ORIGINAL ARTICLE

Childhood Obesity: Parental Misperception of Child's Body Weight Status and Associated Factors

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ABSTRACT

Introduction: The prevalence of childhood obesity is on the rise. Accurate parental awareness of their child's body weight status is imperative in helping them maintain a healthy lifestyle and ideal body weight. This study aimed to determine the accuracy of parental perception of their child's body weight status and identify factors influencing their perception. **Materials and methods:** This was a cross-sectional study involving 586 parents of school-going children aged between 10 to 11 years, in Kuala Lumpur, Malaysia. Parents responded to a self-administered questionnaire regarding their characteristics and perception of their child's weight status. Parental perception of their child's body weight status was compared with the actual body mass index (BMI) of the child. Parental attitude towards childhood obesity was evaluated using a validated questionnaire. **Results:** Thirty-nine percent of parents underestimated their child's body weight status. Among parents of children who were overweight and obese, 54.0% underestimated their child's body weight status. The child's BMI (OR 2.25, 95% CI:1.15-3.34) and parental attitude towards childhood obesity (OR 1.48, 95% CI:1.02-2.17) had a significant association with parental perception. **Conclusion:** More than one-third of parents misperceived their child's weight status. This was especially prominent among parents of overweight and obese children. The child's BMI and parental attitude towards childhood obesity were significantly associated with parental perception of their child's weight status.
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INTRODUCTION

Childhood obesity has become a global public health threat and is a major concern worldwide including Malaysia. In 1975, World Health Organization reported that less than 1% of 5-19-year-old children and adolescents were obese, but in 2016, more than 124 million children and adolescents of the same age group were reported to be obese. (1) The rising trend of childhood obesity was reported in The Malaysian National Health and Morbidity Survey (NHMS); from 6.1% in 2011 among children less than 18 years of age, to 11.9% and 14.8% in 2015 and 2019, respectively. (2-4) The age-standardized prevalence for obesity in East and South Asia for both genders has risen dramatically; from 0.7% in 1975 to 5.6% in 2016 in girls and from 0.9% in 1975 to 7.8% in 2016 in boys. (1)

Type 2 diabetes mellitus, hypertension, heart disease, and an increased risk of adult obesity are all effects of childhood obesity that can lead to greater psychological and economic strain . Sonntag et al. reported that compared to individuals of normal weight, those who had been overweight or obese as children had lifetime excess expenses that were two to three times higher. (5) As childhood obesity determines healthcare costs in adulthood, preventive measures, and interventions to reduce persistent childhood obesity and its related morbidities could reduce its impact on the lifetime burden of not just the family but the entire nation as well.

A child's attitude towards lifestyle modifications is heavily influenced by their parents' behaviour, which is largely determined by how accurately parents assess their child's weight status. (6,7) As parents play an essential part in shaping and nurturing their child, having an accurate assessment of their child's body weight may be a crucial aspect in fostering a healthy lifestyle in a child. The more accurate the parents' estimation of their child's weight status, the more probable it is that they will support their child in reaching a healthy weight. This will almost certainly improve the child's quality of life. (7-9) If parents are unable to recognise their child as being obese or overweight, they may be

unwilling to make adjustments. Studies have shown that correct maternal perception of a child's body size result in greater weight loss in their child in comparison with mothers with an incorrect perception. (9) However, substantive research articles have demonstrated inaccuracy in parental perception of their child's weight status. Parental misperception occurs widespread across most developed and undeveloped nation. (10) Ramiro-Gonzalez et al. reported a parental misperception rate of childhood excess weight of as high as 71.4%. (11) Warkentin et al. reported that 48.1% of parents incorrectly classified their child's weight (12) whilst Ashraf et al. found that 58.7% of parents of 5- to 14-year-old children incorrectly evaluated their child's weight status. (13) In Asia, studies by Cheng et al. and Hong et al. reported a parental misperception rate of 33.9% and 30%, respectively. (14,15) Parental awareness of their child's accurate weight status may be the first step in fostering a healthy lifestyle and maintaining healthy body weight among children.

