



Queensland University of Technology
Brisbane Australia

This may be the author's version of a work that was submitted/accepted for publication in the following source:

[Jani, Rati, Mhrshahi, Seema, & Mallan, Kimberley](#)
(2014)

Psychosocial factors associated with controlling feeding practices of Indian and Australian-Indian mothers.

Asian Journal of Research in Social Sciences and Humanities, 4(5), pp. 385-401.

This file was downloaded from: <https://eprints.qut.edu.au/70143/>

© Copyright 2014 The authors and Asian Research Consortium.

This work is covered by copyright. Unless the document is being made available under a Creative Commons Licence, you must assume that re-use is limited to personal use and that permission from the copyright owner must be obtained for all other uses. If the document is available under a Creative Commons License (or other specified license) then refer to the Licence for details of permitted re-use. It is a condition of access that users recognise and abide by the legal requirements associated with these rights. If you believe that this work infringes copyright please provide details by email to qut.copyright@qut.edu.au

Notice: *Please note that this document may not be the Version of Record (i.e. published version) of the work. Author manuscript versions (as Submitted for peer review or as Accepted for publication after peer review) can be identified by an absence of publisher branding and/or typeset appearance. If there is any doubt, please refer to the published source.*

<http://www.indianjournals.com/ijor.aspx?target=ijor:ajrssh&volume=4&issue=5&article=031>

Title: Psychosocial factors associated with controlling feeding practices of Indian and Australian-Indian mothers

Rati Jani¹, Seema Miharshahi² & Kimberley M. Mallan¹

¹The Institute of Health & Biomedical Innovation, Queensland University of Technology, Brisbane, Australia

²The School of Population Health, The University of Queensland, Brisbane, Australia

Abstract

This cross-sectional study examined the association between psychosocial factors (mothers' perception of own and child weight, maternal self-efficacy in feeding and involvement of the mother-in-law in child-feeding) and controlling feeding practices (monitoring, restriction, pressure to eat and passive feeding). Participants were 531 affluent-Indian mothers in Australia and Mumbai with children aged 1-5 years. The psychosocial variables and feeding practices were measured using a combination of previously validated scales and study-developed items/scales. Multivariable regression analyses were stratified by sample (Australia and Mumbai) to investigate psychosocial factors related to the feeding practices, adjusting for covariates. Self-efficacy in feeding was associated with each of the feeding practices in at least one of the samples (β values between 0.1-0.2, $p=0.04-0.005$). The greater involvement of the mother-in-law in child-feeding was related to the higher use of restriction in both samples (β values ≥ 0.2 , $p=0.02$). In contrast, maternal weight perceptions were not consistently associated with feeding practices in either sample. The findings highlighted that unique (self-efficacy in feeding) and culturally-specific (involvement of the mother-in-law) variables not extensively researched within the context of child-feeding were important factors associated with Indian mothers' feeding practices. Greater consideration of these factors may be required when tailoring child-feeding interventions for Indian mothers.

Keywords: weight perceptions, self-efficacy, mother-in-law, feeding practices, Indian

Introduction

Childhood obesity is a global health concern. The prevalence of obesity including overweight in preschool children is lower in a developing nation such as India (8%) (Khadilkar et al., 2012) in comparison to a developed nation such as Australia (25%) (Australian Bureau of Statistics, 2011-12). However, the obesity associated disease risk-indicators (e.g. higher insulin resistance) are higher for both indigenous (Yajnik, 2003) and migrant Indian children (Whincup et al., 2010) in comparison to Caucasian children. The environment, in combination with genetic factors, plays a critical role in the development of childhood obesity (Ventura & Birch, 2008). While nutritional transition (Tharkar & Viswanathan, 2009) and dietary acculturation (Satia-Abouta, 2003) are broader environmental risk factors for the prevalence of obesity in indigenous and migrant Indian children respectively, the more proximal environmental determinants of obesity in young children are the family and home environment (Ventura & Birch, 2008). In particular, child-feeding practices, that is, how parents feed their children, have gained considerable attention from child obesity researchers in westernised nations (Ventura & Birch, 2008).

A number of distinct child-feeding practices have been linked to the development of both favourable and unfavourable food preferences, eating behaviours and weight patterns in children. The most extensively studied child-feeding practices are monitoring, pressure to eat and restriction (Birch et al., 2001). Monitoring has shown to promote the selection of core foods (Klesges et al., 1991) and exert a protective effect on weight status in a sample of American children aged 4-7 years (Faith et al., 2004). In contrast, detrimental consequences for children's weight status and dietary preferences have been reported with the use of pressure to eat (underweight/lower intake of vegetables) (Fisher et al., 2002, Murashima et al., 2012) and restriction (overweight/higher intake of non-core foods) (Fisher & Birch, 1999, Faith et al., 2004), respectively in American children aged 3-7 years. Commensurate research in Indian populations is scarce. However, the use of 'passive feeding' (i.e. feeding the child even though the child is capable to self-feed), a coercive practice, appears to be a culturally-specific practice used by Indian mothers. In a cross-sectional study (n= 112) of Indian and Caucasian mothers living in either the UK or USA, 46% of Indian mothers vs only 14% of Caucasian mothers reported using passive feeding practices with their 2-6 year old child (Mehta et al., 2003). In the

Indian culture passive feeding may continue beyond five years of age and is proposed to impair children's ability to self-regulate energy intake, which in turn could have detrimental consequences for their weight status (Mehta et al., 2003, Pac et al., 2004). Given the potentially positive and negative implications of these feeding practices (monitoring, restriction, pressure to eat and passive feeding) on children's dietary patterns and growth, identifying modifiable factors associated with maternal feeding practices may assist in developing interventions which address the underlying determinants influencing their use.

