ORIGINAL ARTICLE

Retrospective Child Feeding Practices and Obesity Risk among Young adults

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ABSTRACT

Introduction: Early environmental factors play a major role in shaping the health of an individual. Dietary preference and habits shaped by parental feeding practice during childhood are likely to persist into adulthood which further determines body weights status. This study aimed to determine the retrospective child feeding practices associated with obesity risk in young adults. **Methods:** This was a retrospective cross-sectional study with 176 university students in Kuala Lumpur. Data of maternal age, gestational age and feeding practices were collected retrospectively using Child Feeding Questionnaire (CFQ). Subject's current socio-demographic data was collected and anthropometric measurements were taken using standard protocol. **Results:** Around 22% of the subjects were overweight/obese. No significant association was found between child feeding practices with maternal age. A significant association ($p<0.05$) was found between pressure to eat with gestational age, in which parent with preterm (<37 weeks gestation) and full-term subjects were more likely to pressure their child to eat as compared to post-term subjects (>42 weeks gestation). Obesity risk in young adults was higher among parents who viewed themselves as overweight (aOR=2.783; CI=1.631-4.749) and who viewed their child as overweight from birth to primary school (aOR= 1.512; CI=1.080-2.116). Young adults that were pressured by their parents to eat during childhood were less likely to be obese (aOR=0.785; CI=0.621-0.992). **Conclusion:** Parental influences on child feeding practices were linked to obesity risk in young adulthood. Parent education on child feeding practices is needed to maintain healthy weight status of their child from young to later life.

Keywords: Obesity, Young adults, Gestational age, Child feeding practices, Retrospective

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INTRODUCTION

Obesity is a growing public health issue affecting all age groups in both developing and developed countries. Bodyweight is highly associated with overall body health status. Obesity contributes to unfavourable metabolic effects which increase the risk of premature death and non-communicable diseases such as diabetes, hypertension, cardiovascular disease, etc (1). There is an increasing prevalence of obesity among young adult in Malaysia. According to the National Health and Morbidity Survey (NHMS), the obesity prevalence among young adults aged 18 to 24 years old has increased from 20.7% in 2011 to 23.8% in 2015 (2,3).

Lifestyle factors such as unhealthy diet and sedentary lifestyles are the major contributor to obesity. Nevertheless, family also plays an important role in determining an individual's weight status since birth. Other than shared genetic factors, environmental and behavioural characteristics are shaped by family members; especially parents, have a direct impact on children's energy balance and weight status (4). Parental influence in developing children's dietary preference and habit begins from prenatal period and may persist into adolescence and adulthood. Child feeding practices are used by the parents to influence their children's eating behaviour according to their goal towards children's growth and health status (5). These parental practices refer to goal-oriented strategies to control the type, amount and time of the food their children consume, for example, restricting the access of certain type of food, pressuring children to eat, modelling eating behaviours and creating a home food environment for children (5).

During child development, the inappropriate child feeding practices are a concern towards the growing epidemic of obesity in childhood and may persist to adulthood. For example, parental restriction to unhealthy food is positively associated with childhood obesity as restriction can increase child's interest in restricted food and promote overeating when restricted food is readily available (6-7). Different types of parental child feeding practices may have lasting health consequences that can follow a child into adulthood. Family mealtime pressure during childhood is associated with emotional eating, binge eating and many other negative eating behaviours

during adulthood (8). Previous study also reported that retrospective child feeding practices have a significant impact on weight status of children and young adult (9).

Furthermore, Barker hypothesis highlighted the importance of early fetal development during the first 1000 days after conception including premature birth and low birth weight which can affect the development of obesity and other chronic diseases in later life (10). As childhood nutrition has long been recognized as a crucial aspect in obesity development, child feeding practices that are largely influenced by parent may play a role in children's obesity predisposition (5). Previous studies focused on the impact of child feeding practices towards the obesity disposition among children and adolescent in Malaysia and other countries (5-7). However, there has been a lack of knowledge on the association between retrospective reports of child feeding practices and weight status in early adulthood as there are currently only two published studies that have used the retrospective parents report of feeding practices among university students (9,11). The current update of the adulthood obesity research pattern in Malaysia also reported limited research for the impact of early nutrition in Malaysia on adult obesity development (12). Hence, there is a need to study child feeding practices during childhood in relation to later adulthood weight status, especially in Malaysia. This study aimed to determine the retrospective child feeding practices associated with later obesity risk in young adults. Besides, to determine the relationship between early maternal and child factors including maternal age and gestational age with different child feeding practices used.