Pickens described perception as the process by which a person interprets a situation or stimuli into something meaningful based on earlier experiences. Nonetheless, what an individual perceives or interprets may differ significantly from reality. The awareness and acceptance of stimuli by a person is critical. (16) When a person limits the processing of external stimuli by selectively interpreting what he or she sees based on ideas, experience, or attitudes, this is referred to as selective perception. (17) As perception is directly linked to attitude, parental attitudes regarding paediatric obesity should be investigated. Parental misperception is characterised as parents underestimating their child's weight status, which results in an unrealistic parental perception. (18)

Studies have reported on various factors that is associated with parental perception of their child's weight which include ethnicity, child's gender, child's age, maternal weight status, maternal level of education and household income. (19-23) Boys with larger bodies confer more physical advantages, whereas girls with smaller bodies are more socially acceptable, leading to a higher percentage of underestimation among boys. (12,21,23) Recognising a child's physical activity limitations, as well as physicians' concerns, has been shown to influence parental opinion. (23) Some of the associations reported have been inconsistent. Higher levels of parental educational and health literacy level have been associated with more accurate parental perception of their child's weight status. (23) Higher maternal BMI has been linked with parental underestimation of a child's weight status. (19) Other studies, however, have reported that parents with lower level of education and higher BMI were more accurate in assessing their child's physical size. (13,24)

The aim of this study was to determine the accuracy of parental perception of their child's body weight status as well as identify parental and child characteristics that are associated with parental perception. We also aimed to evaluate the association between parental perception and their attitude towards childhood obesity

MATERIALS AND METHODS

Design and participants

This was a cross sectional study performed over a 9-month period (between August 2019 and April 2020), which involved parents of children aged between 10 to 11 years from 6 primary schools in Kuala Lumpur. This age group was selected as the prevalence of obesity among 10 to 12-year-old was the highest among children between 10 to 17 years of age. (7) Malaysian parents who were able to comprehend either English or the country's national language were invited to participate. The study protocol was approved by the Institution Research and Ethics Committee and Ministry of Education.

Self-administered questionnaire

The self-administered questionnaire consisted of 3 sections. The first section composed of demographic data which included parental weight and height, parental education level, employment status, and monthly family income. The second section composed of questions regarding parental perception of their child's weight status. The third section consisted of 10 questions which evaluated parental attitude towards childhood obesity. The content validated questionnaire on parental attitude was adapted from Hatta et al. (25) A 5-point Likert scale system was used. For questions depicting positive attitude, "1" indicated strong disagreement and "5" indicated strong agreement. The scale was reversed for negative attitude questions. The minimum total score was 10 and the maximum score was 50. Parents were considered to have a positive attitude if total score attained was more than 75% of maximum score. The questionnaire was translated to the country's national language using the forward-backward method. Cronbach's alpha value for the 10 questions on parental attitude was 0.8. The self-administered questionnaire was distributed to eligible parents and returned to the respective school heads upon completion.

Anthropometric measurements

Height and weight measurements of the children were obtained from the schools' National Physical Fitness Standard Test which was held twice a year. Body mass index (BMI) of each child was calculated and the child's weight status was determined using Centers for Disease Control – United States BMI (CDC-US BMI) gender specific-for-age growth charts. Underweight was defined as BMI less than 5th centile, normal weight if between 5th to 85th centile, overweight if BMI was ≥ 85th percentile and obesity if BMI was ≥ 95th percentile of weight for the age and gender. (26) Parental BMI was calculated using self-reported height and weight. Parental BMI

classification was based on the definition by Centers for Disease Control and Prevention; underweight was defined as BMI less than 18.5kg/m^2, normal weight as BMI of 18.5kg/m^2 to less than 25kg/m^2, overweight as BMI of 25kg/m^2 to less than 30kg/m^2 and obese as BMI more than 30kg/m^2. (26)

Parental perception of their child's body weight status was compared with the actual measured BMI of their child. Parents who considered their child as underweight/ slim were deemed to have perceived their child as underweight. Parents who regarded their child as being normal sized were considered to perceive their child to be normal in weight, whereas those who thought their child was plump was considered to perceive their child as being overweight. Parents who thought their child as being fat were considered to perceive their child as being obese. Their perception was considered consistent if it matched the study's weight status definition. Parental underestimation was determined if parents perceived their overweight or obese child as normal sized.

