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Obesity is associated with depression in Malaysian schoolchildren: A cross-sectional study

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Abstract

Background: Overweight and obesity, which may lead to depression, have become prevalent among children worldwide. Hence, this study aimed to measure obesity and depression among schoolchildren in Kuantan. **Methods:** This cross-sectional study was conducted in three different primary schools in Kuantan by purposive sampling. With consent from their parents/guardians, participants were given a self-administered questionnaire. Demographics and anthropometric measurement data were self-reported on the basis of the school records. Furthermore, body mass index was calculated. Data were analyzed using SPSS version 20.0, and chi-square and correlation tests were conducted for the variables. **Results:** Among the 300 schoolchildren who responded, 14.3% were underweight, 37.7% were normal, 11% were overweight, and 37% were obese. Statistically, obesity and ethnicity, as well as obesity and sex, were not associated. Conversely, obesity and age, as well as obesity and depression, were significantly associated. **Conclusion:** Depression is associated with obesity among schoolchildren. Hence, a special approach for designing and implementing prevention programs is necessary to reduce the risk of obesity-led depression and other forms of comorbidity later in life.

Keywords: child, cross-sectional study, depression, Malaysia, mental health, obesity

Introduction

Depression is the leading cause of disease burden globally, as evaluated by disability-adjusted life years, among children within 10 and 19 years of age.¹ Obesity among young people is steadily increasing, and the trends have become a major concern.² For younger people, a body mass index (BMI) more than the 95th percentile indicates obesity, whereas a BMI greater or equal to the 99th percentile indicates extreme obesity.^{3,4} WHO estimated that in 2016, 41 million children below 5 years old were overweight or obese, with almost half of them living in Asia and a quarter in Africa.⁵ Although many strategies have been introduced to overcome this problem, this finding shows that the number of overweight and obesity cases in child population, including those living in Malaysia, demonstrates a growing concern.^{6,7}

Obesity among younger people is linked to many health problems, including musculoskeletal problems, physical health difficulties, and metabolic and endocrine dysfunctions,⁸ which may lead to poor academic performance.⁹ Moreover, children with obesity

generally have negative perceptions among friends, body image disturbance, and difficulties in socializing, thereby possibly leading to the symptoms of depression and ultimately jeopardizing their quality of life.¹⁰ Through a systematic review, children and adolescents with obesity are more likely to suffer from depression and depressive symptoms, with women and non-western people at a higher risk.¹¹ Another strong evidence revealed that female children with obesity have significantly higher probabilities of depression as compared with normal-weight female children until adulthood.¹² By contrast, another review concluded that a higher BMI is not associated with depressive symptoms in early adolescence.¹³

Although the relationship between obesity and depression among children has been documented, to our knowledge, a study investigating on obesity and depression among schoolchildren in Malaysia of multi-ethnicity remains unreported. Healthcare professionals visiting schools, including the parents, poorly emphasize on the mental wellbeing assessment of children, although many works in literature highlighted this observation. Thus, this

study mainly aimed to measure obesity, sex, age group, and depression among schoolchildren in three different ethnic-based primary schools in Kuantan. This study investigated all children who had BMIs greater than the 95th percentile and a significant portion of those who had BMIs greater than the 99th percentile. We hypothesized that higher BMI scores would predict higher rates of symptoms of depression among schoolchildren in Malaysia.

Methods

This cross-sectional study was conducted between February 2016 and March 2016 with the approval from the Kulliyyah of Nursing Research Committee and the IIUM Research Ethics Committee. The parent/legal guardians were asked for the assent/consent for the participation of the selected children, whom their identity and participation would not be revealed to anyone. All information was kept confidential, and the results from the collected data were reported anonymously, with no references to specific individuals.

We applied the convenience sampling method for the eligible participants studying in Kuantan, Pahang. Three different ethnic-based schools were purposively selected. Schoolchildren were included if they were Malaysian, aged 8–11 years, and were physically active. Those who were not willing to participate were excluded.

The sample size was calculated using the online sample size calculator Raosoft®.¹⁴ The minimum effective sample for this study was $N = 306$, with a confidence level of 95%, a response distribution of 50%, and total estimated schoolchildren in the Kuantan population of 15,000. However, upon the start of the survey, the number of parents/guardian who assented/consented to participate in this study, who completed the questionnaire, and who were considered for analysis was only 300.