MATERIALS AND METHODS

Study Design and Participants

This was a retrospective cross-sectional study with 176 students from an urban private university. The minimum required sample size for this study was 163 students based on the estimated 12.1% prevalence of obese young adults with the formulae of Charan and Biswas (2013) which is $n = (Z)^2 p (1–p) /d^2$ (3, 13). The sampling method used in this study was convenience sampling. From June 2018 to August 2018, subjects were approached and recruited. A short recruitement presentation was given in their classes to provide them with study overview and criteria for participation. Malaysian undergraduate students at UCSI University, Kuala Lumpur were included in this study. International students and individuals with any physical disability and/or mental disorder, taking medication on a constant basis, or diagnosed with diseases including hypertension, hypercholesterolemia, diabetes, depression and anxiety were excluded. Informed written consent from all subjects was obtained. Ethical approval was obtained from Medical Research and Ethics Committee (MREC) with the reference number of NMRR-18-1327-42054.

Measures

Retrospective data of maternal age, gestational age and child feeding practices were collected using Child Feeding Questionnaire (CFQ). Information on subject's current sociodemographic characteristics was collected, and anthropometric measurements were obtained using standard protocol. A dual-language questionnaire of English and Bahasa Melayu was available.

Sociodemographic Characteristics

Sociodemographic information of the subjects including sex, age, ethnicity, degree major, year of enrolment, and monthly allowance was collected in the form of questionnaire.

Retrospective Maternal and Child Data

Information on maternal age and gestational age were self-reported by subject's parent. Maternal age referred to the age of mother at the time of delivery of the subject. Gestation age referred to the number of weeks that an infant grows inside the mother's uterus. It is classified into preterm, full-term and post-term. The full-term baby was delivered in the range between 37 to 42 weeks of gestation. A preterm baby was born before 37 weeks of gestation whereas the post-term baby was born after 42 weeks of gestation.

Retrospective Child Feeding Questionnaire (CFQ)

The CFQ was a validated questionnaire for evaluating parental beliefs, attitudes, and practices towards child feeding, as well as focus on the tendency of childhood obesity (5). It was structured for parents of children ranging from preschool age to middle childhood, particularly from 2 to 11 years old. This questionnaire was designed to use in research settings among parents of healthy children with the absence of handicap condition (5). By referring to Galloway, Farrow and Martz 2010, the retrospective version of CFQ questionnaire in this study was modified by changing the phrasing of each item from present to past tense (5). For example, in the original CFQ questionnaire of the concern subscale consists of 3 items that assess how concerned the mother is with her child's weight. As in: ''How concerned are you about your child eating too much when you are not around him/her?'' This was revised to ''How concerned were you about your child eating too much when you were not around him/her.'' There is no validated CFQ questionnaire among Malaysian children, however, CFQ has been used previously among Malaysian children for assessing childhood obesity development (6-7). The translated CFQ was evaluated by a nutrition expert for content validity (7).