Maternal and child-feeding interactions are complex in nature; they may be influenced by both fixed and potentially modifiable factors. Several, fixed maternal and child socio-demographic characteristics have shown to partly explain, predominately Caucasian mothers use of feeding practices, some of which are the mother's education and income (Kroller & Petra, 2009), age and weight status (Brown et al., 2008), and the child's age (Gray et al., 2010), and gender (Gubbels et al., 2011). For Indian mothers specifically, religious background may also be a relevant variable (Jani et al., submitted). Potentially modifiable factors, specifically psychosocial factors, may further assist in explaining maternal feeding practices. Some psychosocial factors (maternal weight perceptions) have been extensively examined in the literature (Francis et al., 2001, Brown & Lee, 2011), but predominantly in Caucasian samples. In contrast, there is a scarcity of literature examining unique (self-efficacy in feeding) and culturally-specific (involvement of the mother-in-law in feeding) psychosocial factors. This paper examined four specific psychosocial factors which may be associated with child-feeding practices: (1) maternal perceptions about her own weight status, (2) maternal perceptions about her child's weight status, (3) maternal self-efficacy in feeding and (4) involvement of the mother-in-law in child-feeding.

Maternal weight perceptions are the most common factors examined in relation to child-feeding practices, specifically restriction and pressure to eat. Previous research has consistently observed that mothers predominately Caucasian perceiving themselves and their child as overweight used more restriction (Francis et al., 2001, Brown & Lee, 2011). Similarly, mothers perceiving their child as underweight used more pressure to eat (Francis et al., 2001, Brown & Lee, 2011).

Self-efficacy in feeding is the parent's confidence in '*providing*' (Cullen et al., 2000, Campbell et al., 2010) and the child '*consuming*' the appropriate quality and quantity of food. Self-efficacy has commonly been studied in terms of general parenting and showed positive association with health behaviours such as promoting physical activity (Ashford et al., 2010), breastfeeding (Ashford et al., 2010) and fostering healthy dietary patterns (higher intake of fruits and vegetables) in children and adolescents aged ≤ 18 years (Arianna et al., 2009). There are limited studies both in terms of number and quality (e.g., prospective designs, adjustment for maternal and child covariates), which have examined the association of self-efficacy in feeding with child-feeding practices. One cross-sectional study observed that lower general parenting self-efficacy (parenting sense of competence scale) (Johnston & Mash, 1989) was associated with higher restriction by Australian mothers with children aged 5-8 years (Mitchell et al., 2009). However, no adjustment for covariates was performed.

In the Indian social system, the mother-in-law (husband's mother) plays a significant role in the continued upbringing of her grandchild. The mother-in-law's experience with child-care gives her authority to guide the mother (Bhopal, 1998). Additionally, in India, the paternal grandparents usually live with their son and his family (Bhopal, 1998). In the case of immigration of the immediate family (the parents and their child/children), the mother-in-law may frequently be invited to stay for extended periods at a time (several weeks or months) with the family to facilitate her continued involvement in child-care related activities (Bhopal, 1998). Qualitative studies with Indian (Bhopal, 1998) and Chinese (Jingxiong et al., 2007) mothers highlighted that grandparents (maternal and parental) freely provided energy-dense food to their grandchildren, to which the mothers responded by restricting the child's intake of those non-core food items (Bhopal, 1998, Jingxiong et al., 2007).

To date, there have been no quantitative studies examining the association between psychosocial variables and controlling feeding practices of Indian mothers. The current study expands upon the existing literature by examining the association between specific psychosocial factors (maternal perception of their own and their child's weight status, maternal self-efficacy in child-

feeding and the involvement of the mother-in-law in child-feeding) and controlling feeding practices (monitoring, restriction, pressure to eat and passive feeding) used by Indian mothers living in Australia and Mumbai with children aged 1-5 years.

Methods

Following ethical approval ([removed for blind peer review]) this cross-sectional study recruited Indian mothers in Australia (n=230) and Mumbai (n=301). The data collection and the recruitment procedures are described elsewhere (Mehta et al., 2013, Jani et al., submitted). In brief, the mothers' eligibility criteria were: born in India, older than 18 years, facility with written and spoken English, and a child aged 1-5 years. In case of more than one child, the mothers reported on the youngest child in the age range. In Australia, mothers residing for 1-8 years were recruited (Kannan et al., 1999, 2004). Potential participants in Australia were approached through Indian community networks such as university associations, media networks, places of worship, retail outlets and online social networks. In Mumbai participants were recruited from five private medical clinics located in higher middle class suburbs (i.e. without slums). In Australia, and Mumbai mothers were also approached through friends and family. Similar questionnaires were developed in English for each sample (hardcopy and online version). Completion of the questionnaire indicated informed consent. The questionnaire was piloted with 15 mothers in Australia and was well received (Mehta et al., 2013). It was not feasible (limited time, project funds) to conduct a pilot study in Mumbai.

Maternal and child characteristics: Child characteristics self-reported by the mother included age, gender and weight (converted to WAZ-score) (World Health Organisation, 2008). Maternal characteristics included age, self-reported height and weight (converted to BMI [kg/m²]) (International Diabetes Federation, 2006), length of residency in Australia (Australian sample only), education (university level vs not university level), and religion (Hindu vs other).

Psychosocial Variables

Maternal perception of child weight: A single item (*Do you think your child is...?*) taken from the *NOURISH* questionnaire (Daniels et al., 2009, 2012, 2013) assessed maternal perception of child weight. Response options were: Underweight/Healthy weight/Somewhat overweight/Very overweight/Don't know. Few mothers selected 'Somewhat overweight' (Australia: 1, Mumbai:

11) and none selected 'Very overweight'. Thus, for analysis the responses were dichotomised as 'Underweight' vs 'Healthy weight/Somewhat overweight'.

Maternal perception of own weight: A single question (*At present how would you describe your own weight?*) also taken from the *NOURISH* questionnaire (Daniels et al., 2009, 2012, 2013) assessed mothers' perception of their own weight. Response options were: Highly underweight/Underweight/Healthy weight/Overweight/Highly overweight/Not sure. Few mothers (Australia: 7, Mumbai: 29) selected 'Highly underweight' or 'Underweight'. Therefore, for analyses, responses were dichotomised as 'Highly underweight/Healthy weight' vs 'Overweight/Highly overweight'.

For both items measuring maternal weight perceptions the 'Not sure' and 'don't know' response options were coded as missing data. The items were dichotomised acknowledging the distribution of the data and for consistency across both variables.

