infection, cervical cancer and HPV vaccine. The questionnaire contained 126 items, however only 26 items were selected for the analysis of this study based on the integrated model for behavior (IMB)<sup>12</sup> and the health belief model (HBM).<sup>13</sup> Out of 26, 15 items contained information on hypothesized correlates of attitudes and beliefs about HPV infection, cervical cancer and HPV vaccine (age, gender, employment, education, religion, marital status, area of residence, HPV awareness, source of information about HPV vaccine) based on literature, IMB and HBM.<sup>12,13</sup> The items were validated and used in previous studies.<sup>19,20</sup> Parental awareness about HPV was assessed by asking the question “*Have you ever heard of HPV*”. Responses were recoded as ‘yes’ and ‘no’. Source of information about HPV vaccine was collected using eight items (Television, Newspaper or Radio, Internet, Doctor, ANM or *Anganwadi* teacher or, Worker, Friends or Neighbors, My daughter's school, Family member or relatives). Responses were recorded on a four-point scale (1=never, 2= not often, 3= often, 4=very often), but were dichotomized into ‘no’ (never) and ‘yes’ (very often, often, not often) during data analysis.



The remaining 11 items were used to assess information on parental attitude and beliefs about HPV infection, cervical cancer and HPV vaccine. Out of the 11 items, four were used to assess parental attitudes towards susceptibility to cervical cancer (*'It is possible that my daughter will get cervical cancer in the future'* and *'It is likely that my daughter may get cervical cancer someday'*) (Cronbach's alpha ( $\alpha$ )= 0.73) and HPV infection (*'It is likely that my daughter will get HPV in the future'* and *'My daughter may be at-risk of getting HPV infection'*  $\alpha$ = 0.72). Other four items were used to assess beliefs towards severity of cervical cancer (*'I believe that cervical cancer is serious disease'* and *'I believe that cervical cancer can be extremely harmful'*,  $\alpha$ = 0.65) and HPV infection (*'I believe that HPV infection can cause serious health problem'* and *'I believe that HPV infection can be extremely harmful'*,  $\alpha$ = 0.63). Responses to these eight items were recorded on a three-point scale (1=disagree, 2=Do not know, 3=Agree).

The remaining three items (out of the 12) were used to collect information about parental beliefs about HPV vaccine (*'HPV vaccine is safe'*, *'HPV vaccine will prevent cervical cancer'* and *'daughter receiving HPV vaccine may become sexually active'*). Responses to the items *'HPV vaccine is safe'* and *'HPV vaccine will prevent cervical cancer'* were recorded on a three-point scale ('very important', 'important' and 'not important at all'). Similarly, responses to the questions about beliefs on whether HPV vaccination will make girls sexually active was recorded on a three-point scale (1= 'disagree', 2='do not know', 3='agree').

#### *Ethical consideration*

Ethical approval to conduct this study was obtained from the Institutional Review Boards at Florida International University and Public Health Research Institute of India. The Block

Education officer and school administrators were also asked for their permission to conduct the study. Only parents who provided written informed consent were included in the study.

### *Data analysis*

Data were entered into an MS Access database, checked for completeness and analyzed using STATA software (Version 14, Texas, USA). The outcome variables were: i) parental attitudes about susceptibility of daughter to HPV infection, and susceptibility to cervical cancer (continuous); ii) parental belief about severity of HPV infection and cervical cancer (continuous) and; iii) parental belief that HPV vaccine is safe (yes, no) and that HPV vaccine prevents cervical cancer (yes, no) and makes adolescents sexually active (disagree, do not know, agree). The main exposure variable was geographical area (0=rural, 1=urban). Other explanatory variables included: sex (0=male, 1=female), age in years (continuous), marital status (0=unmarried, 1= married), religion (0=Hindus, 1=Muslims, 2=Christians/others), employment (0= Retired/unemployed, 1= Employed part-time, 2=Employed fulltime, 3=Self-employed, 4= Full time homemaker) and educational status (0=No formal education, 1=Grade 1 to 10<sup>th</sup>, 2=High school or bachelor degree, 4=Vocational training (diploma), 5=Master degree or above) of parents and their awareness about HPV (0=no, 1=yes) and source of information about vaccines. Parental response to questions assessing their beliefs about the safety of HPV vaccine and its importance to protect cervical cancer was originally recorded in three categories as ‘very important’, ‘important’ and ‘not important at all’. However, the three categories were merged into two during data analysis as ‘yes’ (very important and important) and ‘no’ (not important at all).