Sample size calculation

The sample size was calculated using normal variant of 1.96, precision of 0.05 and expected proportion of population misperception of 38%. (27) Taking into consideration a 20% drop-out rate, a minimum sample size of 434 was determined.

Statistical analysis

Data was analysed using IBM SPSS (Statistical Package for Social Sciences) 26.0. Categorical data were described using frequency and percentage. Continuous data was presented using mean and standard deviation for parametric data and median and interquartile range for non-parametric data. Chi-square test was used to determine association between child and parental characteristics as well as parental attitude and parental perception. Logistic regression was used to determine independent predictors of parental misperception. A p-value of less than 0.05 was considered statistically significant.

Ethical clearance

This research was approved by Research Ethics Committee, Faculty of Medicine, Universiti Kebangsaan Malaysia, FF-2019-377 and Ministry of Education, Malaysia, KPM.600-3/2/3-eras(3603).

RESULTS

Five hundred and eighty-six parents participated in the study. The mean age of parents was 40.4 years (SD 5.4) with majority (n=571, 97.4%) from Malay ethnic group. Three hundred and eighty-three (65.4%) were mothers. Five hundred and twenty-one (89%) parents expressed concern that their child could become overweight or obese. Two hundred and forty-two (41.3%) parents had normal weight, whilst 209 (35.7%) and 114 (19.5%) were overweight and obese, respectively. (Table I)

Table I: Socio-demographic characteristics of 586 parents

Demographic variables		n=586 n (%)
Parental gender	Female	383(65.3)
	Male	203(34.6)
Parental BMI	Underweight	21(3.6)
	Normal	242(41.3)
	Overweight	209(35.7)
	Obese	114(19.5)
No of children	One	39(6.7)
	> 1	547(93.3)
Educational level	Primary	16(2.7)
	Secondary	270(46.1)
	Tertiary	300(51.2)
Ethnicity	Malay	571(97.4)
	Chinese	4(0.7)
	Indian	3(0.5)
	Others	8(1.4)
Income	<RM3860	323(55.1)
	RM3860-RM8319	208(35.5)
	>RM8319	55(9.4)
Occupation	Non-professional	450(76.8)
	Professional	136(23.2)
Concern of child becoming overweight	Concerned	521(88.9)
	Not concerned	65(11.1)

BMI: Body Mass Index

Amongst the 586 children, 338 (57.7%) children had weight within the 5th to 85th centile, whilst 71 (12.1%) and 77 (13.1%) were overweight and obese, respectively. (Table II)

Table II: Gender and Body Mass Index status of 586 children

	Male (n=291) n (%)	Female (n=295) n (%)
Underweight	51 (17.5 %)	49 (16.6 %)
Normal weight	152 (52.2 %)	186 (63.1 %)
Overweight	36 (12.4 %)	35 (11.9 %)
Obese	52 (17.9%)	25 (8.5 %)

Among parents with normal weight, overweight and obese child (n=486), 264 (54.3%) parents accurately estimated their child's weight status. One hundred and ninety-one (39.3%) parents underestimated their child's weight status whilst 31 (6.3%) overestimated their child's weight status. Among parents of overweight and obese children, 80 (54.0%) parents underestimated their child's body weight status. (Figure 1)