Participants who assented/consented to participate in the study were asked to complete a set of self-administered questionnaires, assisted by their parents or teachers. The questionnaires consist of two parts, namely, demographic data and depression scale, which took approximately 10 min for the children to completely answer. In part A, the respondents had to fill in the information on demographics and anthropometric measurements based on the school records (height, weight, neck, waist, and hip and arm circumferences). Part B is the Center for Epidemiological Studies Depression Scale for Children (CES-DC), which is a 20-item self-report questionnaire regarding depressive symptoms.¹⁵ It covers symptom areas such as depressed mood, feelings of worthlessness, a sense of hopelessness, psychomotor retardation, loss of appetite, and sleep disturbance. Each item is rated on a scale of 0 to 3 in terms of how often a symptom has occurred during the past week. Response choices are

assigned to the following point values: 0 = not at all, 1 = a little, 2 = some, and 3 = a lot. Meanwhile, items 4, 8, 12, and 16 are scored in the opposite order to reflect the positive behavior and affect (0 = a lot, 1 = some, 2 = a little, and 3 = not at all), and the scores are then summed together to determine the total measure score. Total scores range from 0 to 60. Higher scores indicate more symptomatology, and a score of 15 or higher indicate a risk for depression. The CES-DC exhibits favorable psychometric properties for screening and evaluating many different contexts.^{15–18}

Moreover, data were analyzed and transformed using SPSS version 20.0. Association between BMI and sex, age, ethnicity, and depression were performed using the chi-square test. A *p*-value of 0.05 or less indicates statistical significance.

Results

Table 1 shows the descriptive statistic of schoolchildren from three selected schools in Kuantan. Ethnicity distribution is similar among the three schools with Malay ($N = 97$, 32.3%), Chinese ($N = 103$, 34.3%), and Indian ($N = 100$, 33.3%). Females ($N = 160$, 53.3%) and males ($N = 140$, 46.7%) were also almost equal in number. Schoolchildren from the age group of 9 years ($N = 119$, 39.7%) obtained the highest number, followed by 10 ($N = 81$, 27.0%), 11 ($N = 62$, 20.7%), and 8 years old ($n = 38$, 12.7%). The prevalence of obesity was highest in Malays ($N = 44$, 45.4%), followed by Indians ($N = 36$, 39.0%) and Chinese ($N = 28$, 27.2%). Regarding the prevalence of obesity based on sex, males ($N = 56$, 40%) were slightly higher than females ($N = 55$, 34.4%). Participants with overweight and obesity ($N = 144$ (48%) obtained the highest number, followed by those with normal weight ($N = 113$, 37.7%) and those with underweight ($N = 43$, 14.3%).

Table 1. Demographic data of schoolchildren in three selected schools in Kuantan ($N = 300$)

Variables	N (%)
Ethnicity	
Malay	97 (32.3)
Chinese	103 (34.3)
Indian	100 (33.3)
Sex	
Male	140 (46.7)
Female	160 (53.3)
Age groups	
8 year old	38 (12.7)
9 year old	119 (39.7)
10 year old	81 (27.0)
11 year old	62 (20.7)
BMI groups	
Underweight	43 (14.3)
Normal	113 (37.7)

Overweight	33 (11.0)
Obese	111 (37.0)

Table 2. Association between the different variables of ethnic group, sex, age group, depression score, and obesity

Variables	N	Underweight N (%)	Normal N (%)	Overweight N (%)	Obese N (%)	χ^2 Stat. (df)	<i>p</i>
Ethnic							
Malay	97	8 (8.2)	33 (34.0)	12 (12.4)	44 (45.4)	10.58 (6)	0.102
Chinese	103	19 (18.4)	43 (41.7)	13 (12.6)	28 (27.2)		
Indian	100	16 (16.0)	37 (37.0)	8 (8.0)	39 (39.0)		
Sex							
Female	160	24 (15.0)	62 (38.8)	19 (11.9)	55 (34.4)	1.09 (3)	0.779
Male	140	19 (13.6)	51 (36.4)	14 (10.0)	56 (40.0)		
Age group (years old)							
8 year old	38	8 (21.1)	14 (36.8)	3 (7.9)	13 (34.2)	52.57 (9)	0.000
9 year old	119	15 (12.6)	64 (53.8)	8 (6.7)	32 (26.9)		
10 year old	81	18 (22.2)	30 (37.0)	11 (13.6)	22 (27.2)		
11 year old	62	2 (3.2)	10 (16.1)	6 (9.7)	44 (71.0)		
Depression score							
Normal	205	24 (11.7)	83 (40.5)	27 (13.2)	71 (34.6)	8.23 (3)	0.041
Depressive symptoms	95	19 (20.0)	30 (31.6)	6 (6.3)	40 (42.1)		

Table 2 presents the association between obesity and different variables. Obesity and ethnic groups ($p = 0.102$), as well as obesity and sex ($p = 0.779$), had no significant differences.

