

ORIGINAL ARTICLE

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

Rina Syahira Rathuan¹, Nurzalinda Zalbahar¹, Norhasmah Sulaiman^{1,2}

¹ Department of Nutrition and Dietetics, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

² Research Centre of Excellence, Nutrition and Non-Communicable Diseases (NCCD), Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

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

Corresponding Author:

Nurzalinda Zalbahar, PhD

Email: nurzalinda@upm.edu.my

Tel: +603-86092960

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 0.1kg, while children's height was assessed with the SECA body meter 206 (Seca GmbH & Co., KG, Hamburg, Germany) and recorded to the nearest 0.1cm. 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 (\geq - 3SD to < - 2SD), normal weight (\geq - 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)

Variables	n (%) / Mean \pm SD
Age (years)	9.04 \pm 1.41 years
7-9	245 (61.6)
10-11	153 (38.4)
Gender	
Male	173 (43.5)
Female	225 (56.5)
Parents	
Mother	265 (66.6)
Father	133 (33.4)
Ethnicity	
Malay	325 (81.7)
Chinese	33 (8.3)
Indian	32 (8.0)
Others	8 (2.0)
Mother educational level	
No formal education	8 (2.0)
Primary education	15 (3.8)
Secondary education	104 (26.1)
Tertiary education	271 (68.1)
Father educational level	
No formal education	14 (3.5)
Primary education	9 (2.3)
Secondary education	121 (30.4)
Tertiary education	254 (63.8)
Occupation	
Professional	105 (26.4)
Management	63 (15.8)
Educator	51 (12.8)
Self-employment	61 (15.3)
Clerk	43 (10.8)
Transportation/communication	4 (1.0)
Housewife	57 (14.3)
Others	14 (3.5)
Household monthly income	
<RM3000 (B40)	135 (33.9)
RM6275 – RM13148 (M40)	201 (50.5)
>RM13148 (T20)	62 (15.6)
Children's body weight status	2.60 \pm 0.764
Underweight	16 (4.0)
Normal	259 (62.0)
Overweight	71 (17.8)
Obesity	52 (13.1)

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=1.080, $p < 0.05$) and decreasing pressure to eat (OR=0.913, $p < 0.05$) increased childhood overweight and obesity risk.

Table II: Association between socio-demographic backgrounds with children’s BMI-for-age z-score (BAZ) (n=398)

Variables	Children’s BMI-for-age z-score (BAZ)			
	UW/NW	OW/OB	χ ²	p
Age (years)			2.960	0.085
7-9	177 (44.5)	68 (17.1)		
10-11	98 (24.6)	55 (13.8)		
Gender			2.719	0.099
Male	112 (28.1)	61 (15.3)		
Female	163 (41.0)	62 (15.6)		
Ethnicity			0.163	0.687
Malay	226 (56.8)	99 (24.9)		
Others	49 (12.3)	24 (6.0)		
Mother educational level			8.471	0.037*
No formal education	2 (0.5)	6 (1.5)		
Primary education	9 (2.3)	6 (1.5)		
Secondary education	71 (17.8)	33 (8.3)		
Tertiary education	193 (48.5)	78 (19.6)		
Father educational level			5.196	0.158
No formal education	6 (1.5)	8 (2.0)		
Primary education	6(1.5)	3 (0.8)		
Secondary education	82 (20.6)	39 (9.8)		
Tertiary education	181 (45.5)	73 (18.3)		
Household monthly income			0.539	0.764
<RM3000 (B40)	92 (23.1)	43 (10.8)		
RM6275 – RM13148 (M40)	142 (35.7)	59 (14.8)		
>RM13148 (T20)	41 (10.3)	21 (5.3)		

*p<0.05

Table III: Association between home food environment components with children’s BMI-for-age z-score (BAZ) (n=398)