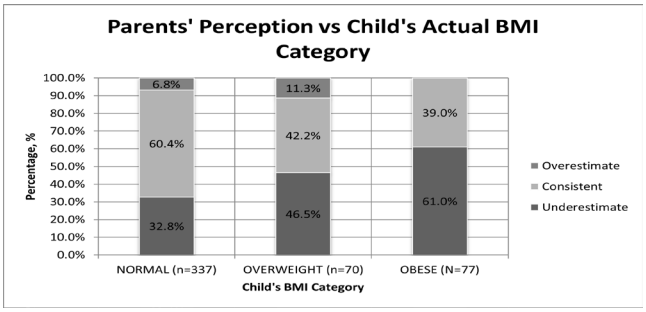

Figure 1: Parental Perception in Comparison with Actual BMI of Children

The child's BMI and parental attitude towards childhood obesity was significantly associated with parental perception of their child's body weight status (p<0.05 and p=0.04 respectively). Though not statistically significant, parental BMI status showed a trend towards an association with parental perception. A higher percentage of overweight and obese parents misperceived their child's body weight status compared to parents who were underweight or had normal weight (n=138, 49.5% versus n=84, 40.6%, p=0.05). Other factors studied were not significantly associated with parental perception. (Table III)

Table III: Parental and Child Characteristics Associated with Parental Perception of Child's Body Weight Status Compared with Child's Actual BMI

Characteristic, n= 486	Parental Perception vs. Child's Actual BMI		p- value
	Match	Mismatch	
Respondent			
Male	91(54.8)	75(45.2)	0.87
Female	173(54.1)	147(45.9)	
Parental BMI status			
Underweight/Normal	123(59.4)	84(40.6)	0.05
Overweight/Obese	141(50.5)	138(49.5)	
No. of children			
One	25(69.4)	11(30.6)	0.06
>1	239(53.1)	211(46.9)	
Child's gender			
Male	127(50.9)	113(47.1)	0.54
Female	137(55.7)	109(44.3)	
Child's BMI status			
Normal	204(60.1)	132(39.6)	0.00*
Overweight/obese	60(40.5)	88(59.5)	
Education level			
Primary and secondary	122(52.4)	111(47.6)	0.41
Tertiary	142(56.1)	111(43.9)	
Ethnicity			
Malay	257(54.1)	218(45.9)	0.53
Others	7(63.6)	4(36.4)	
Income			
<RM3860	139(52.9)	124(47.1)	0.76
RM3860-RM8319	97(56.4)	75(43.6)	
>RM8319	28(54.9)	23(45.1)	
Occupation			
Professional	69(59.0)	48(41.0)	0.25
Non-Professional	195(52.8)	174(47.2)	
Parental concern about child becoming overweight			
Not concerned	28(53.8)	23(46.2)	0.84
Concerned	236(54.4)	199(45.6)	
Parental attitude			
Positive	178(57.8)	130(42.2)	0.04*
Negative	86(48.3)	92(51.7)	

*p<0.05 is significant.
BMI: Body Mass Index

The mean parental attitude score was 38.82 ± 3.76 with 369 (63.4%) parents demonstrating a positive attitude. Majority of parents agreed that an obese child should have regular exercise (n=477, 98.1%) and that parents should play an important role in overcoming and preventing obesity problems in their child (n=480, 98.8%). Most parents agreed that they should try to promote an active lifestyle in their child and limit their child's screen time to not more than 1-2 hours per day as well as restrict the snack food intake. However, 54.3% (n=264) of parents agreed that obesity is a sign of good health. Although 66.7% (n=324) of parents do not force their child to eat when they are not hungry, 73.5% (n=357) felt that their children needed to finish their food every time. (Table IV)