Percentages were used to describe the frequency of parental responses to questions addressing beliefs and attitudes towards cervical cancer, HPV infection and HPV vaccine. Chi-

square test was used to check if there was a relationship between sociodemographic factors and parental attitudes and beliefs towards cervical cancer, HPV infection and HPV vaccine. Because of potential clustering of parental beliefs towards HPV vaccine by the school that the daughters attended, a Generalized Estimating Equations (GEE) using logit function (Stata command=xtgee) was used to test the hypothesis that area of residence is associated with parental beliefs about HPV vaccine (safety, protective ability against cervical cancer, belief that HPV vaccination make daughters sexually active). Similarly, a multinomial regression that accounts school as a clustering variable was used to test the hypothesis that area of residence was associated with parental attitudes about susceptibility of daughters to HPV infection or cervical cancer, and parental attitudes about severity of HPV infection or cervical cancer. Values for the within-school correlation matrix ranged from 0.012 to 0.067 for the different outcomes. Odds ratios (OR) were calculated along with their associated 95% confidence interval (CI).

## RESULTS

### *Characteristics of the study participants*

Of the 800 parents contacted in the urban area, 778 (97.3%) returned the completed questionnaire along with the signed consent forms, and 831 (97.8%) of the 850 parents contacted in the rural area returned the completed questionnaires along with the signed consent forms. The mean age ( $\pm$  standard deviation) of the study participants was  $38.3 \pm 6.58$  years. Majority of them were female (73.0%), Hindu by religion (88.9%), employed (54.8%), educated (60.0%), and married (93.0%). There were significant differences in the composition of participants between urban and rural regions in terms of gender, age, education, occupation, religion and marital status

(Table 1). The proportion of parents who were female, aged younger than 35 years and employed part-time were lower in the urban area than in the rural area ( $p < 0.01$  for all). The proportion of parents who were married, Muslim, educated and full-time employees were greater in the urban area than the rural region ( $p < 0.01$  for all). About 71.6% of urban parents and 75.5% of rural parents had never heard about HPV. The proportion of parents who got information about HPV vaccine from television, newspaper or radio, internet or doctor was greater in urban than rural region ( $p < 0.01$  for all).

[Insert Table 1 here]

*Parental attitudes and beliefs about HPV infection, cervical cancer and HPV vaccine*

Majority of the parents did not know that their daughters could be at-risk for HPV infection (58.2%) or cervical cancer (64.1%) in the future. However, majority of the study participants believed that HPV infection (65.3%) and cervical cancer (68.9%) could cause serious health problems. Majority of the parents also believed that HPV vaccine was safe (90.6%) and could prevent cervical cancer (90.0%). In addition, 21% agreed that HPV vaccination would make girls sexually active.

Greater percentage of parents in the rural region than in the urban region indicated that they did not know whether their daughter was at-risk of getting HPV infection (62.9% vs 53.2%,  $p < 0.001$ ) or cervical cancer (66.8% vs 61.2%,  $p = 0.02$ ). Similarly, the percentage of parents who did not know, and the percentage of parents who disagreed that HPV infection or cervical cancer could cause serious health problems was greater among rural residents than in the urban region (Table 2). However, parents living in the urban area tended to agree that HPV infection (74.2% vs 57.0%,  $p < 0.001$ ) or cervical cancer (78.7% vs 59.7%,  $p < 0.001$ ) caused serious health problems more often than parents in the rural area (Fig 2). The percentage of parents who agreed

that HPV vaccine would make girls sexually active were greater among residents in the rural region than the urban one (23.5% vs 18.5%,  $p=0.001$ ).

