INFANT FEEDING BEHAVIOURS AND ATTITUDES TO FEEDING AMONGST MOTHERS WITH EATING DISORDERS (ED): A LONGITUDINAL STUDY

Martini MG[1], Taborelli E[1], Schmidt U[2], Treasure J[2], Micali N[1,3,4]

1 Behavioural and Brain Sciences Unit, Institute of Child Health, University College of London, UK

2 Eating Disorders Research Unit, Institute of Psychiatry, Psychology and Neuroscience, King's College London, UK

3 Department of Psychiatry, Faculty of Medicine, University of Geneva, Geneva, Switzerland.

4 Child and Adolescent Psychiatry Division, Department of Child and Adolescent Health, Geneva University Hospital, Geneva, Switzerland

*Correspondence to: Dr Maria Giulia Martini, Behavioural and Brain Sciences Unit, UCL Institute of Child Health, 4th Floor, 30 Guilford Street, London WC1N 1EH, UK

Tel: Tel: 020 7905 2163

Fax: 020 7831 7050

Email: m.martini@ucl.ac.uk

Abstract

This study aims to investigate breastfeeding, infant feeding behaviours and attitudes to feeding amongst women with eating disorders (ED) and healthy controls (HC).

Women with active (C-ED) (N=25), past ED (P-ED) (N=28) and HC (N=46) were recruited in pregnancy and followed-up longitudinally. Postnatally infant feeding behaviour was investigated at 8 weeks, 6 months and 1 year, and Parental Modelling at 1 and 2 years.

Women with P-ED and C-ED reported higher concerns about their infant being/becoming overweight compared to HC respectively at 8 weeks and 6 months and 6 months only post-partum. Women with P-ED showed less awareness of infant hunger and satiety cues compared to HC at 8 weeks.

Despite few differences between ED and HC, both past and active ED predicted maternal attitudes and worries about child's eating. These are likely to impact on child's growth and later eating behaviours and might impact on the intergenerational transmission of ED.

Keywords: Eating Disorders, feeding behaviour, mothers, children

Introduction

There is accumulating evidence that psychiatric disorders, including eating disorders, occurring in the peri-natal period are associated with adverse effects on child development (Larsen, Nybo Andersen, Olsen, Micali, & Strandberg-Larsen, 2016; N. Micali, Stemann Larsen, Strandberg-Larsen, & Nybo Andersen, 2016; O'Hara, Wisner, & Asher, 2014; Paschetta et al., 2014). Eating disorders (ED) are characterized by disrupted eating habits and preoccupations with body weight and shape (American Psychiatric Association, 2013). Previous research has indicated that maternal ED are associated with small- and large-for gestational-age births and low birth weight, and children are at greater risk of early feeding problems and disordered eating later in life compared to healthy controls (Micali et al., 2015; Micali, Simonoff, & Treasure, 2009; Solmi, Sallis, Stahl, Treasure, & Micali, 2014).

Feeding the infant is one of the crucial, although challenging, tasks of parenting, and one of the most important means of communication between mother and child (Silva, Costa, & Giugliani, 2016). Mothers with ED might exhibit problems in feeding behaviours with their offspring starting during with breastfeeding (Astrachan-Fletcher, Veldhuis, Lively, Fowler, & Marcks, 2008). A number of population-based studies have investigated the impact of ED on breastfeeding, yielding discrepant findings: in a large population-based study women with ED were more likely to breastfeed and less likely to stop breastfeeding during the first year of life (Micali et al., 2009). A similar study found that women with ED started to breastfeed their infants as often as controls, however they were more likely to stop breastfeeding early (Torgersen et al., 2010). In contrast, Larsson et al. found that women with an history of ED were less likely to breastfeed at 3 months post-partum (Larsson & Andersson-Ellström, 2003). However, the authors used a non-clinical sample, which might have included women with less severe ED.

In relation to child feeding and eating, many studies have investigated feeding and eating outcomes in offspring of women with ED. An early small study showed that mothers with ED might adopt restricting behaviours to limit their child's caloric intake, such as diluting bottle feeds, reducing the amount of food available at home, strictly confining food to mealtimes, and forbidding consumption of sweets (Russell, Treasure, & Eisler, 1998). In contrast, a recent study showed that women with a history of ED and their infants, had a higher diet quality compared to healthy controls (Nguyen et al., 2017). Research has also found that mothers with ED are overly concerned about their child being or becoming overweight (Lacey & Smith 1987). Concern over the child's weight might depend on the gender of the child, with studies finding that mothers with ED reported higher levels of concern about their daughter's weight but not their son's weight compared to those without ED (Agras, Hammer, & McNicholas, 1999; Sadeh-Sharvit et al., 2015). Some studies suggest that despite such concerns, ED mothers do not misperceive their children's size and are not dissatisfied with their children's shape (Stein, Murray, Cooper, & Fairburn, 1996). However, most of the above studies have relied on fairly small sample sizes, in particular when divided by gender of the child and have not included a control group. Contrasting findings are also evident in the association between maternal ED and awareness of the child's hunger and satiety cues (Hoffman et al., 2014; Stein, 1999).