Parents were required to fill up the retrospective version of CFQ and informed to recall the feeding practices they used on their child during the middle childhood age of 5 to 10 years old. The questionnaire was in dual language (English and Bahasa Melayu). Since Bahasa Melayu is the

national language, hence the questionnaire is suitable for the subjects and their parent. Moreover, the contact number of the researcher was provided in the consent form and questionnaire. Therefore, the parents can check with the researcher directly if there's any further inquiry regarding the CFQ questionnaire. Current study focused on middle childhood as it was a transitional stage whereby children started to have more freedom in their food choices. The retrospective CFQ consisted of 31 items with 7 subscales. CFQ assess parental beliefs, attitude and feeding practices. Perceived feeding responsibility, perceived parent weight and perceived child weight were grouped under the subscale of parental beliefs. The parental concerns about child weight was considered as parental attitude's subscale. The parental feeding practices' subscales including pressure to eat, restriction of eating unhealthy food, and monitoring of junk food consumption. The CFQ was scored using a Likert scale with response options ranging from 1 to 5, with higher scores indicating significant amounts of the corresponding feeding practices. The CFQ subscale score was obtained by calculating the mean for the summation of each individual items. These subscales have good internal consistency with levels above α = 0.70 (5). In current study, the reliability of retrospective child feeding practices was high (α = 0.80).

Anthropometric Measurements

Body Mass Index (BMI)

Subject's weight (kg) and height (cm) were measured by trained personnel at the Nutrition Practice Lab. With minimal clothing and without shoes, weight was measured to the closest 0.1 kg using a portable Body Impedance Analyser (BIA) device Tanita SC-330, and height was measured to the closest 0.1 cm using a SECA 213 portable stadiometer (14). Weight and height data of subjects were measured twice to increase the reliability of measurement. BMI was expressed in units of kg/m^2 which was calculated from the subject's average measurement of weight and height. BMI was used to determine the weight status of the subjects and was classified according to BMI cut-off points for Asians from World Health Organization (WHO) standards (14). BMI was categorized into different classes of weight status, with underweight (UW) BMI < 18.5, normal weight (NW) BMI from 18.5 to 22.9, overweight (OW) BMI from 23 to 24.9, obese (OB) Class I BMI from 25 to 29.9 and obese (OB) Class II BMI ≥ 30 (14).

Waist Circumference (WC)

The waist circumference of subjects was measured using non-elastic and firm measuring tape. Subject's waist circumference was taken at the midpoint between the lower rib and superior border of the iliac crest to the nearest 0.1 cm, additionally taken at the end of normal expiration where subjects were in relaxed conditions (15). Measurement was taken two times to obtain the average result. World Health Organization (WHO) classification of waist circumference for Asian population was used to determine the risk of abdominal obesity of the subjects, with men ≥ 90 cm and women ≥ 80 cm were at higher abdominal obesity risk (15).

Body Fat Percentage

The body fat percentage of the subjects was also taken using a portable Body Impedance Analyzer (BIA) device Tanita SC-330. Measurement was taken two times to obtain the average result. Body fat percentage cut-off points were referred from Tanita BIA instruction manual based on Gallagher's classification (16). It was separated into male and female with different age groups. Adults aged below 39 years old were categorized either into low body fat percentage (< 8 for men, < 21 for women), normal body fat percentage (8-19.9 for men, 21-32.9 for women), high body fat percentage (20-24.9 for men, 33-38.9 for women) or very high body fat percentage (≥ 25 for men and ≥ 39 for women) (17).

Statistical Analysis

All the data were analysed using IBM Statistical Package for Social Sciences (SPSS) software version 20.0. Kolmogorov-Smirnov normality test was carried out to check for the data distribution. Descriptive tests for sociodemographic data and body weight status were presented using frequency and percentages. In addition, the non-parametric Mann Whitney test was used to study the differences between groups such as normal weight and overweight/obese group. Kruskal-Wallis test was used to compare more than two groups such as gestational age. Median and interquartile range were reported in those non-parametric tests. Besides, Spearman Correlation was used to measure the relationships between continuous variables and to explore the correlations between the continuous data for maternal age with retrospective child feeding practices among UCSI University students. Multivariate analyses by logistic regression were also used to examine the independent predictors of young adults in developing obesity. Both crude and adjusted Odds ratios (ORs) and 95% confidence intervals (CIs) were reported to determine the strength of association and to control the confounders. All reported p-values were two-tailed, and statistical significance level was established at $p < 0.05$.