Maternal Self-efficacy in feeding: Previous research used two study-developed scales to measure self-efficacy in child-feeding (Cullen et al., 2000, Campbell et al., 2010). These tools predominantly capture parental self-efficacy in '*providing*' the appropriate quality, but not quantity of food. Additionally, they do not reflect parental self-efficacy regarding children '*consuming*' the appropriate quality and quantity of food. These are important aspects in the context of feeding. For example, pressure to eat and restriction may aim not only to regulate the quality (*what*) of food consumed, but more importantly the quantity (*how much*) consumed (Satter, 2000). This study developed a four item scale: (1) *How confident you feel about you providing the right kind of foods to your child?* (2) *How confident you feel about you providing adequate amounts of food to your child?* (3) *Do you feel confident that your child is eating the right kind of foods?* (4) *Do you feel confident about your child eating adequate amounts of food?* The response option ranged from: (1) Not at all confident (2) A little confident (3) Moderately

confident (4) Very confident. The Cronbach's α for both samples (Australia: 0.80; Mumbai: 0.74) were acceptable.

Involvement of mother-in-law in child-feeding: A scale was developed to assess mothers' perception of the extent to which her mother-in-law is involved in child-feeding. The scale consisted of four items: *Your mother-in-law...(1) Gives advice regarding how to feed your child (2) Decides what your child eats (3) Cooks food for your child (4) Feeds your child.* The response options ranged from (1) Never (2) Rarely (3) Sometimes (4) Mostly (5) Always. The Cronbach's α for both samples (Australia: 0.88; Mumbai: 0.80) were good.

Maternal Feeding Practices

The Child Feeding Questionnaire (CFQ) (Birch et al., 2001): Two scales were selected: restriction (8 items, e.g. *I have to be sure that my child does not eat too many sweets*, Cronbach's α : 0.65 [Australia], 0.60 [Mumbai]) and monitoring (3 items, e.g. *How much do you keep track of the high fat food that your child eats?*, Cronbach's α : 0.94 [Australia], 0.74 [Mumbai]). The response options ranged from (1) Disagree to (5) Agree and (1) Never to (5) Always, for restriction and monitoring, respectively.

The Comprehensive Feeding Practices Questionnaire (CFPQ) (Musher-Eizenman & Holub, 2007): The pressure to eat scale (4 items, e.g. *My child should always eat all of the food on his/her plate*) was selected. The rationale for using the pressure scale from the CFPQ rather than the pressure scale from the CFQ are published elsewhere (Mehta et al., 2013). In the Australian sample the Cronbach α for the scale was 0.53, values between 0.50-0.60 are considered acceptable for early research (Nunnally, 1967), and are used in previous studies examining Mexican (Matheson et al., 2006) and Indian (Mehta et al., 2013) samples. However, the internal consistency was particularly poor in the Mumbai sample ($\alpha= 0.33$). Therefore, it was decided to study the pressure to eat scale only for the Australian sample for analytical purpose. The response option ranged from: (1) Disagree to (5) Agree.

Passive feeding: A single item was developed to assess passive feeding (*Even if my child can feed himself/herself, I feed my child*). For analysis the response option was dichotomised as not passive feeding (1: Never, 2: Rarely) vs passive feeding (3: Sometimes, 4: Mostly, 5: Always).

Data analysis: The samples were compared on child and maternal characteristics using Independent sample t-tests or chi-square tests. Despite the cross-sectional nature of the data for the purposes of this study the psychosocial variables, i.e., (1) maternal perception of their own and (2) their child's weight status, (3) maternal self-efficacy in child-feeding and (4) involvement of mother-in-law were treated as the independent variables. The four controlling feeding practices (restriction, monitoring, pressure to eat and passive feeding) were treated as the dependent variables and were normally distributed. The association between the independent variables and the dependent variables were reported using hierarchical linear and logistic regression for the continuous and categorical feeding practices as appropriate. For the regression analyses the Australian and Mumbai samples were examined separately for a number of reasons. Firstly, the samples differed on socio-demographic and anthropometric characteristics, mean score for the involvement of mother-in-law and mean score for monitoring (Table 1). Secondly, the internal consistency for the pressure to eat scale was poor in the Mumbai sample compared to the Australian sample ($\alpha = 0.33$ vs 0.53). Thirdly, to minimise the attenuation of effect size due to noise in the data and/or real differences in the patterns of association across the samples.

Regression analyses were adjusted for the following maternal and child characteristics: mothers' age, BMI, education, religion, Questionnaire type (i.e. hardcopy or softcopy), child's age, WFA Z-score and gender. In the regression analyses the covariates were entered in the first block and the independent variables in the second block. With respect to multivariate outliers and influential data points, all cases had Mahalanobis values below 25 and Cook's D values below one. Hence, all cases were included in the final analyses (Field, 2009). No concerns regarding multicollinearity were noted, i.e. the variance inflation factor for all variables were below 10 (Field, 2009) and the association between the four independent variables tested using appropriate bivariate test for continuous and categorical data were non-significant (data not provided).

Significance was set at $p < 0.05$ and analyses were conducted using SPSS version 21 (SPSS Inc., Chicago, USA).

Results

In Mumbai the majority of mothers completed the hardcopy (97%), whereas in Australia a greater proportion (77%) completed the online version of the questionnaire. Response rate could only be calculated for the questionnaire hardcopies. The response rate was similar in Australia (12.5%) and Mumbai (11.5%).

Participant characteristics are discussed in detail elsewhere (Jani et al., submitted). In brief, the mothers in the Australian sample were slightly older (32 ± 3.3 vs 31 ± 4.2 years, $p<0.002$), had higher self-reported mean BMI (24 ± 3.9 vs 23 ± 4.1 kg/m², $p=0.02$) and a higher proportion had completed a tertiary degree (95% vs 87%, $p=0.005$). A slightly lower proportion of mothers in the Australian sample followed Hinduism (75% vs 84%, $p=0.02$). On average, children in the Australian sample were younger (34 ± 14.0 vs 42 ± 12.3 months, $p<0.001$) and had higher mean WFA Z-scores (0.24 ± 1.79 vs -1.04 ± 1.56 , $p<0.001$). Nearly half of the children in each sample were girls (Australia: 51%, Mumbai: 43%, $p=0.08$). Except for child gender all maternal and child characteristics significantly differed between the samples, and therefore were controlled in further analysis. The mean length of stay in Australia was 4 ± 1.9 years and was not controlled as a covariate because its association with maternal feeding practice (pressure to eat) examined in a paper published from the present study was non-significant ($r=0.04$, $p=0.66$) (Mehta et al., 2013). In addition, to ensure consistency, which allows for comparison of trends across both samples length of residence was not controlled as it only pertains to the Australian sample.