[Insert table 2 here]

[Insert figure 2 here]

*Factors associated with parental attitudes and beliefs about HPV infection, cervical cancer and HPV vaccine*

Urban parents were more likely to believe that HPV infection could cause serious health problems (aOR 2.69; 95%CI 1.43, 5.06) or that it can be extremely harmful (aOR 1.81; 95%CI 1.08, 3.04) than rural parents. Similarly, parents living in the urban area were more likely to believe that cervical cancer is a serious disease (aOR 2.68; 95%CI 1.83, 3.91) or that it can be extremely harmful (aOR 2.28; 95%CI 1.26, 4.12) than those living in the rural area. Parents living in the urban region also had lower odds of agreeing that HPV vaccination will make girls sexually active than those in the rural region (aOR 0.55; 95% CI 0.33, 0.94). However, there was no significant difference among urban and rural parents in their beliefs about safety of HPV vaccine and ability of the vaccine to prevent cervical cancer (Table 3). Furthermore, parental perception about the perceived susceptibility of their daughter to get HPV infection and cervical cancer was not significantly different between urban and rural parents (Table 3).

[Insert table 3 here]

## **DISCUSSION**

This study compared the parental attitudes and belief about HPV infection, cervical cancer and HPV vaccine among urban and rural areas of Mysore district, India. The study

showed evidence of urban-rural differences in the parental attitudes and beliefs about HPV, cervical cancer and HPV vaccine. When compared to parents living in rural regions, urban parents were more likely to believe that HPV infection and cervical cancer caused serious health problems. In addition, urban parents were less likely to agree that HPV vaccination will make girls sexually active

The increased tendency of urban parents to believe that HPV infection and cervical cancer could cause serious health problems could be due to their knowledge about severity and morbidities related to HPV infection and cervical cancer. In one study of a school population, the proportion who knew about cervical cancer and HPV infection was greater in urban than rural areas of Noida and Delhi, India.<sup>21</sup> Although the difference was not significant, a relatively larger number of parents in the urban region compared to those in the rural region had ever heard of HPV in the current study. In addition, majority (>85%) of the parents living in the urban region had formal education and more than 30% had more than high school education. However, only 36.6% of rural parents had formal education and only 2.3% had more than high school education. Literacy rates in India are also greater among urban than rural populations.<sup>22</sup> Furthermore, different media such as radio and television, and health care centers, which could be potential sources of correct information about HPV and cervical cancer, are more common in urban areas.<sup>22</sup> Hence, parents in urban areas may have better knowledge about HPV and this may have positively influenced their beliefs about the severity of HPV infection and cervical cancer. However, in Tanzania, the proportion of individuals who believed that cervical cancer is fatal was lower in urban than rural area.<sup>23</sup> The variation on the type of items used for assessing beliefs around severity of cervical cancer could be a reason for the difference (*cervical cancer is fatal vs 'I believe that cervical cancer is serious disease'* and *'I believe that cervical cancer can be*

*extremely harmful*'). A study in USA reported contradictory results on the beliefs about severity of colorectal cancer, when data were analyzed based on the responses for two items.<sup>24</sup> Rural residents were more likely to agree that colorectal cancer was severe than urban residents, when data were analyzed based on the response to the item 'colorectal cancer would change whole life'. However, rural residents were less likely to agree that colorectal cancer was severe when data were analyzed based on the response to the item 'would not live longer than five years if I develop colorectal cancer'.

Similarly, the reduced odds of the belief that HPV vaccine makes girls sexually active among urban parents could be due to a greater knowledge about HPV vaccine in the urban area. Urban parents may know better and communicate the knowledge to their daughter, that HPV vaccine protects only some strains of HPV infection.<sup>8</sup> In addition, urban parents may think that their daughter would get information about HPV vaccine from different reliable sources, thus decreasing their perception that HPV vaccination would lead to increased sexual activity. A study in northern India found that greater proportion of individuals in urban than in rural areas of Noida and Delhi were aware of the HPV vaccine.<sup>21</sup> Urban women in Wardha district, located in the northeastern part of the state of Maharashtra also reported more positive attitudes towards breast cancer treatment and screening as compared to rural women.<sup>25</sup>