Variables	Children’s BMI-for-age z-score (BAZ)	
	r	p
Parental feeding practices		
Child control	0.060	0.235
Emotion regulation	-0.010	0.847
Encourage balance and variety	-0.860	0.087
Healthy environment	0.017	0.741
Food as a reward	0.005	0.925
Involvement	-0.048	0.337
Modelling	-0.031	0.537
Monitoring	-0.065	0.193
Pressure	-0.243	<0.001***
Restriction for health	0.005	0.916
Restriction for weight control	0.277	<0.001***
Teaching about nutrition	-0.045	0.369
Parenting style		
Authoritative	-0.009	0.858
Authoritarian	0.025	0.613
Permissive	0.013	0.797
Food availability		
Stocked sugar dense foods	0.093	0.065
Stocked fruits and vegetables	0.047	0.347
Physical activity	0.012	0.812

Pearson product-moment correlation (r); ***p<0.001

Table IV: Logistic regression results on the factors associated with body weight status among children (n=398)

	OW/ OB	95% CI		p
		Odds Ratio (OR)	Lower Bound	
Age	1.239	1.036	1.483	0.019*
Gender (Male)	1.619	1.018	2.573	0.042*
Child control	1.054	0.960	1.153	0.269
Parental encouragement in balance and variety	0.914	0.814	1.026	0.126
Monitoring	1.018	0.943	1.098	0.654
Pressure	0.913	0.844	0.987	0.023*
Restriction for weight control	1.080	1.037	1.125	0.001*
Sugar dense food availability	0.970	0.884	1.065	0.524
Maternal education (high education level)	1.097	0.611	1.970	0.756
Paternal education (high education level)	0.663	0.377	1.168	0.155

Cox & Snell R² = 0.097, Nagelkerke R² = 0.137

Model χ² (10) = 40.654, *p<0.05

Note: Education level: Low – no education, UPSR, PMR, SPM

High – STPM, Matriculation, A-Level, Diploma, Degree, Masters & PhD

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, there was a positive attitude such as liking fruits and

vegetables, more physical activity and healthier weight-related attitudes in children. In contrast, a neglectful and uninvolved parenting style promotes 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.

ACKNOWLEDGEMENT

The author appreciates and acknowledges support from the Ethics Committee for Research involving Human Subjects (JKEUPM), Universiti Putra Malaysia, for the approval of ethics and Ministry of Education Malaysia as well as Department of Education in Selangor for the approval of conducting research in public schools. The appreciation also goes to the schools, teachers, and students, who were giving full cooperation in participating in this study.

REFERENCES

1. World Health Organization. Overweight global and regional trends jme-(unicef-who-wb). World Health Organization; 2020 [cited 24 April 2020]. Available from: <https://www.who.int/data/gho/data/themes/topics/indicator-groups/indicator-group-details/GHO/global-and-regional-trends-overweight-1990-2030>
2. Ahmad A, Zulaily N, Shahril MR, Syed Abdullah EFH, Ahmed A. Association between socioeconomic status and obesity among 12-year-old Malaysian adolescents. *PLOS ONE*. 2018;13(7):e0200577.
3. Abdelaal M, le Roux CW, Docherty NG. Morbidity and mortality associated with obesity. *Annals of Translational Medicine*. 2017;5(7):161–161.
4. Adair LS, Popkin BM. Are child eating patterns being transformed globally? *Obesity Research*. 2005;13(7):1281–99.
5. Savage JS, Fisher JO, Birch LL. Parental influence on eating behavior: conception to adolescence. *The Journal of Law, Medicine & Ethics*. 2007;35(1):22–34.
6. Couch SC, Glanz K, Zhou C, Sallis JF, Saelens BE. Home food environment in relation to children's diet quality and weight status. *Journal of the Academy of Nutrition and Dietetics*. 2014;114(10):1569-1579.e1.
7. Neumark-Sztainer D, Wall M, Perry C, Story M. Correlates of fruit and vegetable intake among adolescents. Findings from Project EAT. *Preventive Medicine*. 2003;37(3):198–208.
8. Pearson N, Biddle SJH, Gorely T. Family correlates of fruit and vegetable consumption in children and adolescents: a systematic review. *Public Health Nutrition*. 2009;12(2):267–83.
9. Ayala GX, Baquero B, Arredondo EM, Campbell N, Larios S, Elder JP. Association between family variables and Mexican American children's dietary behaviors. *Journal of Nutrition Education and Behavior*. 2007;39(2):62–9.
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.