Maternal modelling of eating plays a crucial role in the development of children's food choices and behaviours (Palfreyman, Haycraft, & Meyer, 2013). Parental modelling is described as a process of observational learning in which parents facilitate behaviours in the child with the consequence of the behaviour becoming customary (Palfreyman, Haycraft, & Meyer, 2014). Research has shown maternal modelling to be associated with body dissatisfaction (Brown & Ogden, 2004), weight related attitudes (Stein et al., 2006) and

bulimic pathology (Stice, 1998) in their children. A recent study found a positive correlation between higher levels of maternal ED psychopathology and higher levels of awareness of unintentional modelling of ED behaviours, i.e. eating behaviours imitated by the children, which mothers had not intentionally displayed (Palfreyman et al., 2013). This study was limited by the use of self-reported measures relying on the accuracy of mothers report and the use of a non-clinical sample. No studies to date have investigated maternal modelling of eating behaviours in women with ED.

Taken together despite the large body of evidence of eating outcomes in children of ED mothers, there is a considerable lack of research on infant feeding, and no studies have investigated whether active ED in mothers drive negative attitudes and worries about feeding and eating, or if maternal past ED might also affect these.

The aim of this study was to study women with active and past ED and compare them to healthy controls in relation to: 1. breastfeeding at 8 weeks and 6 months post-natally; 2. maternal feeding attitudes and practices at 8 weeks and 6 months of age; and 3. maternal modelling of eating behaviours at 1 and 2 years of age. We also aimed to explore the association between maternal feeding practices and modelling and ED psychopathology.

Methods

Design and participants

The Nutrition and Stress in Pregnancy (NEST-p) study is an observational prospective study of pregnant women and their infants.

The aim of the NEST-p study was to examine *in utero* mechanisms and pathways related to adverse perinatal and infant outcomes in the offspring of mothers with ED (Easter et al., 2013, 2015). Women were recruited for this study during the first or second trimester of pregnancy. The initial core NEST-p sample consisted of 137 mothers, of whom 37 had an active ED (C-ED), 39 had a past ED (P-ED) and 61 were healthy controls (HC). Women were enrolled from antenatal care and specialist ED services. For detailed recruitment methods and study design see Easter et al. (Easter et al., 2013, 2015).

Participants with P-ED were required to have a history of a DSM-IV-TR eating disorder, but did not meet criteria for and ED for at least one year prior to their current pregnancy. Exclusion criteria were any current psychiatric disorder.

For the purpose of this study, assessments were conducted in the postnatal period at the following time points: 8 weeks, 6 months, 1 year and two years post-partum.

In the present study only women with complete data on predictors and outcomes at 8 weeks and 6 months post-partum were included in the analyses on maternal breastfeeding and feeding practices (n=99, HC (n=46), C-ED (n=25), P-ED (n=28); and (n=89, HC (n=45), C-ED (n=21), P-ED (n=23) respectively). Within the C-ED group, 13 (52%) women met criteria for AN, 9 (36%) for BN, 3 (12%) for BED. Within the P-ED group 15 (53.6%) met criteria for AN, 10 (35.7%) for BN and 3 (10.7%) for BED. In relation to maternal modelling of eating behaviours only women with complete data on predictors and outcomes at child age

6

1 and 2 years (HC (n=30), C-ED (n=13), P-ED (n=18) and HC (n=37), C-ED (n=11), P-ED (n=21), (respectively) were included.

Measures

Eating Disorder Diagnosis

ED diagnoses were determined at baseline and were derived using The Structured Clinical Interview for Axis I (SCID-I) for DSM-IV-TR Disorders (American Psychiatric Association, 2000), administered by trained researchers. Interviewers were trained using the SCID training pack. Researchers attended a monthly meeting with the senior author (NM), where interviews of symptomatic individuals were discussed. All diagnoses were reviewed and confirmed by the senior author. Interviewers demonstrated excellent inter-rater reliability on the SCID with 100% agreement.

Eating Disorders psychopathology

At 8 weeks, 6 months, 1 and 2 years post-partum, ED psychopathology was assessed using the Eating Disorder Examination-Questionnaire (EDE-Q), a 36 items self-report version of the Eating Disorder Examination (Cooper & Fairburn, 1987), assessing eating psychopathology, focusing on the last four weeks. In addition to a total score, the EDE-Q measures four aspects of ED symptomatology: dietary restraint, eating concern and body weight and body shape concerns. The EDE-Q is a reliable and valid measure of ED psychopathology (Fairburn & Beglin, 1994).

OUTCOMES

Breastfeeding (8 weeks and 6 months post-partum)

At 8 weeks and 6 months post-partum mothers were asked to report their infant's primary feeding method: choosing from "breast milk", "formula milk" or "both". We dichotomised this variable into exclusive vs. not exclusive breastfeeding at 8 weeks; exclusive or partial breastfeeding vs. not breastfeeding at 6 months.

Maternal feeding attitudes and practices (8 weeks and 6 months post-partum)

At 8 weeks and 6 months post-partum mothers were asked to complete the Infant Feeding Questionnaire (IFQ) (Baughcum et al., 2001), a validated 28-item measure which assesses maternal beliefs and behaviours regarding infant feeding during the first year of life. Mothers rated the 28 items using a 5-point likert scale from 0 (Never/Disagree a lot) to 4 (Always/Agree a lot). Questions on feeding practices were anchored by the terms ''never'' and ''always''; questions on feeding beliefs were anchored by the terms ''disagree a lot'' and ''agree a lot''.