While majority ( $\geq 90\%$ ) of study participants believed that HPV vaccine was safe and could protect against cervical cancer in both urban and rural areas; 18.5% of the urban parents and 23.5% of rural parents believed that HPV vaccination will make girls sexually active and over half of the parents in both areas did not know if HPV vaccination will make girls sexually active. As HPV vaccination targets adolescents aged 11-12 years to prevent cervical cancer and genital warts<sup>9</sup>, parents fear that it would give girls a false sense of security against infection with

sexual transmitted infections other than HPV, and encourage them to become sexually active or practice risky sexual behavior if they are already sexually active.<sup>26</sup> Thus, parents might be reluctant to recommend HPV vaccination for their daughter. Hence, educational programs that can create awareness about infections that can be protected by HPV vaccine are necessary for both urban and rural area in Mysore, India. In addition, previous research findings, which confirmed that HPV vaccination does not affect sexual activity in USA, Europe, Africa and South America<sup>26-30</sup>, should be communicated to parents to increase their trust that HPV vaccination will not change the sexual behavior of their daughters. Rather, HPV vaccination may increase awareness of sexually transmitted infections, sexual health (e.g. condom use) and importance of pap smear screening.<sup>30-32</sup> Moreover, informing parents about the study findings by Grimaldi-Bensouda et al.<sup>33</sup>, and Jefferson and Jørgensen<sup>34</sup>, which showed lack of association between HPV vaccination and autoimmune diseases, would increase their trust on the safety of the vaccine. This will further increase parental acceptance of HPV vaccination for their daughters. However, studies are necessary to make firm conclusion whether HPV vaccination will not affect adolescent sexual behavior in India population.

Almost three-quarters of the parents living in both the urban (71.6%) and rural (75.4%) areas had never heard of HPV. A study among women in Odisha, India reported lack of awareness about HPV by the majority of study participants (68.8%)<sup>35</sup>. This relatively high level of unawareness about HPV in India is however lower, when compared to reports from other Asian countries. For example, the proportion of women who were unaware of HPV was 84.5% in a sample of six community clusters from three major cities (Shenyang, Shanghai and Beijing) and rural areas (Shanxi, Xinjiang and Henan) in China,<sup>36</sup> and 88.4% in rural villages in states of Perak and Pahang in Malaysia.<sup>37</sup> About 74% parents of children aged 10-13 years were also



unaware of HPV in the town Ankara, Turkey.<sup>38</sup> The relatively greater rate of HPV awareness observed among the Indian parents could be due to increased media coverage associated with the demonstration study conducted in the country from 2009 to 2011, to study feasibility and appropriate delivery strategies of HPV vaccine for girls.<sup>39</sup> Knowledge about HPV affects the acceptability of HPV vaccine by individuals.<sup>40</sup> Thus, provision of HPV and health education in the community will be paramount to help increase uptake of the HPV vaccine in future government initiatives to include HPV vaccine in the national immunization program.<sup>41,42</sup> Some states (Punjab, Delhi) in India have already included HPV vaccination in the immunization programme.<sup>43,44</sup>

To our knowledge, this is the first Indian study that assessed urban-rural differences and determinants of parental attitudes and beliefs about HPV, cervical cancer and HPV vaccine. These results will be useful when designing interventions to combat HPV infection and cervical cancer, and increase HPV vaccine uptake by target groups in rural and urban regions. The study involved a relatively large sample size with a response rate of over 95%. This should increase the generalizability of the findings to target populations in India. However, this study was not without limitations: data were self-reported and there could be information bias as parents may have gotten support from other family members or friend when they responded to the questionnaire. In addition, the rural data were collected seven months after the urban data were collected, which may affect the findings of the study. The rural parents may acquire knowledge about HPV, cervical cancer and HPV vaccine during this period, particularly because HPV vaccine was approved in 2008 in India.<sup>45</sup> This may introduce bias to the current results underestimating the observed difference in the parental attitudes and beliefs about HPV, cervical cancer and HPV vaccine between urban and rural residents.

## CONCLUSIONS

Rural parents might be reluctant to make decisions that can help prevent HPV infection and cervical cancer such as HPV vaccination for their daughters. Provision of health education about the different types of cancers caused by HPV infection that can be effectively prevented through HPV vaccination is necessary for rural Indian parents.

