ORIGINAL ARTICLE

Association of Socio-Demographics and Home Food Environment Factors on Body Weight Status Among Primary School Children

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ABSTRACT

Introduction: Obesity in children is a global epidemic issue. Home food environment is an important aspect that may influence children’s body weight status. The aim of this study is to identify the association between socio-demographics and home food environment (HFE) factors with body weight status in primary school children in Bangi, Selangor.

Methods: There were 398 children (43.5% males and 56.5% females) aged 7-11 years old (mean age of 9.04±1.41 years) and their parents (66.6% mothers and 33.4% fathers) from eight randomly selected primary schools participated in this study. Parents were asked to complete a self-administered questionnaire on socio-demographic background, feeding practices and food availability, while children were interviewed to obtain information on parental styles and physical activity level. Weight and height of children were assessed, and BMI-for-age z-score (BAZ) was calculated by using WHO Anthroplus Software.

Results: Overweight and obesity prevalence was 17.8% and 13.1% respectively. A majority of the parents (61.3%) in this study practiced authoritative parenting style. The increased odds of childhood obesity has been found to be associated with an increasing age (OR=1.239, p<0.05). The risk for overweight or obese was greater for male students than for female students (OR=1.619, p<0.05). Parent’s increasing restriction for weight control (OR=1.080, p<0.05) and decreasing pressure to eat (OR=0.913, p<0.05) increased childhood overweight and obesity risk. Conclusion: This study emphasizes the importance of involving parents in the obesity intervention programs for children.

Keywords: Childhood obesity, Home food environment, Parental feeding practices, Parenting styles

INTRODUCTION

Childhood obesity is growing globally with around 38.3 million children under the age of five were reported to be overweight in 2019 (1). According to Ahmad et al. (2), about 70-80% chances that childhood obesity will remain into adulthood, and this has become a concern to the public. This problem led to a higher risk of morbidity and mortality later in life (3). Despite the development of fast food as well as an increased trend of eating outside home, approximately two-thirds of the food they eat is from home (4). This particular reason creates the home environment of a remarkable aspect that might influence the children’s weight status. Parents’ role in promoting children’s healthy behaviour, especially food preferences, is crucial (5).

According to Couch et al. (6), the home food environment (HFE) model consists of social aspects and physical aspects that shape food intake and weight of the children. Social aspects include parenting practices and parenting styles, while physical aspects consist of food availability. In previous studies, the interplay between social and physical aspects was related to children’s weight status (6–8). Past studies showed that HFE highly influenced a child’s weight and eating pattern, in which results revealed that the presence of fast food at home increased the tendency of children to consume those foods at home (9,10). Other evidence suggests that children need to have fruit, juice, and vegetable available at home in order to eat them (10). According to Arredondo et al. (11), HFE components were created by parents of children with the role of making particular food available or unavailable, making rules about food, apply positive reinforcement at home, and modelling healthy dietary behaviours. However, the evidence is still contradictory and limited for most components of HFE, particularly in children’s weight status (8,12).

Previous studies have investigated the association of individual elements of the HFE and ignoring the overall contribution that consist of parental feeding practices, parenting style, and food availability (12). For example,
previous study investigated the relationship of a few components of HFE which only involved parental modelling with dietary intake among adolescents (13). The result revealed that parental modelling practice was associated with the reduced availability of high-fat foods at home, although not connected with diets of adolescents (13). With the mixed findings from previous studies on the effect of feeding practices and parenting style as well as food availability, it is important to highlight the HFE practiced by Malaysian parents among children. Therefore, the objective of this study is to determine the association between socio-demographics and home food environment factors with body weight status among 7 to 11 years of age children.

**MATERIALS AND METHODS**

**Study design and setting**
A cross-sectional study was carried out in the primary schools in Bangi, Selangor. Eight out of ten primary schools had been selected randomly based on a municipal council list in Hulu Langat, including six Sekolah Kebangsaan (SK), one Sekolah Jenis Kebangsaan Cina (SJKC) and one Sekolah Jenis Kebangsaan Tamil (SJKT). The classes were appointed by the school authority hence a random sampling of classes was not possible. Each schools were given 2 to 3 classes according to the school authority. All students were invited to take part in the study. Students with any disease (i.e., asthma and diabetes mellitus type 1) or physically disabled were excluded from the study. Eight hundred eighty consent forms and questionnaires were given to eight schools, but only 519 consent forms and questionnaires were returned. Parents completed a self-administered questionnaire on socio-demographics, feeding practices and food availability. Children answered questionnaire on parenting styles and physical activity level. For standard one to standard three students, the interview session was carried out in a group of three. Whereas, for standard four to standard five, the questionnaire was self-administered with the help of researcher in a class. The response rate was 76.7% with 398 students completed the questionnaire out of 519 consent forms and questionnaire returned from parents and children.