Factor analysis has shown seven subscales can be derived from the IFQ: (1) concern about the infant under-eating or becoming underweight; (2) concern about the infant's hunger; (3) awareness of the infant's hunger and satiety cues; (4) concern about infant overeating or becoming overweight; (5) feeding the infant on a schedule; (6) using food to calm the infant's fussiness; and (7) social interaction with the infant during feeding (Baughcum et al, 2001). To create scale scores for each factor, items from each subscale were summed and a mean subscale score was obtained. Two factors had 4 items, two had 3 items and 3 had 2 items each. For participants with less than 25% missing data, total scores were calculated using pro-rating (Strube, 1985). Responses to questionnaire items regarding bottle or cereal feeding were coded as not applicable if the child was exclusively breastfed (n=55 (75.9%) for subscale 2 and n=29 (74.5%) subscale 7 at 8 weeks), therefore these subscales were excluded from the analyses.

IFQ subscale scores were used as continuous variables if normally distributed. Subscales 1, 4

and 5 were not normally distributed, and could not be normalized, they were therefore modified into binary variables indicating the top quartile vs. the bottom 75%. This instrument was validated when developed (Baughcum et al, 2001).

Parental Modelling of Eating Behaviours (1 and 2 years postnatal)

This was assessed using the Parental Modelling of Eating Behaviours Scale (PARM) (Palfreyman et al., 2014) at 1 and 2 years post-natally. Respondents were required to answer each item on a 7-point Likert Scale, scored from strongly disagree (1) to strongly agree (7). This instrument has good validity and reliability (Palfreyman, Haycraft, & Meyer, 2015). It consists of 15 items and three subscales: 1. Verbal: which explores how parents model their eating behaviour through verbal communication; 2. Behavioural: assessing the number of instances the mother models eating behaviour that her child could copy; and 3. Unintentional modelling, which measures the number of times the child observes and assimilates behaviours that parents have not intentionally modelled. The PARM Scores were inspected for normality. The Unintentional modelling (at 1 year), Verbal modelling and Unintentional modelling subscales (at 2 years) were not normally distributed and could not be normalized after transformation. Hence, they were dichotomized into binary variables indicating the top quartile vs. the bottom 75% to identify women who reported high verbal and unintentional modelling.

In order to ensure a large enough sample size, we included only women with complete data on predictors and outcomes at each time-point. As a result, the sample size varied across analyses.

Response rates were: at 8 weeks post-partum was 78%, at 6 months was 71%, whilst it was 50% in the first year and 55% in the second year.

COVARIATES

Socio-demographic data

Maternal age, infant gender, maternal education, ethnicity, marital status and parity were obtained via self-report at enrolment into the study. Marital status was coded as a binary variable into single with or without a partner, vs. married/cohabiting. Ethnicity was dichotomized into: Caucasian vs. non-Caucasian. Maternal education was coded as: A-level or higher (secondary school or above) and < A-level (no secondary school qualification). Parity was dichotomized into: nulliparous vs primiparous/multiparous.

Infant weight

Mothers were asked to provide their infant weight at 8 weeks and 6 months from their Personal Child Health Record (Red book). The "Red book" is given to new parents in the United Kingdom as a way to keep track of their child's progress and is updated by health care professionals every time the child is seen in a healthcare setting (Royal College of Paediatrics and Child Health, 2012). Infants' weight at 8 weeks was used to estimate the infants' growth centile based on the Royal College of Paediatrics and Child Health UK WHO 0-4 years growth charts (2009) and was corrected for gestational age. Weight at 8 weeks of age was then dichotomised into under-weight/normal weight and overweight (> 85 percentile) (Flegal & Ogden, 2011).

Statistical analyses

Outcomes and covariates were investigated in terms of distribution.

Crude and adjusted linear and logistic regression analyses were used to test whether maternal active or past ED were prospectively associated with breastfeeding, infant feeding practices, and maternal modelling depending on the nature of the variable under study (continuous vs. dichotomous). Adjusted models included *a priori* confounders (maternal age, infant gender,

parity and breastfeeding for analyses regarding infant feeding practices, and maternal modelling).

We also investigated correlations between maternal ED psychopathology at the time of outcome (8 weeks, 6 months, 1 and 2 years) and each outcome to explore the cross-sectional effect of maternal ED symptoms on each outcome.

In post-hoc analyses we also explored weight in children whose mothers reported higher concern about infant overeating or becoming overweight.

All analyses were performed using SPSS 21 and a two-tailed significance level of $p < 0.05$ was used.

Missing data

Missingness on socio-demographic data was examined (ranging from 1.3% for maternal age to 8.9% for education). Missing data on all potential confounders were dealt with using multiple imputation in the statistical analyses. All predictor and outcome variables were used as predictors in the imputation model, which was set for 10 imputations. Differences in results using complete case analyses and imputed datasets were minimal therefore results are presented for imputed analyses.

Ethical approval

This study was approved by the Joint South London and the Institute of Psychiatry NHS Research Ethics Committee (Ref. 09/H0807/12).

Results

Sample characteristics

Across the whole sample the majority of women were of Caucasian ethnicity (84.5%), were married or cohabiting at the time of recruitment (86.6%) and had a higher education (A level or higher) (91.1%).

Women in the C-ED group were significantly younger than women in the P-ED and HC groups (Table 1). A slightly lower percentage of women with P-ED and P-ED were married or cohabited compared to HC but only a trend was observed (Table 1).

