THE RELATIONSHIP BETWEEN A CHILD’S BMI WITH PARENTAL FEEDING STYLE AND MATERNAL PERCEPTION TOWARDS CHILDHOOD OBESITY

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ABSTRACT

Background: Prevalence of overweight and obesity are increasing among preschool children. The aim of this study was to evaluate the relationship between a child’s body mass index (BMI) with maternal perception towards the child’s weight and type of parental feeding style.

Methodology: A cross-sectional study was conducted from June 2017 until November 2018 in kindergartens from Ipoh and Cheras. Self-administered validated questionnaires were distributed to parents. Data on child’s BMI, maternal perception to their child’s BMI, perception towards childhood obesity and parental feeding style were obtained and analysed using SPSS version 21.

Results: A total of 483 children were recruited. The prevalence of overweight children was 6.8% (BMI ≥ 85th to < 95th percentile) whereas the prevalence of obesity was 8.1% (BMI ≥ 95th percentile). When comparing the group of children with BMI ≥ 85th percentile (n= 72) to those with BMI<85th percentile (n= 411), we found that parents of overweight/obese children differed significantly in the accuracy of their judgment about their child’s weight. Only 12.5% in the former group accurately perceived their child’s weight compared to 76.9% in the latter group (p<0.01). Majority of parents (34%) in our community had indulgent feeding style, followed by authoritarian (31%), authoritative (18%) and uninvolved (16%). There was however no statistical significance in terms of parental feeding style in both groups of children.

Conclusion: A significant proportion of parents failed to recognise that their children were overweight. Public health programmes are thus required to raise parental awareness of childhood overweight and obesity.

Keywords: childhood obesity, maternal perception, feeding style, BMI

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1.0 INTRODUCTION

1.1 Background

The global prevalence of overweight and obesity has increased and become one of the main health challenges. UNICEF and WHO reported that the number of overweight children worldwide has increased from 32 million to 42 million between the years 2000 to 2013. The prevalence of overweight children under 5 years old in South East Asia has also increased from 3% to 7% within the same time span.

Malaysia is rated as being the highest among Asian countries for obesity and overweight at 45.3% of its population. The National Health Morbidity Survey (NHMS 2015) showed that more than 7% of Malaysian children under 5 years old were overweight. This is an alarming statistic as there is an upsurge in non-communicable disease risk factors.

Obesity can affect a child from both medical and psychological aspects. Obese children are associated with higher risk of obesity, premature death and disability in adulthood. (Nicklas et.al 2005). Thus, it is hardly surprising that the fourth policy of the global nutrition target is no increase in childhood overweight by 2025. (WHO 2014)

The main reason for childhood obesity is inappropriate diet and lack of physical activity. Parental practices and familial environment influences children’s dietary preferences and physical activities patterns. Parents create environment which influence the development of their children’s eating behaviour. Characteristics of these environments are socio-demographic factors (Strauss & Knight, 1999), parental activity (Sallis et al. & Moore et al., 2003), parental eating styles (Cutting et al. Hood et al., 1999) and parental child-feeding styles (Johnson & Birch; Fisher & Birch, 2000). The important role that parents play in the development of obesity-induced feeding behaviours in their children is a topic of increasing interest worldwide (Golan & Crow, 2004).

Accurate parental recognition of overweight in children is important in overcoming childhood obesity. Parents who were unable to perceive that their own child is overweight will not be motivated to make changes to help their children achieve a healthy weight. Research showed that accurate maternal perception of overweight among young children resulted in greater weight loss over time compared with children whose weight was perceived inappropriately by their mothers (Lundahl 2014). Parents with positive perception towards childhood obesity are also more inclined to comply with obesity intervention programme.