RESULTS

Results showed that the proportion of sex was relatively equal with 43.8% and 56.3% of male and female subjects, respectively. Majority of the subjects were Chinese (90.9%) and around half of them (50.6%) had monthly allowance of less than RM500. The mean age for the subjects was 19.63±0.99 years, whereas the maternal age was 29.39 ± 4.78 years. Almost 86.2% of the subject was full-term, followed by 10.8% and 4.0% of them were premature birth and post-term baby, respectively. Subject's mean BMI was 21.33±3.13kg/m^2, mean waist circumference was 73.44±8.90cm and

mean body fat percentage was 22.47±7.21%. Around 22% of the subjects were overweight and obese, 7.4% of them had abdominal obesity and 16.5% had high body fat percentage (Table I).

Table I: General characteristics of subject

Characteristics	Frequency (n=176)[a] / mean±SD[b]	Percentage (%)
Sex [a]		
Male	77	43.8
Female	99	56.3
Age (years old) [b]	19.63 ± 0.99	
Ethnicity [a]		
Chinese	160	90.9
Malay	4	2.3
Indian	8	4.5
Others	4	2.3
Maternal Age [b]	29.39 ± 4.78	
Gestational Age [a]		
Preterm	19	10.8
Full-term	150	86.2
Post-term	7	4.0
Monthly Allowance (RM) [a]		
< RM500	89	50.6
RM500-RM999	54	30.7
RM1000-RM1499	30	17.0
> RM1500	3	1.8
Body Mass Index (BMI), kg/m^2 [a,b]	21.33 ± 3.13	
Underweight	26	14.8
Normal BMI	111	63.1
Overweight & Obese	39	22.2
Waist Circumference (WC), cm [a,b]	73.44 ± 8.90	
Normal	163	92.6
Abdominal Obesity	13	7.4
Body Fat Percentage, % [a,b]	22.47 ± 7.21	
Low	10	5.7
Normal	137	77.8
High	29	16.5

[a]Frequency; [b]Mean±SD

Median and interquartile range of CFQ score for each subscales based on weight status were compared. Overweight/obese group had significantly higher perceived parent weight (p<0.001) and perceived child weight (p<0.001) than those in the normal weight group. This means that parents of overweight/obese subjects viewed themselves as overweight from their childhood until now, as well as viewed their child (subject) as overweight since birth until primary school. In addition, parental restriction (p=0.027) and pressure to eat (p=0.026) were significantly higher among individuals with normal weight group as compared to those in the overweight/obese group (Table II).

There was no significant association found between maternal age with different child feeding practices used. However, a significant difference between gestational age with pressure to eat was observed (p<0.05). Parents of preterm and full-term born subjects exerted higher pressure to eat, in terms of the type and amount of food being consumed during childhood, as compared to parents of post-term born subjects (Table III).

Multivariate logistic regression was used to determine the CFQ subscales in predicting young adulthood obesity risk. In the multivariate logistic regression, perceived parent weight, perceived child weight, pressure to eat and sex were independent predictors for obesity risk (Table IV). Parent who viewed themselves as overweight from their childhood until currently (Adjusted Odds Ratio [aOR]=2.783; CI=1.631-4.749) and viewed their child as overweight since birth until primary school age (aOR=1.512; CI=1.080-2.116) had greater chances of having overweight children in adulthood. On the other hand, mothers who exerted more pressure on their children to eat (aOR=0.785; CI=0.621-0.992) had lower chances of having overweight child in adulthood. Besides, being female had a lower risk of obesity as compared to male (aOR=0.293; CI=0.105-0.818). Multivariate analysis showed that the variable that had the most influence was perceived parent weight (Table IV).