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## Conflict of interest

The authors report no proprietary or commercial interest in any product mentioned or concept discussed in this article.

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Table 1. Sociodemographic characteristics of rural and urban parents of adolescent girls in Karnataka, India 2010/2011 (n=1609)

Variables	Categories	Urban (n=778)	Rural (n=831)	p-value
Sex				<0.001
	Female	69.0	76.8	
	Male	31.0	23.2	
Age in years				<0.001
	≤35	31.1	53.3	
	36-40	33.0	27.4	
	41-50	31.8	15.5	
	>50	4.1	3.7	
Education				<0.001
	No formal education	14.9	63.4	
	Grade1 to 10 <sup>th</sup>	50.6	34.3	
	High school or bachelor degree	24.3	1.8	
	Vocational training (diploma)	5.1	0.4	
	Master degree or above	5.0	0.1	
Employment				<0.001
	Employed fulltime	27.5	7.0	
	Employed part-time	10.7	43.0	
	Self-employed	14.4	7.0	
	Full time homemaker	43.6	41.8	
	Retired/unemployed	3.9	1.3	
Marital status				0.010
	Married	94.7	91.5	
	Unmarried	5.3	8.5	
Religion				<0.001

	Hindu		78.0	99.0	
	Islam		18.8	1.0	
	Christian/other		3.2	0.0	
<hr/>					
Have you ever heard about HPV?					0.079
	Yes		28.4	24.6	
	No		71.6	75.4	
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Source of information about vaccines					
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Television	Yes		90.0	81.1	<0.001
	No		9.0	18.3	
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Newspaper or Radio	Yes		88.7	75.3	<0.001
	No		10.0	24.2	
<hr/>					
Internet	Yes		59.0	43.9	<0.001
	No		37.7	53.3	
<hr/>					
Doctor	Yes		91.3	87.6	0.005
	No		7.5	11.7	
<hr/>					
ANM or <i>Anganwadi</i> teacher or Worker	Yes		70.7	80.4	<0.001
	No		26.3	17.8	
<hr/>					
Friends or Neighbors	Yes		77.5	68.9	<0.001
	No		20.3	30.1	
<hr/>					
My daughter's school	Yes		91.8	93.6	0.193
	No		8.2	6.4	
<hr/>					
Family member or relatives	Yes		78.4	69.2	<0.001
	No		20.4	30.0	

Notes: Values in the tables are percentages. Percentages may not add up to 100 due to missing data

Table 2. Comparison of the attitudes and beliefs about HPV infection, cervical cancer and HPV vaccine between rural and urban parents of adolescent girls in Mysore district, India

2010/2011(n=1609)

<b>Attitudes and beliefs</b>	Response	Urban (n=778)	Rural (n=831)	p-value
<b>Susceptibility to HPV</b>	Disagree	30.3	23.4	<0.001
My daughter may be at-risk of getting HPV infection	Do not know	53.2	62.9	
	Agree	16.5	13.7	
It is likely that my daughter may get HPV infection in the future	Disagree	23.65	20.70	0.209
	Do not know	60.54	64.74	
	Agree	15.81	14.56	
<b>Susceptibility to cervical cancer</b>	Disagree	22.6	21.1	0.033
It is possible that my daughter will get cervical cancer in the future	Do not know	61.2	66.8	
	Agree	16.1	12.2	
It is likely that my daughter may get cervical cancer someday	Disagree	25.5	22.14	0.160
	Do not know	59.3	63.90	
	Agree	15.2	13.96	
<b>Severity of HPV</b>	Disagree	4.0	8.9	<0.001
I believe that HPV infection can cause serious health problem	Do not know	21.9	34.1	
	Agree	74.2	57.0	
I believe that HPV infection can be extremely harmful.	Disagree	6.04	10.11	<0.001
	Do not know	18.64	27.20	
	Agree	75.32	62.70	
<b>Severity of cervical cancer</b>	Disagree	5.3	10.8	<0.001
I believe that cervical cancer is a serious disease	Do not know	16.1	29.5	
	Agree	78.7	59.7	
I believe that cervical cancer can be extremely harmful.	Disagree	4.8	8.8	<0.001
	Do not know	15.9	28.3	
	Agree	79.3	62.9	

