

## ORIGINAL ARTICLE

# Sociodemographic and Psychological Factors as Predictors of Body Mass Index-for-Age (BAZ) among Adolescents in Sibu, Malaysia

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## ABSTRACT

**Introduction:** Understanding childhood obesity becomes vital as a tremendous increase in the prevalence of overweight/obesity among children and adolescents was observed. This cross-sectional study aimed to investigate the associations between sociodemographic and psychological characteristics with body-mass-index-for-age (BAZ) among adolescents in Sibu, Sarawak. **Methods:** A total of 375 students (32.0% males and 68.0% females; 15-17 years old) at four randomly selected public secondary schools were recruited. A questionnaire on sociodemographic and psychological characteristics (self-efficacy for physical activity, weight management, and nutrition, body discrepancy score, and sociocultural pressure to be thin) were used to gather information. Body weight and height were also assessed. **Results:** Around 18.6% respondents were found to be overweight/obese while nearly 5.0% were categorized as thin. In multiple linear regression, three significant predictors, namely body discrepancy score, being Iban (Reference: Chinese) and sociocultural pressure to be thin explained 45.1% of the variance in BMI-for-age z-score. **Conclusion:** Future interventions on adolescent body weight management should consider incorporating sociodemographic and psychological factors such as the development of positive body image, uniqueness in cultural value, and management of perceived sociocultural pressures to increase their effectiveness

**Keywords:** Body dissatisfaction, Pressure to be thin, Obesity, Adolescents, Body Mass Index-for-age (BAZ)

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## INTRODUCTION

Recent trend showed a tremendous increase in the prevalence of overweight/obesity globally especially among adolescents (1-3). The trend draws concerns that understanding the overnutrition among children is necessary putting a halt to its consecutive growth. These are reasonable concerns as the national health surveillance in the United States presented an increment in the prevalence rate of obesity among American school children from 10.5% to 20.6% between 1988-1994 and 2013-2014 (1). Meanwhile, extreme obesity was reported among 2.6% and 9.1% adolescents in year 1988-1994 and 2013-2014 (1). In addition, China also experienced an upsurge in overweight/obesity among children, a growth from 1.8% in overweight and 0.4% in obesity in 1981-1985 to 13.1% and 7.5% in 2006-

2010 (2). However, the prevalence of obesity in England was reported to fluctuate inconsistently, 22% of the preschoolers (4- to 5-year-old) and 33% of the children (6-year-old) were overweight for year 2014/2015 when compared to 23% and 32% for year 2006/2007 (3).

Locally, the National Health and Morbidity Survey 2011 (NHMS 2011) found 6.3% and 4.9% of adolescents aged 10 to 14 and 15 to 17 years old were categorized as obese (with a body mass index [BMI]-for-age more than +2SD) (4). However, a tremendous increase was observed in NHMS 2017 with the national prevalence rate of overweight among adolescents in Malaysia (between primary four and secondary five) was 15.6%, with Federal Territory of Labuan reporting the highest prevalence at 17.0% while Kelantan the lowest, at 13.7%. Meanwhile, the national prevalence of obesity among same group of adolescents were 14.8%, with the highest prevalence reported in Perlis (17.5%) while the lowest in Sabah (9.9%) (5). The findings were found consistent with several small-scale studies. For instance, Tee et al. (6) found 18.1% and 14.5% of 12- to 16-year

old school students in Selangor were overweight and obese. Another local study done by Gan et al. reported 18.1% and 19.7% of 12- to 16-year old students were overweight and obese (7). Kho et al. found 12.3% and 12.0% of 12- to 17-year old secondary school students in Sarawak were overweight and obese (8).

Despite the growing attention on the issue related to overweight and obesity, Malaysian adolescents were found to be physically inactive and, at the same time, were eating unhealthily (6,9-13). Psychological characteristics included body discrepancy score, level of self-efficacies, together with pressures from family members, peer, and media to be slim, were related to overweight/obesity in adolescents. From existing literature, body discrepancy score was strongly related with body weight status. For example, Banitt et al. (14) reported that body image discrepancy score, an indicator of body dissatisfaction, was correlated significantly (positive) with BMI adolescents of both sexes. Moreover, self-efficacies for adequate nutrition and physical activity had been identified by several weight loss intervention research to predict weight loss among participants (15-17).