Breastfeeding at 8 weeks and 6 months

Overall, 60.6% of women were exclusively breastfeeding at 8 weeks (64.4% of HC, 66.7% of P-ED and 52% of C-ED), and 64% were exclusively or partially breastfeeding at 6 months (66.7% of HC, 73.9% of P-ED, 57.1% of C-ED). Women with active or past ED did not differ from controls in relation to breastfeeding at either 8 weeks (respectively C-ED: adjusted OR= 0.7 (95% CI: 0.2-2.3); P-ED: OR= 1.1 (95% CI: 0.3-3.6) and 6 months C-ED: OR= 2.4 (95% CI: 0.6-9.2); P-ED: OR= 0.9 (95% CI: 0.3-3.1).

Infant feeding practices

Means and standard deviations for scores on each of the IFQ subscales at 8 weeks and 6 months are shown in Table S1.

Women with P-ED reported less awareness about infant hunger and satiety cues compared to HC in crude, minimally adjusted and adjusted models at 8 weeks. Women with P-ED also had increased odds of having high concern about their infant overeating or becoming overweight compared to HC in all models both at 8 weeks OR= 3.2 (95% CI: 1.0-10) and 6 months post-partum OR= 4.3 (95% CI: 1.1-16.8) (see Table 2). Women with C-ED had increased odds of having high concern about infant overeating or becoming overweight at 6

months only OR= 8.1 (95% CI: 2.2-27.7) compared to HC (Table 2). All other subscales were comparable across exposure groups. No significant differences were found in children's weight in mothers who reported high concern vs. those who did not (p=0.46).

Parental modelling of eating behaviours

Means and standard deviations of each PARM subscale at 1 and 2 years are detailed in Table S2. Differences were marginal when studying C-ED and P-ED together or as separate groups, therefore C-ED and P-ED were combined into one exposure group to increase statistical power. We found a significant association between having an ED and lower odds of scoring high on unintentional modelling (Table 3). No significant correlations were observed between ED symptomatology and PARM subscales. No other significant differences were found.

Correlations of ED symptomatology and infant feeding practices

A higher global EDE-Q and higher eating concern, weight concern and shape concern scores correlated with higher concern about the child overeating or becoming overweight at both 8 weeks (Rs(76)= 0.03, p=0.002) and 6 months (Rs(81)= 0.37, p=0.001). A positive correlation was also observed between the EDE-Q restraint subscale and concern about infant overeating or becoming overweight at 6 months only (Rs(83)= 0.24, p=0.03). No other significant correlations were observed.

Discussion

The present study investigated breastfeeding, infant feeding practices and attitudes in mothers with active and past ED compared to healthy controls throughout infancy and up to 2 years. This is the first study to investigate longitudinal patterns of infant feeding behaviours and maternal modelling of eating behaviours in mothers with C-ED and P-ED compared to healthy controls.

Breastfeeding

Overall, 60.6% of women were exclusively breastfeeding at 8 weeks and 64% were fully or partially breastfeeding at 6 months. This proportion of breastfeeding is in line to those reported in previous studies in UK (55%) (McAndrew et al., 2012). In our sample women with ED were as likely as control mothers to breastfeed their infants in the first six months of life. The lack of difference in this study might be due to sample size, i.e. a type II error; or it might be due to ED case mix. In the current study the majority of women suffered from AN (52.8%).

Maternal feeding practices

Women with P-ED reported higher concern about their child being/becoming overweight both at 8 weeks and 6 months post-partum compared to HC. This was also true for women with C-ED at 6 months post-partum. When we explored whether children of women who reported these concerns were in the overweight/obese weight range using data objectively collected we did not find any differences across groups, therefore child weight did not appear to be driving our results. Our findings are consistent with previous findings that have highlighted women with ED being overly concerned about their child's weight and shape (Lacey & Smith, 1987; Russell et al., 1998; Tierney, Fox, Butterfield, Stringer, & Furber, 2011), although these studies did not include a comparison group. Our sample was larger and

we were able to compare women with ED and healthy controls. In addition, we were able to assess both past and active ED diagnosis, showing that both were associated with higher concern about the child being or becoming overweight. We showed that higher global EDE-Q, eating concern, weight concern and shape concern and restraint score were associated with having higher concern about the child overeating or becoming overweight both at 8 weeks and 6 months. These findings substantiate the similarity across C-ED and P-ED groups, suggesting that cross-sectional maternal ED symptoms might be driving the heightened concern about child overweight. Unfortunately we cannot determine whether this concern was reflected in changes in maternal feeding behaviours. Previous studies have shown that mothers with higher concern about their children being or becoming overweight were more likely to restrict their child's eating (Astrachan-Fletcher et al., 2008; Lacey & Smith, 1987; Reba-Harrelson et al., 2010). Previous research has shown that parental critical comments about body weight and shape and encouragement to lose weight are associated with body dissatisfaction in children and development of later ED (Fairburn & Harrison, 2003). This might be a potential pathway of ED transmission from mother to child. Future research should address whether maternal concern of child overeating or overweight is a predictor of later child ED and how it affects child eating behaviour and weight in childhood and adolescence.

In line with a previous study (Stein, 1999), our research found that women with P-ED are less aware of infant hunger and satiety cues compared to HC. Studies have shown that mothers with ED showing less awareness of infant hunger, express more negative emotions toward their children and are more intrusive and controlling during mealtimes (Stein, Woolley, Cooper, & Fairburn, 1994).