**Ethical approval and permission**
Ethical approval was obtained by the Ethics Committee for Research on Human Subjects (JKEUPM), Universiti Putra Malaysia (JKEUPM-2018-454). Authorisation for this study was given from the Ministry of; Education Malaysia, Department of; Education in Selangor as well as principals of the selected primary schools.

**Instruments**

**Socio-demographic backgrounds**
Socio-demographic backgrounds included information on child sex, ethnicity, date of birth, parent academic level, occupation, and monthly household income.

**Parental feeding practices**
The Comprehensive Feeding Practice Questionnaire (CFPQ) was used to assess parental feeding practices (14). The original questionnaire consists of 49 items complementary to parental feeding practices. However, this study used the validated questionnaire that is adapted for our Malaysian culture, and the final questionnaire consists of 39 items with Cronbach’s alpha ranged between 0.45 to 0.90 (15). The CFPQ consisted of 12 subscales which were child control, emotion control, monitoring, foods as a reward, modelling, weight control restrictions, health restrictions, nutrition education, healthy environment, balances/varieties, involvement, and pressure; to eat. Each item was ranked on a 5-point Likert scale with “never”, “rarely”, “sometimes”, “mostly”, and “always” for items 1 to 13, while “disagree”, “slightly disagree”, “neutral”, “slightly agree”, and “agree” for items 14 to 39. The scores were determined by summing each item on each subscale and mean scores for each subscale were calculated. This questionnaire had 0.86 of Cronbach’s alpha in the current study.

**Food availability**
Food availability was adapted from the Determinants of Adolescents’ Social Well-being; and Health (DASH) questionnaire (16). The questionnaire comprised of socio-demographic, health and knowledge about psychology, social support, area, and family life. Only the section on family life quality (stocked foods at home) and physical activity were extracted from the DASH questionnaire for the present study. The DASH questionnaire has been validated among Malaysian school children (17). Food availability at home consisted of two groups of food available at home which were sugar dense foods (chocolate, cake, sweets, crisps, ice-cream, biscuits) and fruits and vegetables. Food availability part consists of 9 items and each item was ranked on a 4-point Likert scale with “never” to “every day”. Only the sugar dense foods item was scored in a reverse direction. The higher scores on each category represent a higher frequency of food stored at home. The items in the current study had Cronbach’s alpha of 0.57.

**Parenting style**
Parenting style in this study was assessed using the 30-item Parental Authority Questionnaire (PAQ) (18). The PAQ consisted parenting styles of “authoritarian”, “permissive”, and “authoritative”. Each item was ranked on a 5-point Likert scale (1=strongly disagree, 2=agree, 3=neutral, 4=disagree, 5=strongly disagree). Total scores ranged from 10 to 50 in every subscale. Higher scores for the subscale indicate the parenting style perceived by parents. This questionnaire has strong Cronbach alpha from 0.74 to 0.87 (19). In this study, this questionnaire had Cronbach’s alpha ranged between 0.55 to 0.74.

**Physical activity**
The child’s physical activity was assessed with items
adapted from DASH questionnaire (16). Example of items measuring child’s physical activity such as “Do your parents encourage you to do sport or any physical activity?” with the choice of “Yes” and “No” answer. The next item measuring whether the child engaging in any of physical activity or sport when they are not at school with few categories of sport such as jogging or skipping, dancing, aerobics, cycling, swimming, football or netball or rugby or hockey, badminton or tennis or squash and, karate or taekwondo. This part consist of 8 items and each item was rated with “never” to “everyday”. Higher scores for each group indicate a higher frequency of children’s physical activity. The items were adapted and used by Tung et al. (17) for Malaysian. The items in the current study had Cronbach’s alpha of 0.66.

**Anthropometric measurement**

Weight of the children were assessed using TANITA digital weight scale HD-314 (Tanita Corporation, Tokyo, Japan) and recorded to the nearest 0.1 kg, while children’s height was assessed with the SECA body meter 206 (Seca GmbH & Co., KG, Hamburg, Germany) and recorded to the nearest 0.1 cm. BMI-for-age z-score was calculated by using WHO AnthroPlus Software and classified based on WHO Growth Reference for children between the ages of 5 and 19 years (20). The classifications included severe thinness (< - 3SD), thinness (≥ - 3SD to < - 2SD), normal weight (≥ - 2SD to < + 1SD), overweight (> + 1SD) and obesity (> + 2SD) (20).

**Statistical analysis**

Data were analyzed using IBM SPSS 25.0 (IBM Corp., Armonk, NY, USA). Continuous data as means and standard deviations (SD) or categorical data as; numbers and percentages were shown as the descriptive statistics. Pearson and chi-square tests have been used to assess the relationships between socio-demographic factors, parental feeding practices, parenting style, food availability and physical activity with BAZ. Lastly, the logistic regression model used variables p<0.25 in bivariate analysis to determine factors contributing to the body weight status of children (21). The significance level was p<0.05.