Table IV: Parental attitude towards childhood obesity

Statement (n=486)	Agree n (%)	Disagree n (%)
Agreement indicates positive attitude		
An obese child should exercise regularly.	477 (98.1)	9 (1.9)
I should play an important role in overcoming and preventing obesity problems in my child.	480 (98.8)	6 (1.2)
I should make an effort to promote active lifestyles in my child.	478 (98.4)	8 (1.6)
I should limit my child's television viewing or playing gadget to not more than 1-2 hours per day.	466 (95.9)	20 (4.1)
I should restrict the snack food intake in my child. (eg. chocolate, ice cream, soft drinks)	473 (97.3)	13 (2.7)
Agreement indicates negative attitude		
Obesity is a sign of good health.	264 (54.3)	222 (45.7)
I should not worry about my child's food intake now as he/she can outgrow obesity in the future.	139 (28.6)	347 (71.4)
I offer sweet treats (e.g. candy, carbonated drinks, doughnut) to my child as a gift for good behaviour.	54 (11.1)	432 (88.9)
I encourage my child to eat even though he/she is not hungry	162 (33.3)	324 (66.7)
My child needs to finish his/her food every time.	357 (73.5)	129 (26.5)

Parental misperception of their child's body weight status was 1.5 times (OR 1.49, 95% CI:1.02-2.17) more likely to occur in parents with a negative attitude and 2.3 times (OR 2.25, 95% CI:1.15-3.34) more likely in parents of overweight or obese child.

DISCUSSION

In the Malaysian NHMS 2019, the prevalence of childhood overweight and obesity was reported to be 15% and 14.8%, respectively, among those aged 5 to 17. (4) Nurul Izzah et al. reported a similar prevalence of overweight and obese among 10 to 12 years-old children old which was 14.9% and 10.8% respectively. (28) Comparable results were seen in our study, which demonstrated that among children aged 10 to 11, the prevalence of overweight and obesity was 14.5% and 15.9%, respectively.

Multiple factors have been attributed to the rising trend

of childhood obesity including sedentary lifestyle and high calorie dietary intake. The MASCOT study in 2011 reported that obese children spent an average of 89% of their wake time on sedentary activities and less than 1% on physical activity. (29) As a role model and main caregiver, parents have an important responsibility in cultivating and promoting a healthy lifestyle among their children. Before engaging in any obesity intervention programme, parents need to identify that their child is obese, and subsequently be motivated to inspire their child to embark on the changes. (13) Correct perception of their child's body weight and adopting a positive attitude towards making a change will result in better compliance to intervention programme and healthy lifestyle.

Majority of studies have shown a consistently high rate of parental misperception. The proportion of parents underestimating their child's weight when the child was overweight or obese ranged between 33.9 to 71.4%. (10-15] In Malaysia, studies have reported a misperception rate of between 25 to 80%. (27,30,31) Although the reasons for misperception were not explored, a substantial number of parents in one of the studies had disagreed with the definition of overweight and obesity used by the health professionals. (27) Our study showed a similar parental misperception rate of 39.3%. Though majority (88.9%) of parents were concerned about their child being overweight or obese, parental misperception rate has not changed. These could possibly be related to the current obesogenic environment in the society which has created a scenario in which being overweight and obese is common and may be perceived as normal. It could also possibly be due to the lack of parental awareness on the definition of healthy weight in children. (15) Jones et al. reported that parents who misperceived their child's weight status often did not understand, use, or trust clinical measures, thus remaining detached from the issue. (32) Parental misperception of their child's weight status has been cited as the strongest predictor for childhood obesity. (33,34)

In this study, the child's BMI was found to be a significant factor associated with parental perception. Parental misperception was higher among overweight and obese child. Warkentin et al. reported that underestimation of a child's weight status tends to happen among child with higher BMI (OR=2.03). (12) A study by Nor et al. reported that a significantly higher rate of parents of overweight and obese children had incorrect perception of their child's weight status, 80.5% and 53.2% respectively. (30) Nemecek et al. reported that parents with overweight children were more likely to misperceive their child's body weight status. (35) Gerards et al. also reported that 85% of parents with overweight children underestimated their child's weight status. (36) Several reasons have been postulated. First, due to the increasing prevalence of obesity worldwide, it has led to the shift of accepting overweight and obesity as normal. Second, parental lack of understanding of what overweight and obesity means may cause parents to not see or not have the skills to see it. Physical limitation habits and social consequences are what parents take into consideration when evaluating childhood overweight and obesity. Third, parents may feel reluctant to acknowledge that their child is overweight or obese due to its negative connotation. (36) Parental reluctance may cloud their perception of accurately identifying their child's body weight. (22)