Since overweight and obesity now have becoming an epidemic worldwide, planning and implementation of intervention programs to halt the further growth of the weight-related problem is a top priority. A better understanding on the contributing factors of the issues guides health practitioners to develop suitable modules for the future intervention programs. Despite its importance, based on literature, several studies pertaining to investigation on the contributing factors of overweight and obesity had been conducted in Sarawak (18,19) but none of them focused on psychological factors. Therefore, this study aims to fill the knowledge gap by investigating the associations between sociodemographic and psychological characteristics with BAZ among adolescents in Sibul, Sarawak.

## MATERIALS AND METHODS

This study conducted at four secondary schools in Sibul, Sarawak, which were selected through simple random sampling. At each selected school, all the eligible students were recruited. For inclusion criteria, both male or female students and both science or arts stream students were invited to participate. Students who refused to participate, or with physical disability, or were absent, were excluded.

Ethical clearance was granted by the Medical Research Ethics Committee of Universiti Putra Malaysia (UPM/FPSK/PADS/T7-MJKEtikaPer/F01(JPD\_Jun(10)03). Besides that, the permission was also obtained from the Ministry of Education and the Department of Education of Sarawak. During data collection, the respondents were briefed on the objectives and procedures

pertaining to this study. Written informed consent from both respondents and parents were obtained.

## Instruments

A Malay version self-administrated questionnaire was used to assess the sociodemographic background and psychological characteristics (physical activity self-efficacy, weight management self-efficacy, nutrition self-efficacy, body image perception, and perceived sociocultural pressure to be thin) of the respondents. The first part of the questionnaire gathered information on sociodemographic characteristics such as age, sex, and ethnic group, and monthly household income.

Next, assessment of the physical activity self-efficacy was carried out by applying the Self-Regulatory Efficacy for Physical Activity Scale (20). Respondents were requested to rate their capability of overcoming eight situations that restricted them to participate in daily physical activity. The response option was ranged from 'not true at all' to 'very true' (five categories). Mean self-regulatory efficacy score was calculated from all the eight items. Better physical activity self-efficacy was manifested with a higher mean score. With the availability of the mean score, three groups, namely low (1.00 to 2.33), moderate (2.34 to 3.66) and high (3.67 to 5.00) self-regulatory efficacy for physical activity were formed. The internal consistency of the instrument as measured by Cronbach's alpha was found to be 0.84.

Then, the respondents were required to evaluate their level of self-resistance in desire to eat under 20 occasions that were listed in the Weight Efficacy Lifestyle (WEL) questionnaire (21). The response option was a ten-point scale: zero to nine, in which 'zero' represented no confidence at all while 'nine' represented full confidence. A summative score was calculated based on the 20 items. A higher score reflected higher level of self-resistance towards desire to eat and vice versa. A score of zero to 60.00 was categorized as having low weight management self-efficacy, a score of 60.01 to 120.00 as having moderate weight management self-efficacy and a score of 120.01 to 180.00 as having high weight management self-efficacy. The internal consistency of the instrument was appropriate (Cronbach's alpha = 0.88).

The Nutrition Self-Efficacy Scale was used to assess the commitment of respondents in overcoming certain barriers in order to stick to healthful foods by rating their approval or disapproval of five statements in the scale (22). The response option was a four-point Likert scale: 'strongly disagree' to 'strongly agree'. A mean score (ranging from one to four) was computed. Higher nutrition self-efficacy was reflected with a high mean score. Then, the respondents were divided into three categories according to their score, namely low (1.00 to 2.00), moderate (2.01 to 3.00) and high (3.01 to 4.00) nutrition self-efficacy. Internal consistency of the

instrument was good (Cronbach's alpha = 0.80).

The Perceived Sociocultural Pressure Scale (23) was used to estimate the external pressure that was received by the respondents to be slim and to lose weight from their friends, family, dating partners, and media. The scale comprises ten items. Each item has five response options ranging from strongly disagree [1] to strongly agree [5]. A mean score was calculated. A higher mean score indicates that the respondent received higher pressure to be thin. Internal consistency of the instrument was good (Cronbach's alpha = 0.91) in this study.

The body discrepancy score was determined by applying the contour drawing rating scale (24) with the respondents were ordered to put a mark under two figures, in which one of the figure reflected his/her current body size while another represented ideal body size. Body discrepancy score was calculated by minus the current size with ideal size. Positive findings showed the respondents wished to be slimmer; a 'zero' score reflected the respondents were satisfied with their current body size and they were grouped as 'wish to maintain body size'; negative findings showed the respondents desired to increase the size of their bodies.