Mean \pm SD scores or prevalence of feeding practices and the dependent variables of interest are shown in Table 1 for both samples. Higher mean score indicates greater use of the feeding practice, higher involvement of the mother-in-law in child-feeding or higher maternal self-efficacy in feeding. Tables 2 and 3 report the association of the psychosocial variables with controlling child-feeding practices.

In the Australian sample, the overall model to account for the mothers' use of monitoring was non-significant ($R^2=0.06$, $R^2_{Adj}=0.01$, $F(12, 136) = 0.78$, $p=0.68$) (Table 2). In the Mumbai sample, the overall model to explain the variance in the mothers' use of monitoring was significant ($R^2=0.11$, $R^2_{Adj}=0.07$, $F(12, 249) = 2.5$, $p=0.004$). Addition of the four independent

variables explained a further 4% of the variance ($R^2_{\text{change}}= 0.04$, $F_{\text{change}}(4, 249) =3.1$, $p=0.01$) in the use of monitoring. Higher maternal self-efficacy in feeding ($\beta= 0.2$, $p=0.005$) was associated with greater use of monitoring.

The overall models to account for the mothers' use of restriction were significant in both the Australian and Mumbai samples (Australia: $R^2=0.18$, $R^2_{\text{Adj}}=0.11$, $F(12, 136) = 2.5$, $p=0.005$; Mumbai: $R^2=0.11$, $R^2_{\text{Adj}}=0.07$, $F(12, 249) = 2.7$, $p=0.002$). Addition of the independent variables explained a further 7% ($R^2_{\text{change}}= 0.07$, $F_{\text{change}}(4, 136) =2.8$, $p=0.02$) and 4% ($R^2_{\text{change}}= 0.04$, $F_{\text{change}}(4, 249) =3.1$, $p=0.01$) of the variance in the use of restriction in the Australian and Mumbai samples, respectively. In both samples involvement of the mother-in-law in child-feeding was positively associated with restriction (Australia: $\beta= 0.21$, $p=0.01$, Mumbai: $\beta= 0.20$, $p=0.02$). Higher maternal self-efficacy in feeding was associated with greater use of restriction in the Australian sample and lower use of restriction in the Mumbai sample (Australia: $\beta= -0.16$, $p=0.04$, Mumbai: $\beta= -0.16$, $p=0.02$).

In the Australian sample, the overall model to account for the mothers' use of pressure to eat was significant ($R^2= 0.18$, $R^2_{\text{Adj}}=0.10$, $F(12, 136) = 2.4$, $p=0.007$) (Table 2). Addition of the four independent variables explained a further 8% of the variance ($R^2_{\text{change}}= 0.08$, $F_{\text{change}}(4, 136) =2.5$, $p=0.04$) in the pressure to eat. Mothers perceiving their child as underweight ($\beta= 0.20$, $p=0.02$) was associated with greater pressure to eat. Higher maternal self-efficacy in feeding ($\beta= -0.13$, $p=0.04$) was associated with lower pressure to eat.

Associations between independent variables and passive feeding in the Australian and the Mumbai samples are shown in Table 3. In both samples, the overall model to explain mothers' use of passive feeding was non-significant (Australia: Nagelkerke $R^2= 0.18$, model $\chi^2(12) = 20.4$, $p=0.06$; Mumbai: Nagelkerke $R^2= 0.06$, model $\chi^2(12) = 20.2$, $p=0.06$). However, in the Australian (OR: 0.56, CI: 0.27-1.14, $p=0.03$) and Mumbai (OR: 0.56, CI: 0.37-0.87, $p=0.009$) samples as mothers mean scores of self-efficacy in feeding increased they were 1.8 times less likely to use passive feeding.

Discussion and conclusions

The aim of this study was to identify psychosocial factors associated with controlling feeding practices in two distinct samples of Indian mothers. On average these practices appeared to be highly endorsed by mothers living in both Mumbai and as recent immigrants in Australia. This finding, is generally concerning given that restriction, pressure to eat and passive feeding are each thought to undermine children's ability to self-regulate intake and have been shown to have unfavourable associations with child weight status and dietary preferences (Fisher & Birch et al., 1999, Fisher et al., 2002, Faith et al., 2004, Murashima et al., 2012). A unique and important finding was that self-efficacy in feeding showed a modest (β values between 0.1-0.2) but significant association with at least one of the four feeding practices across the two samples. In accordance with previous research (Bhopal, 1998, Jingxiong et al., 2007), involvement of the mother-in-law in child-feeding was associated with higher use of restriction in both samples. With regards to maternal weight perceptions, the key findings highlighted that mothers' perceptions of their child being underweight were associated with pressure to eat in the Australian sample, which is consistent with previous literature (Francis et al., 2001, Brown & Lee, 2011). However, in contrast to previous literature (Francis et al., 2001) maternal own self perceptions of overweight were not associated with any of the child-feeding practices.

The present results generally supported the basic proposition of Bandura's theory of self-efficacy which argues that *knowledge* about the task influences its *performance* (Bandura, 1996). In the present case, it is hypothesised that mothers who may not be confident about the quality and quantity of food provided by them and eaten by their child (*knowledge*) may use less appropriate feeding practices (*performance*). In line with this, lower self-efficacy was associated with higher passive feeding (both samples), higher pressure to eat (Australian sample), higher restriction (Australian sample) and lower monitoring (Mumbai sample). This pattern of associations suggests that mothers' who possess self-efficacy in feeding will use more appropriate child-feeding practices such as monitoring (Klesges et al., 1991, Faith et al., 2004) but will be less likely to use overtly-controlling practices such as restriction (Mitchell et al., 2009), pressure to eat and passive feeding. However, an anomaly that emerged was that higher self-efficacy in feeding was associated with higher restriction in the Mumbai sample. This finding stands in

contrast to not only the overall pattern of associations but is contradictory to past literature on self-efficacy (Mitchell et al., 2009). An explanation is not readily apparent and will require further quantitative complemented with qualitative exploration. Overall, the findings highlight maternal self-efficacy in feeding as a potentially important psychosocial factor that can influence Indian mothers' feeding practices.