<b>Believes about HPV vaccine</b>				
Belief that HPV vaccine is safe	No	7.2	8.4	0.387
	Yes	92.2	91.6	
Belief that HPV vaccine will prevent cervical cancer	No	8.5	9.3	0.617
	Yes	90.0	90.0	
Having the HPV vaccination might make girls more likely to have sex	Disagree	23.7	16.7	0.001
	Do not know	56.3	58.6	
	Agree	18.5	23.5	

Notes:

Values in the tables are percentages

Percent values for some items categories do not add up to 100 due to missing data

Table 3. Comparison of the attitudes and beliefs about HPV infection, cervical cancer and HPV vaccine among urban versus rural parents in Mysore district, India 2010/2011(n=1609)

<b>Attitudes and beliefs: Items</b>	Response	Crude OR (95% CI)	Adjusted OR (95% CI)
<b>Susceptibility to HPV</b>			
My daughter may be at-risk of getting HPV infection	Disagree		
	Do not know	0.65 (0.52, 0.82)	0.66 (0.41, 1.07)
	Agree	0.92 (0.67, 1.26)	0.65 (0.35, 1.22)
	Disagree		
It is likely that my daughter may get HPV infection in the future	Do not know	0.82 (0.64, 1.04)	0.88 (0.58, 1.33)
	Agree	0.95 (0.69, 1.320)	0.74 (0.44, 1.24)
	Disagree		
<b>Susceptibility to cervical cancer</b>			
It is possible that my daughter will get cervical cancer in the future	Do not know	0.85 (0.67, 1.09)	0.90 (0.59, 1.38)
	Agree	1.23 (0.88, 1.72)	1.28 (0.68, 2.43)
It is likely that my daughter may get cervical cancer someday	Disagree		
	Do not know	0.81 (0.64, 1.02)	0.78 (0.54, 1.14)
	Agree	0.94 (0.68, 1.31)	0.86 (0.51, 1.45)
<b>Severity of HPV</b>			
I believe that HPV infection can cause serious health problem	Do not know	1.43 (0.90, 2.27)	1.66 (0.78, 3.53)
	Agree	<b>2.91 (1.88, 4.50)</b>	<b>2.69 (1.43, 5.06)</b>
I believe that HPV infection can be extremely harmful	Disagree		
	Do not know	1.15 (0.76, 1.73)	1.30 (0.82, 2.04)
	Agree	<b>2.01 (1.38, 2.92)</b>	<b>1.81 (1.08, 3.04)</b>
<b>Severity of cervical cancer</b>			
I believe that cervical cancer is a serious disease	Do not know	1.12 (0.73, 1.72)	<b>1.78 (1.21, 2.63)</b>
	Agree	<b>2.71 (1.84, 3.99)</b>	<b>2.68 (1.83, 3.91)</b>
I believe that cervical cancer can be extremely harmful.	Disagree		
	Do not know	1.04 (0.66, 1.64)	1.49 (0.76, 2.95)
	Agree	<b>2.33 (1.54, 3.52)</b>	<b>2.28 (1.26, 4.12)</b>
<b>Beliefs about HPV vaccine</b>			
Belief that HPV vaccine is safe	No		

	Yes	1.15 (0.70, 1.91)	0.73 (0.41, 1.29)
Belief that HPV vaccine will prevent cervical cancer	No		
	Yes	1.05 (0.52, 2.14)	0.80 (0.40, 1.57)
Having the HPV vaccination might make girls more likely to have sex	Disagree		
	Do not know	<b>0.68 (0.53, 0.88)</b>	0.89 (0.58, 1.37)
	Agree	<b>0.56 (0.41, 0.76)</b>	<b>0.55 (0.33, 0.94)</b>

Note: adjusted OR values are estimated based on generalized estimated equation using identity function (beliefs about HPV vaccine items) or multinomial regression (beliefs about susceptibility and severity HPV and cervical cancer) after controlling for age, gender, occupation, religion, marital status, education and awareness about HPV, source of information about HPV vaccine in the case of beliefs about HPV vaccine items. School was used as a cluster variable in all the analysis.