We found a significant association between having an ED (both past and active) and lower odds of scoring high on unintentional modelling, i.e. suggesting mothers with ED were more

likely to report lower parental awareness of behaviours adopted by the child which were not intentionally modelled. This finding is in contrast with previous studies that showed women with higher levels of maternal eating psychopathology are more aware of their unintentional modelling (Palfreyman et al., 2013). Also, the discordant findings could be explained by our study focusing on clinical ED; women with full-blown ED might be less aware of unintentional modelling. Another explanation might be that children in our sample were younger compared to (Palfreyman et al., 2013), therefore mothers might be less aware of their unintentional modelling when children are younger and have not attained independent eating yet. Having an ED was not found to be associated with either verbal modelling or intentional modelling. The lack of association might be due to these mothers with ED engaging in lower levels of interactions with their children in relation to food and eating, as has been previously documented in the literature (Patel, Wheatcroft, Park, & Stein, 2002). Additionally, these mothers might be aware that their eating behaviours might affect the child, and therefore they may avoid displaying them (Palfreyman et al., 2013). Fathers might have a protective role in the development of child psychopathology, particularly when they actively parent (Sadeh-Sharvit et al., 2015). Furthermore, fathers' modelling of healthy eating behaviours has been shown to be associated with lower nutrition risk (Watterworth et al., 2017). However, this was not assessed in the present paper and should be addressed in future research.

To our knowledge this is the first study to investigate parental modelling in an ED clinical sample.

Strengths and limitations

Few studies have investigated feeding behaviours, practices and modelling in infancy in offspring of ED women. Our outcomes were all assessed prospectively, avoiding recall bias

which retrospective research suffers from. Another strength is that ED diagnoses were based on diagnostic interviews, rather than self-report; and we were able to include women with past and active ED and assess their differential effect. Given our recruitment strategy, women in the sample included both clinical and community cases. Therefore the generalizability of our results might be higher than studies using samples from specialist services only and community cases only, and might include women with a range of ED severity.

Our study needs to be interpreted in the context of some limitations. Women who continued to take part in our study for the full two postnatal years were more likely to be ==Caucasian== and better educated, limiting the generalizability of results. However, no selective attrition was noted in women with ED. Another limitation lies in the inability to study the effect of specific diagnoses (AN, BN and BED) due to small sample sizes. A further limitation lies in the self-report nature of the IFQ and PARM. While they are validated measures to assess maternal feeding behaviours, attitudes, and modelling the reliability of some subscales (i.e. awareness of infant's hunger and satiety cues) might be questionable and could be improved with corroboration from other caregivers or observational methods. The PARM has good validity and reliability, however the internal consistency of the unintentional modelling subscale is slightly lower compared to the others (verbal and intentional) possibly due to the unintentional modelling subscale relying only on three items (Palfreyman et al., 2014). Finally, no data on whether women engaged in treatment for ED during the duration of the study were collected.

Clinical implications and conclusions

In conclusion, having an active or past ED in pregnancy is prospectively associated with altered maternal feeding practices and worries about the child's eating. Maternal concurrent ED psychopathology affects maternal feeding practices and worries. Research suggests that

maternal ED are associated with several negative outcomes in the offspring (Micali, De Stavola, Ploubidis, Simonoff, & Treasure, 2014; Patel et al., 2002). However, the current study only found minor effects of ED on maternal feeding practices and worries in infancy. Additional in-depth information would be of value assessing how mothers with ED think and feel about feeding their children and their actual ability to feed them in a healthy way. Research exploring the applicability of current interventions to women in the post-partum period is clearly required and should focus on concerns specific to the post-partum period.

The findings suggest that it is not premature to consider the potential value of educational programs and support for mothers with ED (Bryant-Waugh, Turner, Jones, & Caroline, 2007). For example, potential psychological interventions could be aimed at helping mothers with ED to become more attuned to their children's hunger and satiety cues in order to decrease potential adverse outcomes. Also, additional support addressing ED psychopathology, for example dysmorphophobia management, in the post-partum might be useful in preventing childhood feeding problems.

Given the potential negative effect on child development, clinicians should also be alert on the impact that a history of ED can have on infant feeding behaviours. Maternal worries identified are likely to impact on child's growth and later eating behaviours and might impact on the intergenerational transmission of ED.

References

Agras, S., Hammer, L., & McNicholas, F. (1999). A prospective study of the influence of eating-disordered mothers on their children. *The International Journal of Eating Disorders*, *25*(3), 253–262.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders (4th ed., text rev.)*. Washington, D.C.: Author.

American Psychiatric Association. (2013). American Psychiatric Association. Diagnostic and Statistical Manual of mental Disorders: fifth edition, DSM5. American Psychiatric Publishing, Washington DC, London.

Astrachan-Fletcher, E., Veldhuis, C., Lively, N., Fowler, C., & Marcks, B. (2008). The reciprocal effects of eating disorders and the postpartum period: a review of the literature and recommendations for clinical care. *Journal of Women's Health*, *17*(2), 227–239. https://doi.org/10.1089/jwh.2007.0550

Baughcum, A. E., Powers, S. W., Johnson, S. B., Chamberlin, L. A., Deeks, C. M., Jain, A., & Whitaker, R. C. (2001). Maternal feeding practices and beliefs and their relationships to overweight in early childhood. *Journal of Developmental and Behavioral Pediatrics*, *22*(6), 391–408. https://doi.org/10.1097/00004703-200112000-00007

Brown, R., & Ogden, J. (2004). Children's eating attitudes and behaviour: A study of the modelling and control theories of parental influence. *Health Education Research*, *19*(3), 261–271. https://doi.org/10.1093/her/cyg040

Bryant-Waugh, R., Turner, H., Jones, C., & Caroline, G. (2007). Developing a parenting skills-and-support intervention for mothers with eating disorders and pre-school children part 2: Piloting a group intervention. *European Eating Disorders Review*, *15*, 439–448.