**RESULTS**

A total of 398 parents and children completed the questionnaires (Table I). Children’s mean age was 9.04±1.41 years, with 43.5% were males and 56.5% were females. The majority of the children were Malays (81.7%). About two-third of the mothers (68.1%) and fathers (63.8%) completed tertiary education. One quarter of the parents (26.4%) had a professional job such as engineer and doctor. Based on the Malaysian Economic Planning Unit classification from the Department of Statistics Malaysia (22), 50.5% of the parents were in the middle (M40) group. Childhood overweight and obesity prevalence was 17.8% and 13.1% respectively.

### Table I: Socio-demographic backgrounds and children’s body weight status (n=398)

<table>
<thead>
<tr>
<th>Variables</th>
<th>n (%) / Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>9.04±1.41 years</td>
</tr>
<tr>
<td>7-9</td>
<td>245 (61.6)</td>
</tr>
<tr>
<td>10-11</td>
<td>153 (38.4)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>173 (43.5)</td>
</tr>
<tr>
<td>Female</td>
<td>225 (56.5)</td>
</tr>
<tr>
<td>Parents</td>
<td></td>
</tr>
<tr>
<td>Mother</td>
<td>265 (66.6)</td>
</tr>
<tr>
<td>Father</td>
<td>133 (33.4)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
</tr>
<tr>
<td>Malay</td>
<td>325 (81.7)</td>
</tr>
<tr>
<td>Chinese</td>
<td>33 (8.3)</td>
</tr>
<tr>
<td>Indian</td>
<td>32 (8.0)</td>
</tr>
<tr>
<td>Others</td>
<td>8 (2.0)</td>
</tr>
<tr>
<td>Mother educational level</td>
<td>8 (2.0)</td>
</tr>
<tr>
<td>No formal education</td>
<td>14 (3.5)</td>
</tr>
<tr>
<td>Primary education</td>
<td>9 (2.3)</td>
</tr>
<tr>
<td>Secondary education</td>
<td>121 (30.4)</td>
</tr>
<tr>
<td>Tertiary education</td>
<td>254 (63.8)</td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
</tr>
<tr>
<td>Professional</td>
<td>105 (26.4)</td>
</tr>
<tr>
<td>Management</td>
<td>63 (15.8)</td>
</tr>
<tr>
<td>Educator</td>
<td>51 (12.8)</td>
</tr>
<tr>
<td>Self-employment</td>
<td>61 (15.3)</td>
</tr>
<tr>
<td>Clerk</td>
<td>43 (10.8)</td>
</tr>
<tr>
<td>Transportation/communication</td>
<td>4 (1.0)</td>
</tr>
<tr>
<td>Housewife</td>
<td>57 (14.3)</td>
</tr>
<tr>
<td>Others</td>
<td>14 (3.5)</td>
</tr>
<tr>
<td>Household monthly income</td>
<td></td>
</tr>
<tr>
<td>&lt;RM3000 (B40)</td>
<td>135 (33.9)</td>
</tr>
<tr>
<td>RM3000 – RM6275 (M40)</td>
<td>201 (50.5)</td>
</tr>
<tr>
<td>&gt;RM6275 – RM13148 (T20)</td>
<td>62 (15.6)</td>
</tr>
<tr>
<td>Children’s body weight status</td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>16 (4.0)</td>
</tr>
<tr>
<td>Normal</td>
<td>259 (62.0)</td>
</tr>
<tr>
<td>Overweight</td>
<td>71 (17.8)</td>
</tr>
<tr>
<td>Obesity</td>
<td>52 (13.1)</td>
</tr>
</tbody>
</table>

Notes:
Parents’ occupation: The classification of occupation was adapted from previous study (14).
Educational level: Primary education: UPSR
Secondary education: SPM
Tertiary education: STPM, certificates, Diploma, Degree, Masters & PhD
Household income: The classification of group was reported based on report of household income in Malaysia (20).
B40 – refer to the bottom 40% household income group
M40 – refer to the middle 40% household income group
T20 – refer to top 20% household income group

Mother educational level ($\chi^2 = 8.471$, p<0.05) was found to be associated with body weight status (Table II). As for parental feeding practices, only pressure (r=-0.243, p<0.05) and restriction for weight control (r=0.277, p<0.05) were associated with children’s BAZ (Table III). Parental feeding practices, parenting styles, food availability and physical activity were not linked to children’s BAZ (p>0.05).