Meanwhile, obesity is associated with the age group; in particular, 71.0 ($N = 44$) of the 11-year-old school-children were obese, followed by 8 ($N = 13$, 34.2), 10 ($N = 22$, 27.2), and 9 years old ($N = 32$, 26.9). Notably, a significant association was found between obesity and depression ($\chi^2 = 8.235$, $df = 3$, $p = 0.041$), with the highest prevalence of obesity in the depressive symptoms' category ($N = 40$, 42.1).

Discussion

To our knowledge, the current study is the very first to investigate obesity and mental health among school-children in the east coast region of Malaysia. Three different ethnic-based schools easily represent the main three ethnicities in Malaysia. In terms of sex, male and female participants were equally distributed, consistent with another study consisting of pupils studying in Kuantan.¹⁹ No significant relationship was found between obesity and the three main ethnicities in Malaysia, consistent with other study findings of body weight status in another state of the east coast region of Malaysia.²⁰ Malays had the highest prevalence of obesity, followed by the Indians and Chinese. In contrast with another study, Indian children had the lowest prevalence of overweight and obesity compared with the Malaysians and Chinese.²¹

Moreover, sex and obesity had no significant relationship, although males had a higher number of obesity cases than females. In a previous study, the prevalence of obesity for males and females was not significantly different from childhood to adolescence.^{22,23} The current study finding is consistent with another study in which the prevalence of obesity and overweight, in general, is greater in men.²⁴ Although male children have higher BMI values during childhood, such values will be inversed throughout adolescence as compared to the opposite sex.²⁵

A significant relationship was also found between obesity and the age group. This finding is in line with another study, which indicated that the increase in age rises the possibilities of being overweight and obese.²¹ Similarly, a study regarding the epidemiology of obesity concluded that BMI and obesity prevalence increase as the age increases.²⁶ A linear increase over most ages and sex estimates that BMI rises to 0.12 kg/m² per year of age and the obesity prevalence increases to approximately 0.6 percentage points per year. Thus, body weight is inversely related to socioeconomic status at all points of life through observation. In addition, the differences increase with age, thereby increasing the BMI as well.²⁷ Furthermore, BMI and obesity with depressive symptoms were significantly associated. This result is consistent with another study reported in a systematic review and meta-analysis.¹¹ In addition, those that belonged to the highest BMI or obese group more often suffered from major depression.²⁸ Comparably, another study showed a bidirectional association between depression and obesity in which a person with

obesity had a 55 increased risk of developing depression over time, whereas a person with depression had a 58 increased risk of becoming obese.²⁹ Most of the research findings associating the link between depression and obesity reported an association with females.^{30,31} One possible classic explanation for the results is that children with obesity are at an increased risk of being treated in a ridiculing and degrading way by their peers.^{32,33} Previous study showed that body image could be the possible actual factor for the association between obesity and depressive symptoms.³⁴ On the contrary, sex was the only factor in cross-sectional studies conducted in the United States that has associations between depression and obesity.³⁵ Although sex differences could be different according to a different context, on the basis of this study, obesity could lead to depressive symptoms among schoolchildren regardless of any sex. Childhood obesity with depressive symptoms may lead to adolescent depression, which could imply the occurrence of other chronic medical conditions later in life.^{36,37} The results of the current study also provided another support as an etiologic theory and regulation model for the association between depression and obesity.³³

Similar to other studies, this study has some strengths and limitations. The study's sample size of schoolchildren in the east coast region of West Malaysia for which there are no data available on depressive symptoms status and BMI is a strong point. In addition, the study findings consist of three major ethnic groups in Malaysia, thereby representing the population of schoolchildren in Malaysia. However, the limitation of the study is that other factors, such as academic performance and food intake, may be considered as important factors influencing depressive symptoms among schoolchildren. Measurement using self-reported weights and heights may also result in underestimation of BMI, considering the possibility of over-reported and under-reported measurements.

Conclusions

Schoolchildren with obesity in Kuantan have symptoms of depression compared with those with normal weight. Hence, healthcare professionals should screen schoolchildren or employ any health technology assessments while conducting school visits. Furthermore, a special approach that designs and implements prevention programs among each school-age group for early-onset depression could be planned accordingly to reduce the risk of obesity-led depression and other forms of comorbidity later in life.

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Conflict of Interest Statement

The authors declare no conflict of interest.

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