Feeding style is feeding-related attitudes regarding interaction between parents and their children during mealtime. (Hughes et al., 2005; Ventura and Birch, 2008; Blissett, 2011)) There are four types of feeding styles: authoritarian, authoritative, indulgent and uninvolved. Authoritative feeding style is characterized by encouraging the child to eat healthy foods using negotiations, and providing rationales. Authoritative feeding style is associated with lower BMI. In contrast, parents with indulgent feeding style allow freedom for their child to choose food they prefer and is associated with higher BMI.
2.0 MATERIALS AND METHOD

2.1 Study design

The aim of this study was to evaluate the relationship between a child’s body mass index (BMI) with maternal perception towards their child’s weight and type of parental feeding style. A cross-sectional study was conducted from June 2017 until November 2018 in kindergartens from Ipoh and Cheras. This study was approved by the National University of Malaysia research ethics committee in which the reference number was UKM PPI/111/8/JEP-2016-652.

Following permission from the kindergarten’s teacher, a set of questionnaire, parent information sheet and consent forms were distributed to the children on the first kindergarten visit. The completed questionnaire was collected on the second visit and measurement of the child’s height and weight were done using a calibrated scale. All children aged between 4 to 6 years old were recruited following parental consent.

2.2 Sampling method

This study used cluster sampling method in which the kindergartens in Ipoh and Cheras were divided into 5 zones respectively. One kindergarten was selected randomly from each zone and all the children who fulfilled the inclusion criteria from the selected kindergarten were recruited into the study. Sample size for cluster sampling method was calculated using Kish L (1965) formula for simple random sample and a design effect of 1.5. Prevalence was set at 0.5 for maternal perception towards childhood obesity as there was no prior published information. A total of 576 respondent was needed. However, due to time constraints, only 483 children were recruited in this study. Hence, the power of this study was 83%.

2.3 Research instrument

This study was conducted using self-administered and bilingual questionnaire which comprised three sections: parental socio-demographic parameters, maternal perception on their child’s weight, and parental feeding style. Both English and Malay version were available. The English version was translated to Malay and re-translated to English to ensure content validity. The questionnaires were tested for validity and reliability; Cronbach’s Alpha value for reliability was 0.77.

2.4 Questionnaire on Maternal Perception of Child’s Weight

This comprised seven questions; the first assessed weight for height perception on a scale of 1 to 4 with “1” being “I feel my child is underweight for his/her height”, “2” being “I feel my child has normal weight for his/her height”; “3” being “I feel my child is overweight for his or her height”, “4” being “I feel my child is markedly overweight for his/her height”.

The remaining 6 questions were adapted from Anderson et al which addressed general perception related to childhood obesity.
2.5 Questionnaire on feeding style

This questionnaire was adapted with permission from the caregiver feeding style questionnaire (Hughes et al., 2005) to evaluate parents’ interactions with their child during mealtime.

The questionnaire has 19 items describing methods that may be used by parents to get their child to eat (e.g., “Beg the child to eat dinner,” “Ask the child questions about the food during dinner”). The scoring for this measure is on a scale of 1 to 5, with “1” being “never”, “2” being “rarely”, “3” being “sometimes”, “4” being “most of the time” and “5” being “always”.

2.6 Main Outcome Measure

The child’s BMI was calculated using the obtained height and weight measurements. Overweight and obesity were defined as ≥85th to <95th percentiles and ≥95th percentiles respectively following the Centres for Disease Control and Prevention criteria for BMI. Maternal BMI was also calculated and a cut-off BMI of more than 25 was defined as being overweight based on the WHO guidelines.

BMI percentile for each child was derived from growth charts published by the Centres for Disease Control according to their age and gender. Each maternal perception of their child’s weight was compared with the child’s actual BMI percentile based on their height and weight data. For example, if the child’s parameters were at the 90th percentile, which is overweight, we concluded that the mother “underestimated” the child’s weight if the answer was “I feel my child has normal weight for his/her height”; interpreted as “correct” if the answer was “I feel my child is overweight for his/her height” and “overestimate” if the answer was “I feel my child is markedly overweight for his/her height”.