A novel and culturally significant finding was that greater involvement of the mother-in-law in child-feeding was related to the higher use of restriction in both samples. Explanation for this association can be sourced from studies conducted with children aged nine months to six years living with their grandparents (maternal or paternal) from Indian (Bhopal, 1998), Chinese (Jingxiong et al., 2007); Japanese (Watanabe et al., 2011) and mixed (Caucasian, African and South-Asian children residing in the UK) samples (Dwyer et al., 2008). These studies reported that grandparents may allow their grandchildren unrestricted access to sweet and savoury energy dense food items (Bhopal, 1998, Jingxiong et al., 2007, Dwyer et al., 2008, Watanabe et al., 2011), play a dominant role in planning and cooking meals for children, coerce children to eat frequently and eat larger portions, and use food as reward (Jingxiong et al., 2007). These feeding practices used by grandparents may be seen by mothers as a barrier to promoting healthy eating in their children. As a result mothers may use restriction to regulate their child's dietary quality (i.e. intake of non-core energy dense foods) (Jingxiong et al., 2007, Dwyer et al., 2008). Although information on the mother-in-law's feeding practices was not collected, the results of the present study do appear to be consistent with this explanation. Further research on these family dynamics is needed, however based on current evidence it seems that acknowledging the extended family (e.g., maternal and paternal grandparents) as a salient factor that may influence Indian mothers' feeding practices may be important when designing feeding interventions.

In our study the majority (Australia: 99%; Mumbai: 96%) of mothers did not perceive their child as overweight despite 11% and 2% being classified as overweight/obese in the Australian and Mumbai samples (Jani et al., submitted). This may partly explain why no associations were observed between maternal perceptions of the child's weight status and child-feeding practices in either sample with the exception of perception of the child as underweight being associated with higher pressure to eat. The latter finding is, consistent with the wider predominantly Caucasian

literature (Francis et al., 2001, Brown & Lee, 2011), however previous studies have also shown that mothers perceiving themselves and/or their child as overweight are likely to use practices such as restriction (Francis et al., 2001, Brown & Lee, 2011). This discrepancy with the broader literature may reflect Indian mothers' tendency to fail to recognise overweight in their children (Jani et al., 2014) which may in turn reflect cultural beliefs such as a chubby baby being an indicator of good child-rearing (Bhargava et al., 2004) and a large body size being considered appealing (Tang et al., 2012). Overall, in the present samples mothers' perceptions of their own and their child's weight status were not consistently associated with child-feeding practices and therefore, may not be pivotal factors influencing Indian mothers' decisions around child-feeding. Rather, salient cultural beliefs around appropriate body size may play a role and should be investigated in future research.

Overall the findings highlighted a similar pattern across both samples: self-efficacy in feeding and involvement of the mother-in-law proved to be important psychosocial factors associated with feeding practices of both recently immigrated (1-8 years) Australian-Indian and Indigenous-Indian mothers. The former tended to have a positive influence on feeding practices whereas the latter appeared to increase the use of controlling feeding practices. A couple of important differences between the samples were noted. Firstly, the direction of the relationship between self-efficacy in feeding and restriction differed across the samples. As indicated above, an explanation for this discrepancy is not readily apparent. Secondly, the internal consistency of the pressure to eat scale (Musher-Eizenman & Holub, 2007) was acceptable in the Australian sample, but poor in the Mumbai sample, therefore rendering it unusable. The implications of this measurement issue are discussed in the context of study limitations.

The present study is the first to examine the association between a selection of psychosocial factors and controlling feeding practices in the Indian context. Due to the scarcity of previous research, scales to measure maternal self-efficacy in feeding and involvement of the mother-in-law in child-feeding were developed specifically and showed good internal consistency in both samples. However, findings for the current study should be interpreted keeping in consideration the limitations. The cross-sectional nature of the study precludes claims about causality, and it is likely that the relationships observed could be bidirectional in nature. Due to the lack of

validated scales, a single item was developed to measure the culturally-specific practice of passive feeding. However, this may not comprehensively capture multiple dimensions constituting a feeding practice. In addition, due to poor internal consistency ($\alpha = 0.33$) of the pressure to eat scale from the CFPQ (Musher-Eizenman & Holub, 2007) in the Mumbai sample, factors associated with pressure to eat could not be examined. Thus, a culturally-appropriate coercive feeding scale/s (passive feeding and pressure to eat) needs to be designed through an iterative process combining qualitative and quantitative methods. Similarly, a single item was used to measure maternal perceptions of weight. However, the item has high face validity and has been used in earlier research (Carruth et al., 1998, Daniels et al., 2009, Mascola et al., 2010, Daniels et al., 2012). Other limitations included social desirability bias associated with the use of a self-report questionnaire. The self-reported anthropometric covariates (maternal BMI and child WAZ-scores) may be subjected to reporting errors, but have in the past shown to be reliable with children and youth aged 3-19 years (Kaur et al., 2006, Kroller & Petra, 2009). The convenience sampling technique limits the generalisation of the findings to well-educated Indian mothers of children 1-5 years living in Australia and in affluent areas of Mumbai. However, the target groups were of interest as the prevalence of childhood obesity is rising within these groups (Khadilkar et al., 2012, Mehta et al., 2013). Additionally, the Australian sample, although highly educated, likely reflects the wider Australian-Indian population. Indians in Australia tend to be highly educated due to the immigration policies favouring higher education attainment (www.immi.gov.au). The national data has also shown that Indian born Australians are three times more likely than all other Australians to have a bachelor's degree or higher (Australian Bureau of Statistics, 2006). Lastly, the potential impact of multiple comparisons needs to be acknowledged. In total seven regression models were tested to examine the association between the four independent variables and the feeding practices in each sample separately. However to mitigate further risk of Type I errors, all independent variables were examined together in the regression models, correlations between feeding practices were checked and found to be non-significant and screening for multicollinearity was always conducted.