Although not statistically significant, it was observed that parents who were overweight and obese were more likely to misperceive their child's body weight status (62.2% versus 53.4%). Queally et al. and Rodrigues et al. reported that a higher maternal BMI was associated with failure to identify their child's weight as being either overweight or obese (OR 1.5, 95% CI: 1.28-1.55 and OR 1.85. 95% CI: 1.16-2.94, respectively). (22,34) Parental overweight status may influence their norm regarding what is normal weight. (15) A meta-analysis by Lee et al. reported a significant association between parents and children who were overweight and obese (pooled OR, 1.97; 95% CI: 1.85–2.10). Parents who had experienced weight struggles were less likely to discuss their child's weight with a professional, frequently recalling their discomfort to be labelled as overweight or obese. (37) Weight stigma encompasses not only unfavourable views and ideas about an individual's weight but also the perceived discrimination, prejudice, and rejection that follow from these stereotypes and beliefs. (38) Therefore, as a result of the negative connotations and stigma attached to the terms overweight and obese, some parents may not want to formally identify their child as such.

Attitude towards childhood obesity play an important role in influencing parental perception of their child's weight status. Majority of our parents (63.4%) had positive attitude towards childhood obesity and of these, up to 54.3% correctly perceived their child's weight status. Though most had a positive attitude, approximately 54.3% of parents felt that obesity is still a good sign of health. Similarly, Contento et al. and Crawford et al. reported that mothers considered thin children more worrisome than those who were fat and preferred their children to be plumper. (39,40) Among the Chinese, overweight is believed to be a sign of prosperity, good health, and success; therefore children are encouraged to eat more. (41) Some cultures consider having a thin child more worrisome than a fat child and that having larger body size was viewed as healthy even though overweight or obesity is associated with health consequences; "a plump child means prosperity and good health". (13,20,42) Many parents strongly feel that a child needs to finish their food every time and that they should eat though they are not hungry. Wen and Hui reported that parents with incorrect perception

of their child's body weight had higher frequency of using the "pressure to eat" strategy which correlates with children's caloric intake and is associated with childhood obesity. (43) A systematic review showed that mothers that misperceived their child as underweight tend to pressure feed their child. (41)

Parental misperception is a significant public health issue that need to be addressed urgently. It influences parental actions in improving children's overweight-related health behaviours and is especially relevant in children that are already overweight or obese. Therefore, a realistic parental perception is the first steppingstone for successful involvement of parents in preventive and treatment program for overweight and obese children.

Parents play a huge role in influencing and controlling health-related behaviour of school-aged children. Parental awareness and understanding of the health consequences of childhood obesity is a key to effectively address the increasing epidemic and bring about family-oriented lifestyle changes which is a crucial step in weight management among children. (21) Therefore, identifying appropriate measures that could be taken to positively influence parental attitude towards preventing childhood obesity is crucial. Parental education on appropriate identification and recognition of BMI and enhancing parental knowledge on childhood obesity and its complication may play a pivotal role in reducing childhood obesity.

Limitations of the study worthy of note include possibility of biasness in self-reporting of parental height and weight which may lead to inaccurate calculation of BMI. The anthropometry measurement (height and weight) of children were obtained from the individual school's standard physical fitness test, therefore the Stadiometer and weighing scale used were not standardized.

CONCLUSION

More than one-third of parents misperceived their child's weight status. This was especially prominent among parents of overweight and obese children. The child's BMI and parental attitude towards childhood obesity had a significant association with parental perception of their child's weight status.

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The authors declare no competing interests. The study protocol was approved by the Institution Research and Ethics Committee of University Kebangsaan Malaysia (FF-2019-377) and Ministry of Education, Malaysia.

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