Table IV shows that increasing age (OR=1.239, p<0.05) increased overweight and obesity risk. Male students were at greater risk than female students of overweight and obesity (OR=1.619, p<0.05). Parent’s increasing restriction for weight control (OR=0.913, p<0.05) increased childhood overweight and obesity risk.
DISCUSSION

Overall, this study showed 17.8% and 13.1% respectively of overweight and obesity prevalence. This result was in line with a recent study by Selangor, which found that overweight and obesity prevalence was 18.9% and 16.0% respectively (23). Another study by Norimah et al. (24) has reported that the obesity prevalence in Malaysia among primary school children has risen from 9.7% in 2001/02 to 13.7% in 2007/08. In the Nutrition Survey of Malaysian Children (SEANUTS Malaysia), obesity children’s prevalence in Malaysia was 11.8% (25). In the current study, it was found that more males were overweight and obese compared to females, in which such pattern was also shown in previous studies (2,23).

Parent’s role is crucial in the home food environment that determines children obtained enough nutritious foods and ensure their healthy eating behaviour (26). Current findings showed that restriction for weight control was associated positively with children’s BMI-for-age. This finding was similar with the previous finding by Yamborisut et al. (27) among grade 4 to 6 children in Thailand. A higher level of restriction was likely linked to the parent’s view or concern about the weight of their child, resulting in a correlation between restriction and child obesity (28). The parents who apply the restriction in child feeding should be emphasized that unnecessary controls may not predict any differences in child eating behaviours (29). Instead, restrictions may lead to harmful eating behaviour and hence worsen the weight problem (30).

This study found that pressure to eat decreased the likelihood to be overweight or obese in children. In contrast with parents that have normal children, parents who have overweight children were unlikely to pressure their children (31). This is because parents worried about their child’s weight gain if more emphasis was put on pressure to eat (29). On the other hand, parents in this study were found to slightly agree that they attempted to help their children to eat more if their children only ate a small serving. When the children were perceived as thin, especially daughters, mothers mostly reported that they are pressuring their daughters to eat more (32). Forcing a child to eat was associated with negative behaviours leading to children eat less food and becoming thin due to food becomes less desirable to them (33).

Authoritative parenting style was the leading style in this study, which demonstrates that parents administer their responsibility with the same level of control and affection for their children. Parenting style was associated with the children’s BMI in the previous study (34). However, there was no association found in the current study between parenting style and children’s BAZ. According to Shloim et al. (35), when children perceived that their parents were more demanding and responsive, their parents were more likely to be overweight or obese in children. In the current study, it was found that more males were overweight and obese compared to females, in which such pattern was also shown in previous studies (2,23).

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vegetables, more physical activity and healthier weight-related attitudes in children. In contrast, a neglectful and uninvolved parenting style promotes to the connection between child appetitive traits and an increased BMI (35). Vollmer and Mobley reported that the authoritative parenting style was more efficient in combating obesity risk among children (36).

The current study showed that most parents stocked sugar-dense foods moderately, while healthy foods (fruits and vegetables) were almost made available every day. However, there was no association found between stocked sugar-dense foods or fruits and vegetables with children’s BMI-for-age in this study. Consistent with past study, the correlation between food availability and children’s BMI was weak (37). In contrast, research into food availability and food consumption showed that excessive presence of fruits and vegetables at home did not predict significantly higher intakes of such foods among children (38). This suggests that the presence of nutritious foods alone might not be sufficient to encourage healthy eating practices among children (38). Furthermore, most of the children were encouraged by their parents to involve in physical activity in this study. However, the current study found no correlation between physical activity and children’s BMI-for-age. Previous studies have shown that participation in physical activity can lead to lower child weight gains (39,40). A recent study also suggested that children after the age of 6 years who are overweight and obese are not physically active, which make up the difference between healthy and obese weight rises over time, and thus contribute to higher BMI (41).

This study poses several limitations. Firstly, the questionnaire was self-administered among parents and hence might be a possible source of recall bias. Also, the cross-sectional setting makes the causal connection between the home food environment and children’s BMI-for-age cannot be firmly determined. Lastly, the selection of students depended on the authority of the school during data collection. The classes were assigned by the school principal thus a random sampling of students was not possible.

CONCLUSION

Overweight and obesity in this study are prevalent in children. In comparison with their normal weight children, parents use more weight control restriction, and less pressure to eat method for their obese children. In addition, the risks of childhood obesity were found to be associated with rising age and male students. Home food environment should be highlighted in the obesity prevention programs, especially the component of parental feeding practices. Parents should be educated on feeding practices to prevent unwanted weight gain among children. Future longitudinal studies are necessary to explore the relationship of home food environments and children’s weight status.

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10. Cullen KW, Baranowski T, Owens E, Marsh T, Rittenberry L, de Moor C. Availability, accessibility, and preferences for fruit, 100% fruit juice, and vegetables influence children’s dietary behavior.