In conclusion, the study highlighted that self-efficacy in feeding and involvement of the mother-in-law in child-feeding were each important factors associated with Indian mothers' feeding practices. Neither has been included in much of the past research within the context of child

feeding, but the present results warrant follow up in different populations. In contrast, maternal perceptions regarding own and child weight which are reported to be associated with Caucasian mothers' feeding practices (Brown & Lee, 2011, Gross et al., 2011) may not be fundamental factors associated with Indian mothers' feeding practices. A small proportion of variance (6%-18%) in child-feeding was explained by the independent variables and selected covariates. This indicates that other factors that may further explain Indian mothers' child-feeding practices, such as cultural beliefs (e.g. chubby baby is a healthy baby), need to be investigated. Lastly, the study informs future research regarding potential variables that may need consideration when tailoring child-feeding interventions for Indian mothers.

Ethical approval

The study has been approved by the ethical committee of Queensland University of Technology (Approval number: 1000000943).

Acknowledgements

The study was a part of Rati Jani's doctoral project funded by the Queensland University of Technology, Australia. Dr. Kimberley Mallan occupied the Heinz Postdoctoral Research Fellowship provided by HJ Heinz. The project idea was conceived by Prof. Lynne Daniels.

Conflicts of interest

The authors declare that they have no conflicts of interest.

Author Contributions

All authors supervised and gave input during the designing of the questionnaire, data collection and recruitment. Additionally, Dr. Kimberley Mallan provided guidance on statistical techniques for data analysis. Each author contributed to preparation of the manuscript and gave their final approval for submission.

References

- Arianna, M., Courtney, C., Selena, R., Amy, Y., & Donna, S. (2009). Psychosocial correlates of eating behavior in children and adolescents: a review. *International Journal of Behavioral Nutrition and Physical Activity*, 6(54): 18-38.
- Ashford, S., Edmunds, J., & French, A. (2010). What is the best way to change self-efficacy to promote lifestyle and recreational physical activity? A systematic review with meta-analysis. *British Journal of Health Psychology*, 15(2): 265-288.
- Australian Bureau of Statistics (2006). *Australian Census of Population and Housing*. Canberra, Australian: Commonwealth of Australia.
- Australian Bureau of Statistics (2011-12). *Australian Health Survey: First Results*. Canberra, Australia: Commonwealth of Australia.
- Bandura, A. (1996). *Self-efficacy: The exercise of self-control*. New York, USA: Henry Holt and Company.
- Bhargava, K., Sachdev, S., Fall, C., Osmond, R., Lakshmy, D., Barker, S., Biswas, S., Ramji, D., Prabhakaran, P., & Reddy, K. (2004). Relation of serial changes in childhood body-mass index to impaired glucose tolerance in young adulthood. *New England Journal of Medicine*, 350(9): 865-875.
- Bhopal, K. (1998). *South Asian women in East London: Motherhood and social support*. Women's Studies International Forum: Elsevier.
- Birch, J., Fisher, K., Grimm-Thomas, C., Markey, R., Sawyer., & Johnson, S. (2001). Confirmatory factor analysis of the Child Feeding Questionnaire: a measure of parental attitudes, beliefs and practices about child feeding and obesity proneness. *Appetite*, 36(3): 201-210.
- Brown, J., & Lee, M. (2011). Maternal child-feeding style during the weaning period: Association with infant weight and maternal eating style. *Eating behaviors*, 12(2): 108-111.

Brown, J., Ogden, C., Vogelee., & Gibson, E. (2008). The role of parental control practices in explaining children's diet and BMI. *Appetite*, 50(2): 252-259.

Campbell, K., Hesketh, H., Silverii, A., & Abbott, G. (2010). Maternal self-efficacy regarding children's eating and sedentary behaviours in the early years: Associations with children's food intake and sedentary behaviours. *International Journal of Pediatric Obesity*, 5(6): 501-508.

Carruth, R., Skinner, J., Houck, K., Moran, J., Coletta, F., & Ott, D. (1998). The phenomenon of “picky eater”: a behavioral marker in eating patterns of toddlers. *Journal of the American College of Nutrition*, 17(2): 180-187.

Cullen, W., Baranowski, T., Rittenberry, L., Cosart, C., Owens, E., Hebert, D., & de Moor, C. (2000). Socio-environmental influences on children's fruit, juice and vegetable consumption as reported by parents: reliability and validity of measures. *Public Health Nutrition*, 3(03): 345-356.

Daniels, L., Magarey, A., Battistutta, D., Nicholson, J., Farrell, A., Davidson, G., & Cleghorn, G. (2009). The NOURISH randomised control trial: Positive feeding practices and food preferences in early childhood- a primary prevention program for childhood obesity. *BMC Public Health*, 9(1): 387-397.

Daniels, L., Mallan, K., Battistutta, D., Nicholson, J., Perry, R., & Magarey, A. (2012). Evaluation of an intervention to promote protective infant feeding practices to prevent childhood obesity: outcomes of the NOURISH RCT at 14 months of age and 6 months post the first of two intervention modules. *International Journal of Obesity*, 36(10): 1292-7.

Daniels, L. A., Mallan, K., Nicholson, J., Battistutta, D., & Magarey, A. (2013). Outcomes of an Early Feeding Practices Intervention to Prevent Childhood Obesity. *Pediatrics*, 132(1): 109-121.

Dwyer, J. Needham, J., Simpson, R., & Heeney, S., (2008). Parents report intrapersonal, interpersonal, and environmental barriers to supporting healthy eating and physical activity among their preschoolers. *Applied Physiology, Nutrition, and Metabolism*, 33(2): 338-346.

Faith, M., Berkowitz, R., Stallings, V., Kerns, J., Storey, M., & Stunkard, A. (2004). Parental feeding attitudes and styles and child body mass index: prospective analysis of a gene-environment interaction. *Pediatrics*, 114(4): e429-e436.

Field, P. (2009). *Discovering statistics using SPSS*. London, England: SAGE publications Ltd.

