

ASSOCIATION OF HEALTH LITERACY WITH OBESITY AND OVERWEIGHT AMONG ARABIC SECONDARY SCHOOL STUDENTS IN KUALA LUMPUR AND PUTRAJAYA, MALAYSIA

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ABSTRACT

Background: Overweight and obesity among adolescents is considered an epidemic in both developed and developing countries. There is still limited study on the health literacy as a determinant of overweight and obesity in adolescents. The aims of this study was to determine the association of health literacy with overweight and obesity.

Methods: This was a cross-sectional study among Arabic secondary school students in Kuala Lumpur and Putrajaya. Health literacy was measured using the Newest Vital Sign (NVS) questionnaire. Limited health literacy was defined as the NVS score of 0 to 3. Body weight and height were measured twice by standard methods and the mean of these two measurements was used in the calculation of body mass index. Overweight and obesity classification were based on the World Health Organization criteria. Chi-square test and multivariate binary logistic regression were performed using IBM-SPSS version 21.0.

Results: A total of 202 out of 250 students involved in this study giving the response rate as 81.0%. The percentage of overweight and obesity among the respondents was 21.3% and 6.9% respectively. Respondents with limited health literacy was 51.5%. Those with limited health literacy was almost 2 times higher (AOR = 1.963, 95%CI: 1.010, 3.816) to have overweight and obesity as compared to adequate health literacy.

Conclusion: The prevalence of overweight and obesity was high among the study population. Limited health literacy is a predictor of overweight and obesity. Improving health literacy should be considered in obesity and overweight intervention.

Keywords: Arabic secondary school, health literacy, overweight and obesity, Newest Vital Signs, Malaysia

1.0 Introduction:

Obesity and overweight among adolescent is also a major public health problem worldwide. Obesity and overweight are considered not only a problem in high-income country, but they are also showing an increasing trends in low- and middle-income countries, especially in urban settings (WHO, 2010). According to the Central for Disease Control and Prevention (CDC) the prevalence of obesity among adolescents aged 12 to 19 years old were increased from 5% in 1980 to about 21% in 2012 (CDC, 2013). Obese and overweight adolescents are at higher future risk for morbidity and mortality from non-communicable diseases, such as hypertension, cardiovascular diseases, insulin resistance and psychological effects (WHO, 2010).

Obesity and overweight among school children and adolescents was also alarming in most Arab countries of the Eastern Mediterranean Region (EMR) (Musaiger, 2011). In EMR, school children and adolescents aged 6 to 18 years with obesity and overweight were ranged from 18.0% to 46.9% in boys and 17.6% to 46.9% in girls (Musaiger, Hassan, & Obeid, 2011). A study in Kuwait among adolescents aged 14 to 19 years old showed that the prevalence of overweight and obesity among boys and girls was 50.5% and 46.5% respectively (Al-Haifi et al., 2013). Another study in Arab country among secondary school students aged between 13 to 17 years at Selami City Centre, Iraq indicated that the prevalence of obesity and overweight was 11.3% and 20.6% respectively (Qadir, Rampal, Mohd Sidik, Salmiah, & Ramzi, 2014). In Malaysia, national study in secondary schools students reported a lower prevalence of obesity and overweight as compared to most Arab countries which was 4.9% and 16.9% respectively (Institute for Health Behavioural Research, Ministry of Health [IHBR, MOH], 2011).

Numerous factors are associated with obesity and overweight, such as sedentary behavior, low physical activity, socioeconomic status and high consumption of foods rich in fat (Musaiger et al., 2011; Frederick, Snellman, & Putnam, 2014). Based on these factors there are several strategies and programmes implemented to reduce the prevalence of overweight and obesity but it is still rapidly growing. These provide a gap in knowledge the role health literacy as determinant of overweight and obesity in adolescent (Sharif & Blank, 2010). Health literacy is defined as “the degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions” (U.S. Department of Health and Human Services, 2010) and it may influence the successful of public health and medical intervention.