Parental response on perception regarding childhood obesity (Anderson et al) was measured on a Likert scale. For the purpose of analysis, the response of “disagree” and “slightly disagree” were grouped as negative perception whereas response of “agree” and “slightly agree” were grouped as positive perception.

Two scales were derived with reference to feeding style. The first scale is demandingness which was the mean of all 19 items. The second scale is responsiveness which was calculated as a ratio of the mean for the group of items that represented child-centred strategies and the mean for overall demandingness. Based on these scores, feeding style were categorized into: (i) Authoritative Feeding Style - high demandingness/high responsiveness; (ii) Authoritarian Feeding Style - high demandingness/low responsiveness; (iii) Indulgent Feeding Style - low demandingness/high responsiveness; and (iv) Uninvolved Feeding Style - low demandingness/low responsiveness

2.7 Statistical analysis

Data was analysed using the statistical package for social sciences (SPSS version 21). Continuous data were presented as mean, standard deviation, median, interquartile range, with minimum and maximum values. Descriptive categorical data were calculated as frequencies and percentages with 95% confidence interval. Chi square and Mann-Whitney U test were used to examine significant different responses of parents whose children fell into different categories based on their BMI. These tests analysed two groups of children.
according to their BMI, i.e. comparing children with BMI ≥ 85th percentile (overweight and obese, n= 72) to those with BMI < 85th percentile (underweight and normal, n= 411). Significance level of 0.05 was used for all comparisons.

3.0 RESULTS

3.1 Socio-demographic characteristics

A total of 483 children (250 from Ipoh and 234 from Cheras) were recruited. Their mean age was 62.2 months with a standard deviation of 8.2. A total of 245 children were male (50.7%) and 238 children were female (49.3%). Ethnic distribution were: 64 Malays (75.4%), 101 Chinese (20.9%), 15 Indians (3.1%) and 3 of other ethnicity (0.6%).

The mean BMI for these children was 15.7 with standard deviation of 2.6 (minimum: 8.3; maximum: 34.0). Table 1 highlights the BMI status of all participants. The prevalence of overweight children in this study was 6.8%, whereas the prevalence of obesity was 8.1%. The total prevalence of both overweight and obese children in this study was therefore 14.9%.

Table 1: Body Mass Index (BMI) of 483 children

<table>
<thead>
<tr>
<th>BMI Status by Percentiles</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight (BMI &lt; 5th percentile)</td>
<td>31</td>
<td>6.4</td>
</tr>
<tr>
<td>Normal (BMI ≥ 5th to &lt; 85th percentiles)</td>
<td>380</td>
<td>78.7</td>
</tr>
<tr>
<td>Overweight (BMI ≥ 85th to &lt; 95th percentiles)</td>
<td>33</td>
<td>6.8</td>
</tr>
<tr>
<td>Obese (BMI ≥ 95th percentiles)</td>
<td>39</td>
<td>8.1</td>
</tr>
</tbody>
</table>

There was no statistically significant difference in socio-demographic profile for both groups of children as shown in Table 2. There was no association between household income and child’s BMI. (p = 0.39)
Table 2: Comparison of socio-demographic characteristics between the group of children with BMI < 85th percentiles and BMI ≥ 85th percentiles