Fisher, J., & Birch, L. (1999). Restricting access to palatable foods affects children's behavioral response, food selection, and intake. *The American Journal of Clinical Nutrition*, 69(6): 1264-1272.

Fisher, J., Mitchell, H., Smiciklas-Wright, & Birch, L. (2002). Parental influences on young girls' fruit and vegetable, micronutrient, and fat intakes. *Journal of the American Dietetic Association*, 102(1): 58-64.

Francis, A., Hofer, S., & Birch, L. (2001). Predictors of maternal child-feeding style: maternal and child characteristics. *Appetite*, 37(3): 231-243.

Gray, N., Janicke, D., Wistedt, K., and Dumont-Driscoll, M. (2010). Factors associated with parental use of restrictive feeding practices to control their children's food intake. *Appetite*, 55(2): 332-337.

Gross, L., Mendelsohn, H., Fierman, & Messito, M. (2011). Maternal controlling feeding styles during early infancy. *Clinical pediatrics*, 50(12): 1125-1133.

Gubbels, S., Kremers, S., Stafleu, A., de Vries, S., Goldbohm, R., Dagnelie, P., de Vries, N., Buuren, S., & Thijs, C. (2011). Association between parenting practices and children's dietary intake, activity behavior and development of body mass index: the KOALA Birth Cohort Study. *International Journal of Behavioral Nutrition and Physical Activity*, 14(8): 18-26.

International Diabetes Federation (2006). *The IDF consensus worldwide definition of the metabolic syndrome*. Brussels, Belgium.

Jani, R., Miharshahi, S., Mandalika, S., & Mallan, K. (2014). Accuracy of mothers' perceptions of their 2-5 year old child's weight status. *Indian pediatrics*, (In press).

- Jingxiong, J., Rosenqvist, U., Huishan, W., Greiner, T., Guangli, L., & Sarkadi, A. (2007). Influence of grandparents on eating behaviors of young children in Chinese three-generation families. *Appetite*, 48(3): 377-383.
- Johnston, C., & Mash, E. (1989). A measure of parenting satisfaction and efficacy. *Journal of clinical child psychology*, 18(2): 167-175.
- Kannan, S., Carruth, B., & Skinner, J. (1999). Infant feeding practices of Anglo American and Asian Indian American mothers. *Journal of the American College of Nutrition*, 18(3): 279-286.
- Kannan, S., Carruth, B., & Skinner, J. (2004). Neonatal feeding practices of Anglo American mothers and Asian Indian mothers living in the United States and India. *Journal of Nutrition Education and Behavior*, 36(6): 315-319.
- Kaur, H., Li, C., Nazir, H., Choi, W., Resnicow, K., Birch, L., & Ahluwalia, J. (2006). Confirmatory factor analysis of the Child Feeding Questionnaire among parents of adolescents. *Appetite*, 47(1): 36-45.
- Khadilkar, V., Khadilkar, A., Cole, T., Chiplonkar, S., & Pandit, D. (2012). Overweight and obesity prevalence and body mass index trends in Indian children. *International Journal of Pediatric Obesity* 6(2-2): e216-e225.
- Klesges, C., Stein, R., Eck, L., Isbell, T., & Klesges, L. (1991). Parental influence on food selection in young children and its relationships to childhood obesity. *The American Journal of Clinical Nutrition*, 53(4): 859-864.
- Kroller, K., & Petra, W. (2009). Maternal feeding strategies and child's food intake: considering weight and demographic influences using structural equation modeling. *International Journal of Behavioral Nutrition and Physical Activity*, 22(6): 78-83.
- Mascola, J., Bryson, S., & Agras, W. (2010). Picky eating during childhood: A longitudinal study to age 11 years. *Eating behaviors*, 11(4): 253-257.

Matheson, M., Robinson, T., Varady, A., & Killen, J. (2006). Do Mexican-American mothers' food-related parenting practices influence their children's weight and dietary intake? *Journal of the American Dietetic Association*, 106(11): 1861-1865.

Mehta, R., Mallan, K., Mahrshahi, S., Mandalika, S., & Daniels, L. (2013). An exploratory study of associations between Australian-Indian mothers' use of controlling feeding practices, concerns and perceptions of children's weight and children's picky eating. *Nutrition and Dietetics*, 71(1):28-34.

Mehta, H., Shah, R., Patel, J., Glutting, U., Blecker, B., & Mehta, D. (2003). Eating and Mealtime Problems in Children in USA and UK: A Cross-Cultural Study. *International Pediatrics*, 18(4): 217-222.

Mitchell, S., Brennan, L., Hayes, L., & Miles, C. (2009). Maternal psychosocial predictors of controlling parental feeding styles and practices. *Appetite*, 53(3): 384-389.

Murashima, M., Hoerr, S., Hughes, S., & Kaplowitz, S. (2012). Feeding behaviors of low-income mothers: directive control relates to a lower BMI in children, and a nondirective control relates to a healthier diet in preschoolers. *The American Journal of Clinical Nutrition*, 95(5): 1031-1037.

Musher-Eizenman, D., & Holub, S. (2007). Comprehensive Feeding Practices Questionnaire: validation of a new measure of parental feeding practices. *Journal of Pediatric Psychology*, 32(8): 960-972.

Nunnally, C. (1967). *Psychometric theory*. New York, USA: McGraw-Hill.

Pac, K., McMahon, M., Ripple, K., Reidy, P., Ziegler, A., & Myers, E. (2004). Development of the Start Healthy Feeding Guidelines for Infants and Toddlers. *Journal of the American Dietetic Association*, 104(3): 455-467.

Satia-Abouta, J. (2003). Dietary acculturation: definition, process, assessment, and implications. *International Journal of Human Ecology*, 4(1): 71-86.

Satter, E. (2000). *Child of mine: feeding with love and good sense*. Boulder, Colorado: Bull Publishing Company.

Tang, W., Mason, M., Kushner, R., Tirodkar, M., Khurana, N & Kandula, N. (2012). South Asian American perspectives on overweight, obesity, and the relationship between weight and health. *Preventing Chronic Disease*, 9:110284.

Tharkar, S., & Viswanathan, V. (2009). Impact of socioeconomic status on prevalence of overweight and obesity among children and adolescents in Urban India. *Open Obesity Journal*, 1: 9-14.