- Health Education & Behavior. 2003;30(5):615–26.
11. Arredondo EM, Elder JP, Ayala GX, Campbell N, Baquero B, Duerksen S. Is parenting style related to children's healthy eating and physical activity in Latino families? *Health Education Research*. 2006;21(6):862–71.
 12. Rosenkranz RR, Dziewaltowski DA. Model of the home food environment pertaining to childhood obesity. *Nutrition Reviews*. 2008;66(3):123–40.
 13. Watts AW, Barr SI, Hanning RM, Lovato CY, Mbsse LC. The home food environment and associations with dietary intake among adolescents presenting for a lifestyle modification intervention. *BMC Nutrition*. 2018;4(1).
 14. Musher-Eizenman D, Holub S. Comprehensive Feeding Practices Questionnaire: validation of a new measure of parental feeding practices. *Journal of Paediatric Psychology*. 2007;32(8):960–72.
 15. Shohaimi S, Wei WY, Shariff ZM. Confirmatory factor analysis of the Malay version comprehensive feeding practices questionnaire tested among mothers of primary school children in Malaysia. *The Scientific World Journal*. 2014;2014:676174.
 16. Harding S, Whitrow M, Maynard MJ, Teyhan A. Cohort profile: The DASH (Determinants of Adolescent Social well-being and Health) Study, an ethnically diverse cohort. *International Journal of Epidemiology*. 2007;36(3):512–7.
 17. Tung EH, Shamarina S, Mohd NMT. Familial and socio-environmental predictors of overweight and obesity among primary school children in Selangor and Kuala Lumpur. *Malaysian Journal of Nutrition*. 2011;17(2):151–62.
 18. Buri JR. Parental authority questionnaire. *Journal of Personality Assessment*. 1991;57(1):110–9.
 19. Lin TE, Tam CL. Relationship between perceived parenting styles and coping capability among Malaysian secondary school students. In Lin CH, editor, *IPEDR Proceedings*. Vol. 5. Singapore: International Association of Computer Science and Information Technology (IACSIT Press). 2011. p. VI20 - VI24.
 20. World Health Organization. BMI-for-age (5-19 years) [Internet]. 2019 [cited 24 April 2020]; Available from: https://www.who.int/growthref/who2007_bmi_for_age/en/
 21. Bursac Z, Gauss CH, Williams DK, Hosmer DW. Purposeful selection of variables in logistic regression. *Source Code for Biology and Medicine*. 2008;3(1).
 22. Department of Statistics Malaysia. Report of Household Income and Basic Amenities Survey 2016 [Internet]. Department of Statistics Malaysia, Official Portal. 2017 [cited 24 April 2020]. Available from: https://www.dosm.gov.my/v1/index.php?r=column/cthemByCat&cat=120&bul_id=RUZ5REwveU1ra1hGL21JWVlPRmU2Zz09&menu_id=amVoWU54UTl0a21NWmdhMjFM MWcyZz0923.
 23. Leiu KH, Chin YS. Comparison of paternal and maternal feeding practices and parenting styles between healthy weight and overweight or obese primary school children. *Malaysian Journal of Medicine and Health Sciences*. 2019;15(SP1):2-9.
 24. Norimah AK, Mohd Nasir MT, Hazizi AS, Nurliyana AR. Association of body weight status and socio-demographic factors with food habits among preschool children. *Malaysian Journal of Nutrition*. 2014;20(3):303-315.
 25. Poh BK, Ng BK, Siti Haslinda MD, Nik Shanita S, Wong JE, Budin SB, et al. Nutritional status and dietary intakes of children aged 6 months to 12 years: findings of the Nutrition Survey of Malaysian Children (SEANUTS Malaysia). *British Journal of Nutrition*. 2013;110(S3):S21–S35.
 26. Birch L, Savage JS, Ventura A. Influences on the Development of Children's Eating Behaviours: From Infancy to Adolescence. *Canadian Journal of Dietetic Practice and Research*. 2007;68(1):s1–56.
 27. Yamborisut U, Visetchart P, Thasanasuwan W, Srichan W, Unjana R. Parental feeding practice is associated with child's body mass index in Thai school-aged children: A case study in Don Tum district, Nakhon Pathom, Thailand. *Journal of Health Research*. 2018;32(1):82–94.
 28. Webber L, Hill C, Cooke L, Carnell S, Wardle J. Associations between child weight and maternal feeding styles are mediated by maternal perceptions and concerns. *European Journal of Clinical Nutrition*. 2010;64(3):259–65.
 29. Gregory JE, Paxton SJ, Brozovic AM. Pressure to eat and restriction are associated with child eating behaviours and maternal concern about child weight, but not child body mass index, in 2- to 4-year-old children. *Appetite*. 2010;54(3):550–6.
 30. Francis LA, Birch LL. Maternal weight status modulates the effects of restriction on daughters' eating and weight. *International Journal of Obesity*. 2005;29(8):942–9.
 31. Wan Abdul Manan WM, Norazawati AK, Lee YY. Overweight and obesity among Malay primary school children in Kota Bharu, Kelantan: parental beliefs, attitudes and child feeding practices. *Malaysian Journal of Nutrition*. 2012;18(1):27–36.
 32. Rodgers RF, Paxton SJ, Massey R, Campbell KJ, Wertheim EH, Skouteris H, et al. Maternal feeding practices predict weight gain and obesogenic eating behaviors in young children: a prospective study. *The International Journal of Behavioral Nutrition and Physical Activity*. 2013;10:24.
 33. Penilla C, Tschann JM, Deardorff J, Flores E, Pasch LA, Butte NF, et al. Fathers' feeding practices and children's weight status in Mexican American families. *Appetite*. 2017;117:109–16.
 34. Rodenburg G, Kremers SPJ, Oenema A, van de Mheen D. Psychological control by parents is associated with a higher child weight. *International Journal of Pediatric Obesity*. 2011;6(5–6):442–9.