### Anthropometric Measurements

The weighing scale HD-306 (TANITA Corporation, USA) was used to measure weight while the body tape measure SE 206 (SECA, Germany) was applied to assess height. Two measurements for weight and height were taken. Then, means of the two measurements were computed. The Anthroplus software (Department of Nutrition, WHO, Geneva, Switzerland) was used to obtain BMI-for-age z-score (BAZ). The WHO growth reference 2007 (25) was referred in order to determine the body weight status among respondents.

### Statistical Analysis

The SPSS 22.0 (IBM SPSS Statistic, Inc., Chicago, IL, USA) was applied for data analysis. The findings from univariate analysis were presented in means, standard deviation (SD) percentages and proportions. The associations between independent continuous variables and BAZ were investigated using simple linear regression (SLR). Additionally, multiple linear regression (MLR) analysis (stepwise method) was then performed to investigate the contributions of predictors (with a p-value < 0.25 during SLR) towards BAZ. The associations were considered to be significant when p-value was lower than 0.05 (two-sided).

## RESULTS

As shown in Table I, a total of 375 students (mean age = 16.45±0.53 years old) were recruited. More female respondents (68.0%) were recruited as compared to male respondents (32.0%). About half of the respondents (57.9%) live in a family with income less than RM 1000

(median = RM 800).

Almost one fifth (18.6%) of the respondents was overweight/obese (male respondents = 22.5%; female respondents = 16.9%). Only a small number of the respondents were categorized in the thinness group (5.0%) (male respondents = 5.0%; female respondents = 5.1%). All the descriptive data are presented in Table I.

**Table I: Distribution of respondents by sociodemographic characteristics, psychological factors, and body weight status (n = 375)**

Variable	Sex		Total n (%)	Mean	SD
	Male n (%)	Female n (%)			
<b>Sociodemographic Characteristics</b>					
Sex					
Male			120 (32.0)		
Female			255 (68.0)		
Age (years)				16.45	0.53
Ethnicity					
Malay	20 (16.7)	44 (17.3)	64 (17.1)		
Chinese	55 (45.8)	93 (36.5)	148 (39.5)		
Iban	25 (20.8)	74 (29.0)	99 (26.4)		
Melanau	20 (16.7)	44 (17.3)	64 (17.1)		
Family Income (RM)				800.00*	
<1000			217 (57.9)		
1000-1999.99			81 (21.6)		
2000-2999.99			24 (6.4)		
3000-3999.99			24 (6.4)		
≥4000			29 (7.7)		
Household Size					
2 - 3			11 (2.9)		
4 - 5			115 (30.6)		
6 - 7			160 (42.7)		
8 - 9			59 (15.7)		
≥ 10			30 (8.0)		
Number of Siblings					
0 - 1			50 (13.4)		
2 - 3			175 (46.7)		
4 - 5			109 (29.1)		
6 - 7			31 (8.3)		
≥ 8			10 (5.7)		
<b>Psychological Factors</b>					
EAT-26				12.30	9.95
<20	98 (81.7)	203 (79.6)	301 (80.3)		
≥20	22 (18.3)	52 (20.4)	74 (19.7)		
Self-Regulatory Efficacy for Physical Activity Score				2.49	0.87
Low	44 (36.7)	117 (45.9)	161 (42.9)		
Moderate	62 (51.7)	115 (45.1)	177 (47.2)		
High	14 (11.7)	23 (9.0)	37 (9.9)		
WEL Score				87.54	34.48
Low	30 (25.0)	53 (20.8)	83 (22.1)		
Moderate	78 (65.0)	159 (62.4)	237 (63.2)		
High	12 (10.0)	43 (16.9)	55 (14.7)		
Nutrition Self-Efficacy Score				2.62	0.57
Low	25 (20.8)	45 (17.6)	70 (18.7)		
Moderate	77 (64.2)	169 (66.3)	246 (65.6)		
High	18 (15.0)	41 (16.1)	59 (15.7)		
Body Discrepancy Score (mm)				7.56	29.99
Wish to have smaller body size	42 (35.0)	123 (48.2)	165 (44.0)		
Wish to maintain body size	32 (26.7)	74 (29.0)	106 (28.3)		
Wish to have bigger body size	46 (38.3)	58 (22.7)	104 (27.7)		
Perceived Sociocultural Pressure to be Thin				2.01	0.83
Low	76 (63.3)	169 (66.3)	245 (65.3)		
Moderate	44 (36.7)	75 (29.4)	119 (31.7)		
High	0 (0)	11 (4.3)	11 (2.9)		
Body Weight Status (BMI-for-age z-score)				-0.14	1.35
Underweight	6 (5.0)	13 (5.1)	19 (5.0)		
Normal	87 (72.5)	199 (78.0)	286 (76.3)		
Overweight/Obese	27 (22.5)	43 (16.9)	70 (18.6)		
Overweight	14 (11.7)	27 (10.6)	41 (10.9)		
Obese	13 (10.8)	16 (6.3)	29 (7.7)		
median					