Cimino, S., Cerniglia, L., Paciello, M., & Sinesi, S. (2013). A Six-year Prospective Study on Children of Mothers with Eating Disorders : The Role of Paternal Psychological Profiles, *21*, 238–246. https://doi.org/10.1002/erv.2218

Cooper, Z., & Fairburn, C. G. (1987). The eating disorder examination: A semi-structured interview for the assessment of the specific psychopathology of eating disorders. *International Journal of Eating Disorders*, *6*(1), 1–8.

Easter, A., Bye, A., Taborelli, E., Corfield, F., Schmidt, U., Treasure, J., & Micali, N. (2013). Recognising the symptoms: how common are eating disorders in pregnancy? *European Eating Disorders Review*, *21*(4), 340–344. https://doi.org/10.1002/erv.2229

Easter, A., Solmi, F., Bye, A., Taborelli, E., Corfield, F., Schmidt, U., … Micali, N. (2015). Antenatal and Postnatal Psychopathology Among Women with Current and Past Eating Disorders: Longitudinal Patterns. *European Eating Disorders Review*, *23*(1), 19–27. https://doi.org/10.1002/erv.2328

Fairburn, C., & Beglin, S. (1994). Assessment of eating disorder: Interview or self-report questionnaire. *International Journal of Eating Disorders*, *16*(4), 363–370.

Fairburn, C. G., & Harrison, P. J. (2003). Eating disorders. *Lancet*, *361*(9355), 407–416. https://doi.org/10.1016/S0140-6736(03)12378-1

Flegal, K. M., & Ogden, C. L. (2011). Childhood Obesity : Are We All Speaking the Same Language ? *Advances in Nutrition*, *2*, 1595–1665.

Hoffman, E. R., Bentley, M. E., Hamer, R. M., Hodges, E. A., Ward, D. S., & Bulik, C. M. (2014). A comparison of infant and toddler feeding practices of mothers with and without histories of eating disorders. *Maternal and Child Nutrition*, *10*(3), 360–372. https://doi.org/10.1111/j.1740-8709.2012.00429.x

Lacey, J. H., & Smith, G. (1987). Bulimia nervosa: The impact of pregnancy on mother and baby. *British Journal of Psychiatry*, *150*(6), 777–781. https://doi.org/10.1192/bjp.150.6.777

Larsen, P. S., Nybo Andersen, A. M., Olsen, E. M., Micali, N., & Strandberg-Larsen, K. (2016). What's in a Self-report? A Comparison of Pregnant Women with Self-reported and Hospital Diagnosed Eating Disorder. *European Eating Disorders Review*, *24*(6), 460–465. https://doi.org/10.1002/erv.2464

Larsson, G., & Andersson-Ellström, A. (2003). Paper Changes and of Breast-feeding in Women. *European Eating Disorders Review*, *11*(1), 116–124.

McAndrew, F., Thompson, J., Fellows, L., Large, A., Speed, M., & Renfrew, M. J. (2012). *UK infantfeeding survey. Leeds, UK: NHS England, Health and Social Care Information Centre.*

Micali, N., De Stavola, B., Ploubidis, G. B., Simonoff, E., & Treasure, J. (2014). The effects of maternal eating disorders on offspring childhood and early adolescent psychiatric disorders. *International Journal of Eating Disorders*, *47*(4), 385–393. https://doi.org/10.1002/eat.22216

Micali, N., Kothari, R., Nam, K. W., Gioroukou, E., Walshe, M., Allin, M., … Nosarti, C. (2015). Eating disorder psychopathology, brain structure, neuropsychological correlates and risk mechanisms in very preterm young adults. *European Eating Disorders Review*, *23*(2), 147–155. https://doi.org/10.1002/erv.2346

Micali, N., Simonoff, E., & Treasure, J. (2009). Infant Feeding and Weight in the First Year of Life in Babies of Women with Eating Disorders. *Journal of Pediatrics*, *154*, 55–60. https://doi.org/10.1016/j.jpeds.2008.07.003

Micali, N., Stemann Larsen, P., Strandberg-Larsen, K., & Nybo Andersen, A. M. (2016). Size at birth and preterm birth in women with lifetime eating disorders: a prospective population-based study. *BJOG: An International Journal of Obstetrics and Gynaecology*, *123*(8), 1301–1310. https://doi.org/10.1111/1471-0528.13825

Nguyen, A. N., de Barse, L. M., Tiemeier, H., Jaddoe, V. W. V., Franco, O. H., Jansen, P. W., & Voortman, T. (2017). Maternal history of eating disorders: Diet quality during pregnancy and infant feeding. *Appetite*, *109*, 108–114. https://doi.org/10.1016/j.appet.2016.11.030

O'Hara, M. W., Wisner, K. L., & Asher, H. (2014). Perinatal mental illness : De fi nition , description and aetiology. *Best Practice & Research Clinical Obstetrics and Gynaecology*, *28*, 3–12. https://doi.org/10.1016/j.bpobgyn.2013.09.002