Fig 1. Map of India

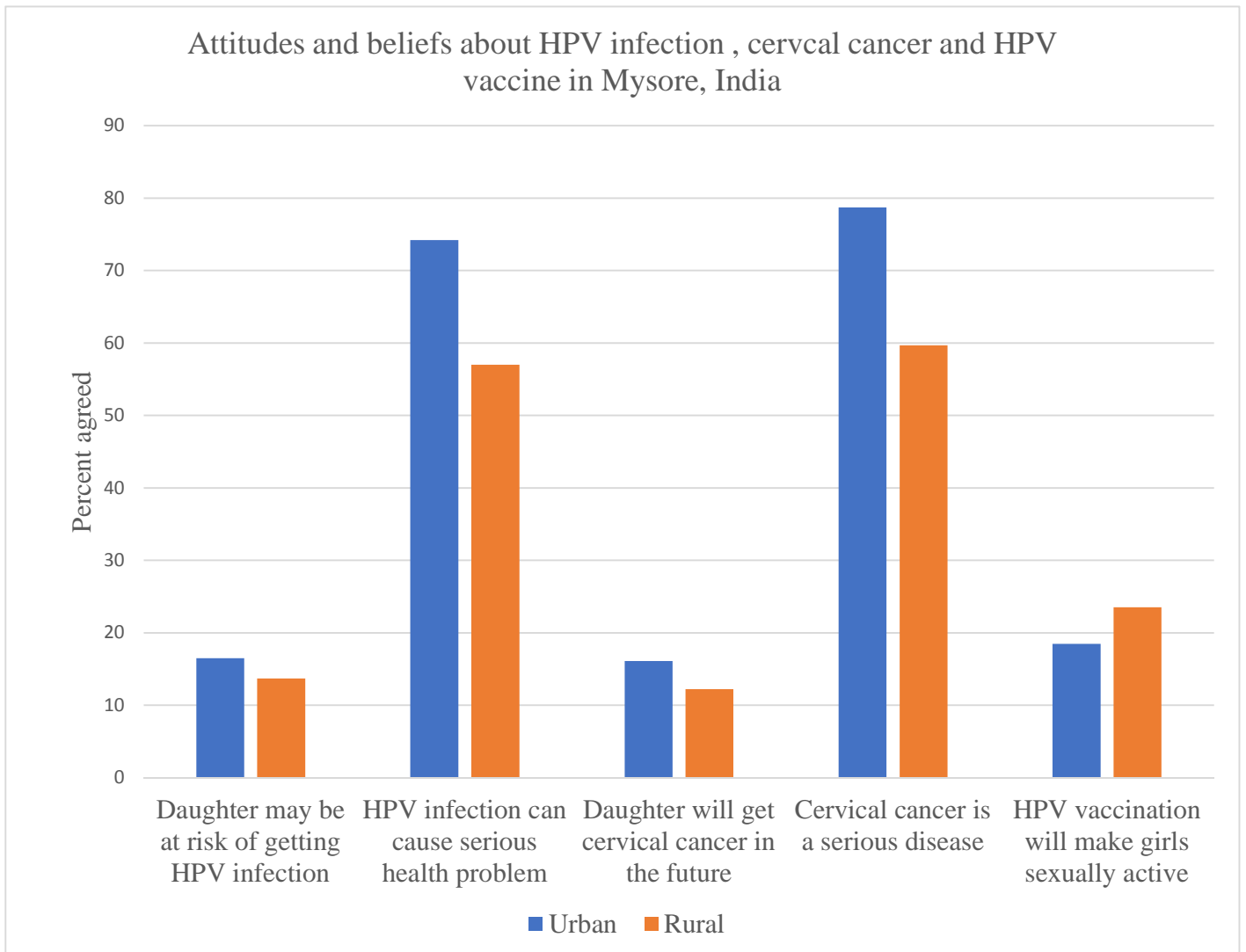


Fig 2. Attitudes and beliefs about HPV infection, cervical cancer and HPV vaccine among rural (n=831) and urban (n=778) parents of adolescent girls in Mysore district, India 2010/2011.