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Non-overweight BMI &lt; 85th percentiles [total n = 411]</th>
<th>Overweight &amp; Obese BMI ≥ 85th percentiles [total n = 72]</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (months) median (IQR)</td>
<td>61 (11)</td>
<td>62.5 (11)</td>
<td>*0.32</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td>0.37</td>
</tr>
<tr>
<td>- Female</td>
<td>206 (50.1%)</td>
<td>32 (44.4%)</td>
<td></td>
</tr>
<tr>
<td>- Male</td>
<td>205 (49.9%)</td>
<td>40 (55.6%)</td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td>0.50</td>
</tr>
<tr>
<td>- Malay</td>
<td>305 (74.2%)</td>
<td>59 (81.9%)</td>
<td></td>
</tr>
<tr>
<td>- Chinese</td>
<td>90 (21.9%)</td>
<td>11 (15.3%)</td>
<td></td>
</tr>
<tr>
<td>- Indian</td>
<td>13 (3.2%)</td>
<td>2 (2.2%)</td>
<td></td>
</tr>
<tr>
<td>- Others</td>
<td>3 (2.6%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Maternal BMI (kg/m²)</td>
<td></td>
<td></td>
<td>0.38</td>
</tr>
<tr>
<td>- &lt; 25</td>
<td>244 (59%)</td>
<td>44 (61.1%)</td>
<td></td>
</tr>
<tr>
<td>- ≥ 25</td>
<td>167 (40.6%)</td>
<td>28 (38.9%)</td>
<td></td>
</tr>
<tr>
<td>Monthly income (RM)</td>
<td></td>
<td></td>
<td>0.39</td>
</tr>
<tr>
<td>- &lt; 4000</td>
<td>116 (28.2%)</td>
<td>22 (30.6%)</td>
<td></td>
</tr>
<tr>
<td>- &gt; 4001</td>
<td>295 (71.8)</td>
<td>50 (69.4)</td>
<td></td>
</tr>
<tr>
<td>Maternal education</td>
<td></td>
<td></td>
<td>0.50</td>
</tr>
<tr>
<td>- Tertiary</td>
<td>283 (68.5%)</td>
<td>41 (56.9%)</td>
<td></td>
</tr>
<tr>
<td>- Secondary</td>
<td>117 (28.5%)</td>
<td>31 (43.1%)</td>
<td></td>
</tr>
<tr>
<td>- Primary</td>
<td>7 (1.7%)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>- No formal education</td>
<td>4 (1%)</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Analysis was done using Chi square test except significant median difference of age for which Mann-Whitney U test was used

3.2 Maternal perception towards their own child’s weight

Comparison of maternal perception towards their own child’s weight between those with BMI < 85th percentile and those with BMI ≥ 85th percentile was done using the Chi Square test as illustrated in Table 3. The majority of mothers (76.9%) correctly perceived their child’s weight in those with BMI < 85th percentile group whereas only 12.5% correctly perceived their child’s weight in those with BMI ≥ 85th percentile. An alarming number of parents (n= 63, 87.5%) underestimated their child’s weight in the BMI ≥ 85th percentile group. This finding was statistically significant (p=0.00).

3.3 Parental feeding style

The majority of parents had indulgent (n=164, 34%) and authoritarian (n= 150, 31%) feeding style (Table 5). There was no statistically significant difference in terms of parental feeding style between both groups (p=0.96).
3.4 Maternal perception towards childhood obesity

There was no statistically significant difference in maternal perception towards childhood obesity between the group of parents with non-overweight children and overweight children as illustrated in Table 4. However, a higher proportion of parents in the latter group agreed that overweight is caused by too little exercise (84%) and inappropriate diet (98%) and most of them agreed that overweight in children is a health problem which requires medical attention. Majority of the parents in both groups agreed that they were concerned if their child became overweight.

Table 3: Comparison of maternal perception towards child’s weight, parental feeding styles and maternal perception towards childhood obesity between those with BMI < 85th percentiles (n=411) and BMI ≥ 85th percentiles (n=72)

<table>
<thead>
<tr>
<th>Accuracy of Maternal Perception towards child’s weight</th>
<th>Non-overweight BMI &lt; 85th percentile</th>
<th>Overweight &amp; Obese BMI ≥ 85th percentile</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Correct</td>
<td>316 (76.9%)</td>
<td>9 (12.5%)</td>
<td>&lt;0.01*</td>
</tr>
<tr>
<td>• Underestimate</td>
<td>63 (15.3%)</td>
<td>63 (87.5%)</td>
<td></td>
</tr>
<tr>
<td>• Overestimate</td>
<td>32 (7.8%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
</tbody>
</table>