Palfreyman, Z., Haycraft, E., & Meyer, C. (2013). Unintentional Role Models : Links Between Maternal Eating Psychopathology and the Modelling of Eating Behaviours. *European Eating Disorders Review*, *21*, 195–201. https://doi.org/10.1002/erv.2219

Palfreyman, Z., Haycraft, E., & Meyer, C. (2014). Development of the Parental Modelling of Eating Behaviours Scale (PARM): Links with food intake among children and their mothers. *Maternal and Child Nutrition*, *10*(4), 617–629. https://doi.org/10.1111/j.1740-8709.2012.00438.x

Palfreyman, Z., Haycraft, E., & Meyer, C. (2015). Parental modelling of eating

behaviours: Observational validation of the Parental Modelling of Eating Behaviours scale (PARM). *Appetite*, *86*, 31–37. https://doi.org/10.1016/j.appet.2014.08.008

Park, R., Senior, R., & Stein, A. (2003). The offspring of mothers with eating disorders. *European Child & Adolescent Psychiatry*, *12*, 110–119. https://doi.org/10.1007/s00787-003-1114-8

Paschetta, E., Berrisford, G., Coccia, F., Whitmore, J., Wood, A. G., Pretlove, S., & Ismail, K. M. K. (2014). Perinatal psychiatric disorders : an overview. *The American Journal of Obstetrics & Gynecology*, *210*(6), 501–509. https://doi.org/10.1016/j.ajog.2013.10.009

Patel, P., Wheatcroft, R., Park, R., & Stein, A. (2002). The children of mothers with eating disorders. *Clinical Child and Family Psychology Review*, *5*(1), 1–19.

Reba-Harrelson, L., Von Holle, A., Hamer, R. M., Torgersen, L., Reichborn-Kjennerud, T., & Bulik, C. M. (2010). Patterns of maternal feeding and child eating associated with eating disorders in the Norwegian Mother and Child Cohort Study (MoBa). *Eat Behav.*, *11*(1), 54–61.

Russell, G. F., Treasure, J., & Eisler, I. (1998). Mothers with anorexia nervosa who underfeed their children: their recognition and management. *Psychological Medicine*, *28*(1), 93–108. https://doi.org/10.1017/S003329179700603X

Sadeh-Sharvit, S., Levy-Shiff, R., Feldman, T., Ram, A., Gur, E., Zubery, E., … Lock, J. D. (2015). Child feeding perceptions among mothers with eating disorders. *Appetite*, *95*, 67–73. https://doi.org/10.1016/j.appet.2015.06.017

Silva, G., Costa, K., & Giugliani, E. (2016). Infant feeding: Beyond the nutritional aspects. *Jornal de Pediatria (Rio J)*, *92*(3), S2–S7. https://doi.org/10.1016/j.jped.2016.02.006

Solmi, F., Sallis, H., Stahl, D., Treasure, J., & Micali, N. (2014). Low birth weight in the offspring of women with anorexia nervosa. *Epidemiologic Reviews*, *36*, 49–56. https://doi.org/10.1093/epirev/mxt004

Stein, A. (1999). Conflict between mothers with eating disorders and their infants duing mealtimes. *British Journal of Psychiatry*, *175*, 455.

Stein, A., Murray, L., Cooper, P., & Fairburn, C. (1996). Infant growth in the context of maternal eating disorders and maternal depression: a comparative study. *Psychol Med.*, *26 (3)*, 569–574.

Stein, A., Woolley, H., Cooper, S., & Fairburn, C. (1994). An observational study of mothers with eating disorders and their infants. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *35*(4), 733–748.

Stein, A., Woolley, H., Cooper, S., Winterbottom, J., Fairburn, C. G., & Cortina-Borja, M. (2006). Eating habits and attitudes among 10-year-old children of mothers with eating disorders: Longitudinal study. *British Journal of Psychiatry*, *189*, 324–329. https://doi.org/10.1192/bjp.bp.105.014316

Stice, E. (1998). Modeling of eating pathology and social reinforcement of the thin-ideal predict onset of bulimic symptoms. *Behaviour Research and Therapy*, *36*(10), 931–944. https://doi.org/10.1016/S0005-7967(98)00074-6

Strube, M. (1985). Prorate: a basic program for calculating minimum test length given internal consistency constraints. *Behav Res Methods Instrum Comput.*, *17*(5), 580.

Tierney, S., Fox, J., Butterfield, C., Stringer, E., & Furber, C. (2011). Treading the

tightrope between motherhood and an eating disorder: A qualitative study. *International Journal of Nursing Studies*, *48*(10), 1223–1233. https://doi.org/10.1016/j.ijnurstu.2010.11.007

Torgersen, L., Ystrom, E., Haugen, M., Meltzer, H. M., Von Holle, A., Berg, C. K., … Bulik, C. M. (2010). Breastfeeding practice in mothers with eating disorders. *Maternal and Child Nutrition*, *6*(3), 243–252. https://doi.org/10.1111/j.1740-8709.2009.00208.x

Watterworth, J., Hutchinson, J., Buchholz, A., Darlington, G., Randall Simpson, J., Ma, D., & Haines, J. (2017). Food parenting practices and their association with child nutrition risk status: comparing mothers and fathers. *Appl Physiol Nutr Metab.*, *42*(6), 667–671.