35. Shloim N, Edelson LR, Martin N, Hetherington MM. Parenting styles, feeding styles, feeding practices, and weight status in 4-12 year-old children: A systematic review of the literature. *Frontiers in Psychology*. 2015;6:1849.
36. Vollmer RL, Mobley AR. Parenting styles, feeding styles, and their influence on child obesogenic behaviors and body weight. A review. *Appetite*. 2013;71:232–41.
37. Nepper MJ, Weiwen Chai. Associations of the home food environment with eating behaviors and weight status among children and adolescents. *Journal of Nutrition and Food Science*. 2015;s12(4):1–5.
38. Befort C, Kaur H, Nollen N, Sullivan DK, Nazir N, Choi WS, et al. Fruit, vegetable, and fat intake among non-Hispanic black and non-Hispanic white adolescents: associations with home availability and food consumption settings. *Journal of the American Dietetic Association*. 2006;106(3):367–73.
39. Janssen X, Basterfield L, Parkinson KN, Pearce MS, Reilly JK, Adamson AJ, et al. Non-linear longitudinal associations between moderate-to-vigorous physical activity and adiposity across the adiposity distribution during childhood and adolescence: Gateshead Millennium Study. *International Journal of Obesity*. 2019;43(4):744–50.
40. Griffiths LJ, Sera F, Cortina-Borja M, Law C, Ness A, Dezaux C. Objectively measured physical activity and sedentary time: cross-sectional and prospective associations with adiposity in the Millennium Cohort Study. *BMJ Open*. 2016;6(4):e010366.
41. Jago R, Salway R, Emm-Collison L, Sebire SJ, Thompson JL, Lawlor DA. Association of BMI category with change in children’s physical activity between ages 6 and 11 years: a longitudinal study. *International Journal of Obesity*. 2020;44(1):104–13.