Parental Feeding style

<table>
<thead>
<tr>
<th></th>
<th>Authoritative</th>
<th>Authoritarian</th>
<th>Indulgent</th>
<th>Uninvolved</th>
</tr>
</thead>
<tbody>
<tr>
<td>78 (19%)</td>
<td>127 (30.8%)</td>
<td>138 (33.6%)</td>
<td>67 (16.3%)</td>
<td></td>
</tr>
</tbody>
</table>

Questions on maternal perception towards childhood obesity

<table>
<thead>
<tr>
<th>Questions on maternal perception towards childhood obesity</th>
<th>Positive perception n (%)</th>
<th>Negative perception n (%)</th>
<th>Positive perception n (%)</th>
<th>Negative perception n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1: Caused by too little exercise</td>
<td>336 (81.8)</td>
<td>75 (18.2)</td>
<td>61 (84.7)</td>
<td>11 (15.3)</td>
</tr>
<tr>
<td>Q2: Caused by inappropriate diet</td>
<td>390 (94.9)</td>
<td>21 (5.1)</td>
<td>71 (98.6)</td>
<td>1 (1.4)</td>
</tr>
<tr>
<td>Q3: Does not go away by itself</td>
<td>239 (58.2)</td>
<td>172 (41.8)</td>
<td>43 (49.7)</td>
<td>29 (40.3)</td>
</tr>
<tr>
<td>Q4: Is a health problem</td>
<td>284 (69.1)</td>
<td>127 (30.9)</td>
<td>53 (73.6)</td>
<td>19 (26.4)</td>
</tr>
</tbody>
</table>
3.5 Maternal BMI

There was no statistically significant difference in maternal BMI between the group of children with BMI < 85th percentile and BMI ≥ 85th percentile (p=0.55).

4.0 Discussion

4.1 Socio-demographic factors

The prevalence of overweight and obesity among children age 4 to 6 years old in this study were 6.8% and 8.1% respectively. These results were comparable to the study conducted by Nutrition Society of Malaysia [NutriStudy project (2010)] which showed 16% (1 in 6) of children in Peninsular Malaysia aged between 4 to 6 years were either overweight or obese. The prevalence of overweight and obese children had increased from 6.4% in 2006 to 14.9%. (National Health and Morbidity survey (NHMS) III 2006). This is alarming and warrants attention because obesity is associated with many adverse outcomes. Children who are overweight between ages 2 to 5 years are five times more likely to be overweight at 12 years of age and obesity in adolescence is highly predictive of adult adiposity. (Lundahl et al 2014).

With globalization and urbanization, children are exposed to environment of ultra-processed, energy-dense food as well as screen-based and sedentary leisure activities which contributes to the increasing statistics of childhood obesity. Surveillance of childhood overweight and obesity in pre-school age group represents a timely opportunity to develop active lifestyle and healthy eating habits to maintain healthy growth in these children.

4.2 Maternal perception towards their own child’s weight

When comparing the two groups of children i.e. BMI ≥ 85th percentile to those with BMI<85th percentile, we found that mothers of overweight/obese children showed significant difference in the accuracy of their perception about their child’s weight. Only 12.5% in the former group accurately perceived their child’s weight compared to 76.9% in the latter group (p=0.00). These results were consistent with a study done by Etelson et al (2003) where they found only 10.5% of parents of overweight children accurately perceived their child’s weight. A meta-analysis by Lundahl et.al (2014) showed that overall rate of parental underestimation of overweight/obesity was 50.7 %.

Our study showed that there was inadequate awareness regarding childhood obesity among parents in our population. Recognition of weight problem is a first step towards taking preventive measures in managing childhood obesity. Efforts from paediatricians and other health care providers in the community are required to help parents acknowledge their
children’s weight status. Literature showed that if mothers of children who are overweight and obese are informed regarding their children’s weight status, they are more inclined to make changes in both their children and family’s lifestyles (Binkin et al 2013).