Table 1. Socio-demographic characteristics of the sample

	HC (N=46)	P-ED (N=28)	C-ED (N=25)	p-value
Age, mean (SD)	34.0 (3.8)	33.3 (5.5)	29.0 (5.4)	**0.009**
Ethnicity, Caucasian (%)	41 (89.1)	24 (85.7)	17 (68)	0.08
Education, A level or higher (%)	41 (89.1)	20 (71.4)	21 (84)	0.4
Marital status, married/cohabiting (%)	43 (93.5)	22 (78.6)	19 (76)	0.06
Gender, female (%)	27 (58.7)	13 (46.4)	13 (52)	0.58
Parity, nulliparous (%)	24 (52.2)	16 (57.1)	17 (68)	0.2

Note: categorical outcomes X2 tests were undertaken for categorical outcomes, and continuous outcomes were tested using ANOVA.

Table 2. Associations between infant feeding at 8 weeks and 6 months post-partum and maternal ED: crude and adjusted[1] linear and logistic regression

Infant Feeding Questionnaire subscales	Unadjusted			Adjusted		
	HC	P-ED	C-ED	HC	P-ED	C-ED
8 weeks post-partum §						
Mothers concern about infant under-eating or becoming underweight OR (95% C.I.)	N=44	N=27	N=25	N=44	N=27	N=25
	Ref	2.3(0.8,6.7)	1.2(0.4,4.0)	Ref	2.2(0.7,6.9)	1.1(0.3,4.2)
High Concern about infant overeating or becoming overweight OR (95% C.I.)	N=46	N=28	N=25	N=46	N=28	N=25
	Ref	4.1(1.5,11.6)**	1.9(0.6,5.9)	Ref	3.2(1.1,10.0)*	3.3(0.9,11.8)+
Feeding infant on a schedule OR (95% C.I.)	N=46	N=28	N=25	N=46	N=28	N=25
	Ref	0.7(0.2,2.5)	1.1(0.3,4.8)	Ref	0.8(0.2,3.2)	1.1(0.2,5.6)
High Awareness of Infant's Hunger and Satiety Cues Model B (95%C.I.)	N=44	N=27	N=25	N=44	N=27	N=25
	Ref	-0.3(-0.6,-0.03)*	-0.1(-0.4,0.2)	Ref	-0.3(-0.6,-0.01)*	0.0(-0.3,0.4)
Using food to calm infant's fussiness Model B (95%C.I.)	N=46	N=28	N=25	N=46	N=28	N=25
	Ref	-0.1(-0.6,0.4)	-0.1(-0.7,0.4)	Ref	-0.1(-0.6,0.5)	-0.1(-0.7,0.5)
6 months post-partum	N=45	N=23	N=21	N=45	N=23	N=21
High Mothers concern about infant under-eating or becoming underweight OR (95% C.I.)	Ref	1.4(0.4,4.6)	3.0(1.0,9.3)+	Ref	1.1(0.3,4.3)	2.4(0.5,8.6)
High Concern about infant overeating or becoming overweight OR (95% C.I.)	Ref	3.5(1.1,11.2)*	7.2(2.2,23.6)**	Ref	4.3(1.1,16.8)*	8.1(2.2-27.7)**
Feeding infant on a schedule OR (95% C.I.)	Ref	1.0(0.3,3.3)	1.8(0.6,5.5)	Ref	1.2(0.3,4.4)	1.3(0.3,5.1)
Awareness of Infant's Hunger and Satiety Cues B (95%C.I.)	Ref	-0.2(-0.5,0.1)	-0.0(-0.3,0.3)	Ref	-0.2(-0.5,0.1)	0.1(-0.2,0.5)
Using food to calm infant's fussiness B (95%C.I.)	Ref	0.2(-0.4,0.8)	-0.2(-0.8,0.4)	Ref	0.1(-0.4,0.7)	-0.2(-0.8,0.4)

HC, healthy controls, ED, Eating disorders, C-ED current cases, P-ED past cases

[1]: adjusted for maternal age, infant gender, parity, breastfeeding

+0.1>p<0.05, * p<0.05, ** p<0.01

§ IFQSubscales at 8 weeks post-partum had different sample sizes (as shown in each row)

Table 3. Crude and adjusted linear and logistic regression analyses of ED status (active and past ED) and PARM subscales at 1 and 2 years post-partum

PARM subscale	ED History	
	HC	ED
1 year post-partum (N)	30	31
Verbal modelling		
Model I b (95%CI)	Ref	-0.2(-0.9,0.4)
Model II^a b (95%CI)	Ref	-0.1(-0.7,0.5)
Unintentional modelling		
Model I OR	Ref	0.8(0.3,2.5)
Model II^a OR	Ref	1.3(0.3,5.2)
Behavioural modelling		
Model I b (95%CI)	Ref	-0.1(-0.6,0.4)
Model II^a b (95%CI)	Ref	-0.1(-0.6,0.4)
2 year post-partum (N)	37	32
Verbal modelling		
Model I OR	Ref	0.5(0.2,1.5)
Model II^a OR	Ref	0.7(0.2,2.0)
Unintentional modelling		
Model I OR	Ref	0.4 (0.1,1.2)
Model II^a OR	Ref	0.4(0.1,0.8)*
Behavioural modelling 2 year score		
Model I b (95%CI)	Ref	0.1(-0.5,0.7)
Model II^a b (95%CI)	Ref	0.2(-0.4,0.8)

HC, healthy controls, ED, Eating disorders, C-ED current cases, P-ED past cases
a: adjusted for age, education, infant gender, parity
[+]0.1>p<0.05, * p<0.05, ** p<0.01