The findings of MLR revealed significant contributions of body discrepancy score (beta = 0.588;  $p < 0.001$ ), being Iban (reference group: Chinese; beta = 0.152;  $p < 0.001$ ) and sociocultural pressure to be thin (beta = 0.147;  $p = 0.001$ ) towards BAZ. A beta coefficient of 0.588 for body discrepancy score indicated that one SD increase in the body discrepancy score led to 0.588 SD increase in BAZ. Similarly, one SD increase in the perceived sociocultural pressure to be thin led to 0.147 SD increase in the BAZ. Lastly, being Iban possessed 0.152 SD higher BAZ than Chinese. Higher standardized beta coefficient in body discrepancy score when compared to being Iban and perceived sociocultural pressure to be thin implied that body discrepancy score contributed the highest to the variation in BAZ. The final model that comprised the three predictors, explained about 45.1% (adjusted R square) of the variation in BAZ (Table II).

### DISCUSSION

The current findings provided information that overweight and obesity was reported in 18.6% respondents while thinness was 5.0%. The reported percentage for overweight and obesity was high. The thinness prevalence was almost similar but the overweight prevalence rates were far than the findings from the NHMS 2017 in which 6.6% of primary four to secondary five adolescents was categorized as thinness while another 15.6% and 14.8% were overweight and obese, respectively (5). This indicated that both thinness and obesity were present simultaneously among adolescents in Malaysia.

Only one of the sociodemographic characteristics,

namely ethnicity appeared to be a predictor to BAZ among adolescents in Sarawak. Significant association between ethnicity and body weight status was also shared by Chew et al. in which being an Indian increased the likelihood of having abdominal obesity among secondary school students in Hulu Langat, Selangor by 10.164 times (26). Besides that, in a study by Pell et al., Orang Asli youth had two times higher risk of developing overweight when compared to Malays. On the other hand, Chinese were found to have lower risk of overweight and obesity when compared to Malays (27). The positive association between ethnicity and BAZ could be attributed to interactions of several factors, namely socioeconomic, biological, and cultural factors. For example, socioeconomic factors focused on the financial stability in determining the family diet habits, which could be ranging from food insecurity to affordability of fast food. Not only that, ethnicity had different underlying genetic predisposition that brought about differences in the patterns of the fat distribution, fundamental metabolic rate, insulin secretion, insulin sensitivity, and lipids and lipoproteins. In addition, culture can influence different aspects of life, such as changes in the diet and physical activity, body image development, responsibilities of the women, child feeding practices, and levels of exposure to nutritional marketing (28).

Body image perception was found to make highest significant contribution towards BAZ among adolescents in this study. The result was in line with Xanthopoulos et al. (29) in which children's body dissatisfaction varied with their relative weights. In their study, body dissatisfaction among overweight children was