Ventura, A., & Birch, L. (2008). Does parenting affect children's eating and weight status? *International Journal of Behavioral Nutrition and Physical Activity*, 5(1): 15-27.

Watanabe, E., Lee, J., & Kawakubo, K. (2011). Associations of maternal employment and three-generation families with pre-school children's overweight and obesity in Japan. *International Journal of Obesity*, 35(7): 945-952.

Whincup, H., Nightingale, C., Owen, C., Rudnicka, A., Gibb, I., McKay, C., Donin, A., Sattar, N., Alberti, K., & Cook, D. (2010). Early emergence of ethnic differences in type 2 diabetes precursors in the UK: the Child Heart and Health Study in England (CHASE Study). *PLoS Med*, 7(4): 1-10.

World Health Organization (2008). *Child growth standards: training course on child growth assessment*. WHO, Geneva.

Yajnik, C. (2003). Early life origins of insulin resistance and type 2 diabetes in India and other Asian countries. *The Journal of Nutrition*, 134(1): 205-210.

Table 1: Mean±SD or prevalence of child-feeding practices and psychosocial variables in the Australian (child age: Mean± SD: 34.3±14.0 months) and Mumbai (child age: Mean± SD: 42.0±12.3 months) samples

Child-feeding practices	Australia	Mumbai	p value
	% (n) or Mean±SD	% (n) or Mean±SD	
Passive feeding ¹ Sometimes-Always	<i>n</i> =210 61 (128)	<i>n</i> =301 68 (204)	0.11
Restriction ^{2,3}	<i>n</i> =210 3.5±0.8	<i>n</i> =301 3.7±0.7	0.12
Monitoring ^{2,3}	<i>n</i> =210 3.9±1.0	<i>n</i> =301 3.3±0.9	<0.001
Psychosocial variables			
Perceived child weight ^{1,4,5} Healthy weight-underweight Overweight-highly overweight	<i>n</i> =203 66 (133) 34 (68)	<i>n</i> =301 83 (250) 17 (51)	<0.001
Perceived own weight ^{1,4,6} Underweight Healthy weight-somewhat overweight	<i>n</i> =228 23(51) 77(175)	<i>n</i> =301 13(40) 85(257)	0.007
Involvement of mother-in-law ²	<i>n</i> =198 2.1±0.9	<i>n</i> =301 2.7±0.9	<0.001
Self-efficacy in feeding ²	<i>n</i> =230 3.4±0.6	<i>n</i> =301 3.4±0.7	0.79

¹Pearson's chi-squared test

²Independent samples t-test

³CFQ (Birch et al., 2001)

⁴NOURISH questionnaire (Daniels et al., 2009, 2012, 2013)

⁵‘Highly underweight-Underweight’ selected by few mothers (Australia: *n*=7; Mumbai: *n*=29), combined with ‘Healthy weight’

⁶None selected ‘Very overweight’. ‘Somewhat overweight’ selected by few mothers (Australia: *n*=1; Mumbai: *n*=11), combined with ‘Healthy weight’

Italicised *n* value denotes data obtained

Table 2: Psychosocial variables associated with controlling feeding practices in the Australian (child age: Mean: 34.3, SD: 14.0 months) and Mumbai (child age: Mean: 42.0, SD: 12.3 months) samples

Psychosocial variables	Monitoring				Restriction				Pressure to eat	
	Australia (n=149)		Mumbai (n=262)		Australia (n=149)		Mumbai (n=262)		Australia (n=147)	
	β	p value	β	p value	β	p value	β	p value	β	p value
Perceived child weight ¹ Underweight (Healthy-Somewhat overweight)	-0.08	0.34	-0.02	0.80	0.03	0.74	0.09	0.16	0.20	0.01
Perceived own weight ¹ Overweight-Highly overweight (Underweight-Healthy weight)	0.05	0.64	0.09	0.21	-0.07	0.50	0.08	0.23	-0.13	0.21
Involvement of mother-in-law	-0.14	0.12	-0.08	0.20	0.21	0.01	0.20	0.02	-0.03	0.67
Self-efficacy in feeding	0.10	0.24	0.20	0.005	-0.16	0.04	0.16	0.02	-0.13	0.04

Dependent variable: Mean scores computed: monitoring: (1) Never-(5) Always, restriction and pressure to eat: (1) Disagree-(5) Agree
 Hierarchical linear regression: covariates controlled at step 1: mothers' age, BMI, education, religion, questionnaire type, child's age, WFA Z-score and gender. Independent variables added at step 2

Note: Referent groups in brackets, further categorisation details in the method section, β = Standardised Beta Coefficients

¹NOURISH questionnaire (Daniels et al., 2009, 2012, 2013)

Table 3: Psychosocial variables associated with passive feeding in the Australian (child age: Mean: 34.3, SD: 14.0 months) and Mumbai (child age: Mean: 42.0, SD: 12.3 months) samples

Psychosocial variables	Australia (n=149)			Mumbai (n=262)		
	Adj OR	95% CI	p value	Adj OR	95% CI	p value
Perceived child weight ¹ Underweight (Healthy-Somewhat overweight)	1.89	0.74, 4.85	0.18	0.75	0.35, 1.64	0.47
Perceived own weight ¹ Overweight-Highly overweight (Underweight-Healthy weight)	0.86	0.39, 2.50	0.79	1.38	0.63, 3.05	0.42
Involvement of mother-in-law	1.29	0.84, 1.98	0.24	1.23	0.98, 1.69	0.07
Self-efficacy in feeding	0.56	0.27, 1.14	0.03	0.56	0.37, 0.87	0.009

Dependent variable: Passive feeding: *Even if my child can feed himself/herself, I feed my child*, response options: (1) Never-(5) Always; results for: (3) Sometimes-(5) Always

Hierarchical logistic regression: covariates controlled at step 1: mothers' age, BMI, education, religion, questionnaire type, child's age, WFA Z-score and gender. Psychosocial variables added at step 2

Note: Referent groups in brackets, further categorisation details in the method section

¹NOURISH questionnaire (Daniels et al., 2009, 2012, 2013)