Table II: Score differences in CFQ subscales of subjects based on Body Mass Index (BMI)

CFQ Subscales	Median (IQR)		p-value[a]
	Normal (n=108)	Overweight & Obese (n=39)	
Perceived Responsibility	4.00 (3.33, 4.92)	4.00 (3.00, 4.67)	0.360
Perceived Parent Weight	3.00 (2.75, 3.00)	3.25 (3.00, 3.50)	<0.001**
Perceived Child Weight	3.00 (2.80, 3.00)	3.00 (3.00, 3.40)	<0.001**
Concern	3.33 (3.00, 4.33)	3.33 (2.67, 4.33)	0.598
Restriction	3.63 (3.16, 4.00)	3.25 (2.63, 3.88)	0.027*
Pressure to Eat	3.75 (3.25, 4.00)	3.25 (3.00, 4.00)	0.026*
Monitoring	3.00 (2.67, 4.00)	3.33 (2.67, 4.00)	0.835

*Significant at p<0.05; ** significant at p<0.01
[a]p-value analysed using Mann–Whitney Test

Table III: Score differences in CFQ subscales (practices) of subjects between different gestational age

CFQ Subscales (Practices)	Median (IQR)			p-value
	Pre-term (n=15)	Full-term (n=125)	Post-term (n=7)	
Restriction	3.38 (3.00, 3.93)	3.50 (3.00, 3.93)	3.38 (3.13, 4.25)	0.961
Pressure to Eat	3.75 (3.25, 4.00) [a]	3.75 (3.25, 4.00) [a]	2.75 (2.75, 3.25) [b]	0.041*
Monitoring	3.00 (2.33, 3.83)	3.00 (2.67, 4.00)	2.00 (1.33, 3.33)	0.081

*Significant at p<0.05
[a,b]Statistically significant different as analysed using Kruskal–Wallis Test followed by post hoc test with Bonferroni correction

DISCUSSION

In this study, around 22% of the subjects were overweight and obese. These data suggested that almost one in five young adults in Malaysia are overweight and obese. The rising rate of obesity highlights the need for determining factors during the early development of life which may have an impact on the weight status of the child in later adulthood.

Table IV: Crude and adjusted odds ratio for obesity risk according to CFQ subscales[a]

CFQ Subscales	**BMI (kg/m²)** (base = normal weight)	
	Crude Model	**Adjusted Model**
	OR (95% CI)	**OR (95% CI)**
Perceived Responsibility	0.926 (0.812, 1.057)	1.000 (0.820, 1.218)
Perceived Parent Weight	2.217 (1.509, 3.255) **	2.783 (1.631, 4.749) **
Perceived Child Weight	1.633 (1.229, 2.168) **	1.512 (1.080, 2.116) *
Concern	0.956 (0.850, 1.075)	1.014 (0.864, 1.190)
Restriction	0.914 (0.849, 0.984) *	0.915 (0.826, 1.014)
Pressure to Eat	0.829 (0.709, 0.969) *	0.785 (0.621, 0.992) *
Monitoring	1.15 (0.972, 1.25)	0.164 (0.969, 1.399)
Sex		
Male	Reference	Reference
Female	0.426 (0.202, 0.900) *	0.293 (0.105, 0.818) *

CFQ = Child Feeding Practices
OR (95% CI) = Odd Ratio (95% Confidence Interval)
[a] Odds Ratio adjusted by child's sex, age, maternal and gestational age.
*Significant at p<0.05; **significant at p<0.01

The present study did not find any significant relationship between maternal age with child feeding practice. This result was consistent with a previous study which revealed that maternal age was not significantly correlated with their feeding practices (18). However, most of the research reported that younger mothers were more likely to pressure their children to eat and explicit control in their child feeding practices (19). On the other hand, findings on the restriction in feeding were inconsistent. Younger maternal age was associated with food restriction which may suggest that maternal control decreased with child age (19,20). The different findings for maternal age and child feeding practices used could be due to the different cultural setting and child's age group as previous studies generally focused on pre-school age of before 5 years (20).

There was a significant relationship between gestational age with pressure to eat. Previous study suggested that parents tend to exert mealtime pressure to eat when they are concerned with their child being or becoming underweight (21). Meanwhile, most of the low birth weight babies were born pre-term, as data demonstrated that around 70% of low birth weight babies were born premature, and the rest were born full-term (22). Thus, preterm and full-term infants may indirectly link to parental pressure to eat out of the concern for their child weight status. On the other hand, previous studies suggested parents exert more pressure to eat when their child had a lower appetite (23). Preterm children usually had difficulties in feeding during early childhood due to factors such as nausea, choking, food rejection and selection while crying and spitting food, which further causing low appetite (23,24). It has been demonstrated in previous studies that pressure to eat was associated with low birth weight, less appetite and parental concern of weight status (24). Hence, this study provides a valuable finding to further examine the relationship between gestational age with different subscales in child feeding practice.