**Table II. Correlations of sociodemographic and psychological factors with BMI-for-age z-score (Stepwise method)**

Variable	Simple linear regression					Multiple linear regression				
	B	Beta	95% CI <sup>c</sup>		p	B	Beta	95% CI <sup>c</sup>		p
			Lower Bound	Upper Bound				Lower Bound	Upper Bound	
Sociodemographic Characteristics										
Number of siblings	-0.025	-0.034	-0.100	0.050	0.513					
Sex <sup>a</sup>										
Dummy for boy	0.131	0.047	-0.153	0.415	0.365					
Ethnicity <sup>b</sup>										
Dummy for Malay	0.088	0.025	-0.292	0.468	0.649	0.450	0.152	0.227	0.673	<0.001
Dummy for Iban	0.287	0.097	-0.043	0.617	0.088					
Dummy for Melanau/others	-0.375	-0.108	-0.755	0.005	0.053					
Psychological Factors										
EAT-26 score	0.023	0.178	0.010	0.036	0.001					
Physical activity self-Regulatory efficacy	0.053	0.035	-0.099	0.205	0.494					
Weight management self-efficacy	0.003	0.079	-0.001	0.007	0.126					
Nutrition self-efficacy	0.184	0.080	-0.049	0.417	0.121					
Body dissatisfaction score	0.281	0.645	0.247	0.315	< 0.001	0.256	0.588	0.220	0.292	<0.001
Perceived sociocultural pressure to be thin	0.615	0.392	0.468	0.762	< 0.001	0.230	0.147	0.099	0.361	0.001

<sup>a</sup>Reference: Female

<sup>b</sup>Reference: Chinese

<sup>c</sup>Confidence interval

F = 103.415,  $p < 0.001$ ; R<sup>2</sup> = 0.451

significantly greater than normal weight children (29). Laus et al. provided additional evidence which showed that underweight male adolescents desired bigger body size and their overweight counterparts tended to prefer a thinner body (30). Female adolescents on the other hand preferred the thinner body even though they have normal body weight. Moreover, unhealthy body weight status among adolescent girls in Brazil (combination of underweight and overweight) was closely associated with body dissatisfaction and the girls were 11 times more likely than their normal weight counterparts to develop body dissatisfaction (31). In addition, consistent findings were shared by Zarychta et al. as lower body discrepancy score predicted lower BMI (32) while, Fernández-Bustos et al. revealed BMI predicted body dissatisfaction (33). The possible explanation to the correlation between body discrepancy score and BAZ was due to high exposure of a standard of beauty that is unrealistic and unattainable on media (31).

Besides that, perceived sociocultural pressure to be thin was another factor found to contribute significantly towards BAZ and it indicated messages that were brought up by significant others around adolescents (family members, friends, classmates and partners) or the media might have an influence on their body weight status. Consistent findings were shared by Xu et al. who found that pressure to be thin exerted by relatives and media among BMI groups were significantly different (34). Overweight adolescents had higher likelihood than their normal-weight counterparts and normal-weight adolescents also possessed higher tendency than their underweight counterparts to be pressured to reduce their weight (34). Similarly, Helfert and Warschburger found that adolescents were more likely to receive appearance pressure from their peers and parents (35). Moreover, consistent findings were presented in Suelter et al. who reported that self-reported pressure from parents and peers correlated significantly with adolescent BMI or fat (36). The possible explanation for respondents having higher vulnerability towards perceived sociocultural pressure to be thin could be explained by thin internalization in the society and a high level of body dissatisfaction among the students in the present study (37).

All the three self-efficacy scales, namely self-regulatory efficacy for physical activity, weight management, and nutrition were not significantly correlated with BAZ among respondents. Robbins et al. also found that BMI was not correlated with physical activity self-efficacy (38). However, the findings were in contrast with other studies. For example, Carissimi et al. revealed the presence of an inverse significant association between body weight status and physical self-efficacy among Italian, Brazilian, and Spanish school children (39). In addition, in a study involving adult respondents in Finland presented that low health-related self-efficacy was a predictor for high BMI (40). Information regarding

the interaction between self-efficacy with body weight status especially among adolescents was still scarce. More exploration into the topic is needed.

The use of cross-sectional study design is identified as one of the major limitations in this study. A cross sectional study design provides a “snapshot” of body weight status and all the independent variables of the adolescents at the same point in time. The temporal relationships between body weight status and all the independent variables are unclear. As such, no causal inference regarding the relationships can be drawn. Another limitation recognized was the reliance on self-reported data as most of the information was collected by using a self-administered questionnaire. Self-report data are questionable as they are recorded at face value without being independently verified (41).

## CONCLUSION

Ethnicity, body discrepancy score and perceived sociocultural pressure to be thin were found to be associated significantly with BAZ among adolescents in this study. Future interventions or weight management programs should incorporate these factors to improve body weight status of adolescents. Positive body image should be promoted among adolescents by encouraging them to place less emphasis on their appearance and to maintain a positive attitude towards food and physical activity. It is also important for parents, peers, partner and media to place less emphasis on appearance or thin ideal among adolescents. They may make weight-related comments that are health-promoting or complimentary but not to criticize (36).

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