Hence, health care providers play a pivotal role in correcting parental misperceptions and to facilitate parental awareness of childhood obesity.

4.3 Maternal perception towards childhood obesity

Although there was no statistically significant difference in maternal perception between the two groups of children, there was a higher proportion of parents of overweight children who agreed that overweight is caused by inappropriate diet (98%) and sedentary lifestyle (84%). Interestingly, they also agreed that being overweight is a health problem that requires medical care.

This implies that these parents do have knowledge about diet and weight gain. Despite this knowledge however, their children were still obese; this maybe because these parents (40%) believed that overweight in children will go away as the child grows up. During counselling for childhood obesity, it is essential to emphasise that a decline in physical activity contributes towards obesity and thus reduction in sedentary activities such as screen time should be reduced from an early age. The fact that 73.6% of parents with overweight children agreed that childhood obesity is a health problem infers that these parents are willing to be helped to overcome childhood obesity.

4.4 Parental feeding style

Majority of parents in our community had indulgent feeding style, followed by authoritarian, authoritative and uninvolved. There was no statistically significant difference in terms of parental feeding style between both groups of children. The findings are consistent with findings of Taylor et.al (2012) which also showed no significant correlation of feeding style with a child’s BMI. In contrast, Shloim et.al (2015) showed that indulgent feeding style was associated with a higher BMI and that authoritative parenting was associated with a healthy BMI. Majority of parents in our study had indulgent feeding style which may be a possible explanation for the rise in prevalence of childhood obesity.

4.5 Maternal BMI

Our study showed no significant association between maternal BMI with the child’s BMI. This finding differs to that from Swanton et al (2017) who showed significant correlation between maternal and offspring’s BMI. Our results may be biased as all maternal BMI in our study population was calculated based on weight and height parameters provided by the mothers themselves.

4.6 Limitations

The power of this study was 83% as this study did not achieve the desired sample size of 576 due to time constraint. Therefore, the results may not be significant due to type 2 error. A further limitation of the study was that recruitment was only from urban areas and thus the results might not be representative of the Malaysian community as a whole. In this study, the mother’s perception towards her child’s weight was assessed by questionnaires. Assessment by means of an interview or using body habitus image would have been more objective.
4.7 Recommendations

Parental underestimation of their child’s weight may hinder timely recognition and intervention of the overweight problems. Health care providers play a pivotal role in increasing awareness amongst parents. Surveillance and intervention targeting pre-schoolers are necessary as a significant proportion (14.9%) are overweight.

There ought to be community programmes that provide parental guidance on healthy body size, healthy diet and physical activity to ensure that children grow appropriately and develop healthy habits. Policy makers should develop strict regulations in line with WHO recommendations on limiting the marketing of foods and beverages high in fat, sugar and salt consumed by young children.

Future research should focus on identifying mothers who are more likely to underestimate their children’s weight status. Educating these mothers to correctly perceive their children’s weight is essential towards successfully combating the childhood obesity epidemic.

5.0 Conclusion

The prevalence of overweight and obesity among children age 4 to 6 years old in this study were 6.8% and 8.1% respectively. Our study confirms that a significant proportion (87.5 %) of parents failed to perceive that their child was overweight or obese. However, majority of the parents acknowledged that obesity is caused by inappropriate diet and sedentary lifestyle. Public health programmes are therefore required to raise parental awareness of childhood overweight and provide parents with practical strategies to prevent excessive weight gain in their children. Recognition and acknowledgment of childhood obesity are the first steps for successful behavioural modification. Healthcare providers play an important role in creating awareness amongst parents about childhood obesity.

Declaration

No conflict of interest in publishing this manuscript.

Authors’ contribution

Author 1: Study design, data collection and analysis, preparation and editing of the manuscript.

Author 2: Study design, review and editing of the manuscript.
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