Obesity risk in young adults was higher among their parents who viewed themselves as overweight or obese from their childhood until currently. This is parallel with the findings from previous study which reported that offspring who had overweight or obese parents were six times more likely to become overweight and obese during young adulthood, as compared to offspring with normal weight parents (25). Interestingly, the relationship between parental obesity risk with their offspring obesity risk increases gradually from childhood into adulthood, while the strongest relationship was established when the offspring became older (25). At the same time, parents who viewed their offspring as overweight or obese since birth until primary school age had a higher obesity risk among offspring during young adulthood. Parental perception of their child's weight status early in the development is simultaneous with their child's current weight status which suggested that obese children were more likely to become obese adults (26). It is believed that being labelled as overweight in a social environment that only recognises thinness and criticizes adiposity can trigger psychological distress which caused coping behaviours such as overeating that could further increase the risk of weight gain as the child growing up (27). In this study, the restriction was higher among the normal weight group than the overweight group. However, previous study indicated that higher recollection of parental restriction was positively related to higher BMI and emotional eating in young adulthood (9).

Logistics regression analysis conducted on the variables of the CFQ found significant predictors of young adulthood obesity including higher perceived parent weight and perceived child weight. In contrast, pressure to eat during childhood would not result in obesity risk in young adults. However, previous findings found that parental pressure to eat was linked to a higher problematic eating disorder in young adulthood (28). Another retrospective study also found that young adults reported strong disliking for foods that they had been pressured to eat as a child which therefore potentially contributed to food rejection (29). Hence, future study should look into childhood pressure to eat with the development of disordered eating behaviours which might persist from childhood into adulthood. The CFQ findings in this study were also parallel to previous Malaysia studies for childhood obesity among primary school children aged 7 to 12 years old, the findings including a positive relationship of perceived parent and child weight and negative relationship of pressure to eat

with weight status (6-7). Moreover, being female has a lower risk of obesity which is parallel to previous finding conducted among young adults from private universities in Malaysia (30).

There are several limitations to this study. First, the study was only conducted in one university in the Kuala Lumpur, thus the findings might not be generalizable to all young adults in different states in Malaysia. Besides, the subjects recruited were mostly Chinese (90%) university students. Since Malaysia is a multiracial country with primarily three major ethnic groups of Malay, Chinese and Indian population, future studies should be done among other ethnicities to demonstrate the relationship between previous child feeding practices with the current development of obesity. Moreover, the maternal information and child feeding practices were self-administrated among parent which could be a potential cause of recall bias. However, the use of the child feeding questionnaire is a validated questionnaire to assess feeding attitudes, beliefs and practices among parent and focus on the tendency of childhood obesity. The retrospective design of this study could also lead to recall bias as the parents might recall according to their child current weight status. Furthermore, the development of different unhealthy eating behaviours which could affect weight status should also be included in further study for different parental child feeding practices, since those poor eating behaviours were not identified in this study. Nevertheless, this might be the first study that emphasized on the retrospective parental child feeding practices to current young adulthood obesity risk in the Malaysian setting. Findings are valuable in providing the cause evidence for future intervention to combat obesity since young.

CONCLUSION

This study suggested that higher perceived parent and child weight were more likely to develop obesity in young adulthood, whereas excessive pressure to eat was not associated with young adulthood obesity. In additional, the use of parental pressure to eat was linked with smaller gestational age of the offspring. Parental child feeding practices might play an important role in shaping the optimal weight status of the offspring early in the development and may persist into young adulthood. Results of current study highlighted the need for further study on parental child feeding practices to the other potential long-term consequences, perhaps to the development of unhealthy eating behaviours in later life.

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