Very few studies have focused on the association of health literacy with obesity and overweight among adolescents. Low health literacy was more likely to have obesity (Chari, Warsh, Ketterer, Hossain, & Sharif, 2014). Another study in China among adolescents aged 12 to 16 years showed that, low health literacy was almost two times higher of developing obesity and overweight than high literacy (Lam & Yang, 2014). Thus, the present study aims to determine the factors associated with overweight and obesity among adolescents, as well as bridge the knowledge gap in health literacy as an important associated factor of overweight and obesity among secondary school students.

2.0 Materials and Methods

2.1 Study design and subjects

A cross-sectional study was conducted from September 2014 to July 2015 among students aged 14 to 19 years at three Arabic secondary schools in Putrajaya and Kuala Lumpur, Malaysia. Students with physical disability and cannot stand without support and who did not have Arabic nationality were excluded from this study. The estimated sample size was 247 using two proportion formula (Lwanga & Lemenshow, 1991) after taken the proportion of obesity among low health literacy and high literacy as 0.47 and 0.22 (Chari et al., 2014) and also after adjusted for 3 categories health literacy, 80% of estimated response rate, and 90% of estimated eligibility in the calculations. All 250 students from three schools were invited to participate in this study.

2.2 Study instruments and data collection

In this study, the height and body weight were measured twice and the mean from these two measurements were used in the calculation of body mass index. The height and body weight measurements used SECA body meter and SECA weighing scale respectively. For height, the respondents were instructed to remove their shoes and stand upright with their head pointing straight forward, and then their height were recorded to the nearest 1 centimeter (cm). While, for body weight measurement, the respondents were instructed to remove their shoes, wearing light clothing, empty their pocket and then asked them to stand upright unassisted on the weighing scale. The body weight was recorded to the nearest 0.1 kilogram (kg). Body mass index (BMI) was calculated as weight in kilograms divided by the square of height in meters. The BMIs for age and sex were used to classified into four groups as obese (BMI \geq 97th percentile), overweight (BMI \geq 85 and <97th percentiles), normal (BMI \geq 3th and <85th percentiles), and underweight (BMI<3th percentile) (WHO, 2007).

The respondents were also required to answer a set of questionnaire. This self-administered questionnaire consisted of five sections. The questionnaire was written in Arabic language. This Arabic questionnaire was prepared by translating the English version of the questionnaire to Arabic, and then the Arabic questionnaire was back-translated into English to ensure similarity in meaning. The first two sections were on the sociodemographic of the respondents and the sociodemographic of parents. The third section comprises of Physical Activity Questionnaire for Adolescents (PAQ-A) (Kowalski, Crocker, & Donen, 2004). The PAQ-A consists of nine-items and was developed to assess general levels of physical activity. The respondents were asked to recall a summary of physical activities for the past 7 days. The PAQ-A provides a summary of physical activity score derived from eight items (the 9th item does not factor into the overall score). The respondents had to score on a 5-point scale ("no" activity being a 1, "7 times or more" being a 5). The mean of all activities on the activity checklist were calculated to form a composite score for each item. The final PAQ-A activity summary score derived from the mean of these composite scores of 8 items. A score of 1 indicates low physical activity, whereas a score of 5 indicates high physical activity. The PAQ-A have been supported as valid and reliable measures of general physical activity levels from childhood to adolescence (Kowalski et al., 2004).

The fourth section consists of the Adolescent Sedentary Activity Questionnaire (ASAQ) (Hardy, Booth, & Okely, 2007). The ASAQ was used to measure time spent by adolescents in sedentary behaviours across a usual week. There are 4 components and 11 activities included in the ASAQ: small screen recreation (watching television/videos/ DVDs/playing video games, using computer for fun including e-communications, e-games, and surfing the net); for education (using computer for homework, doing homework not on the computer, and out-of-school hours tutoring); for travel (motorized travel by car / bus / train / boat); for cultural activities (reading for fun, doing hobbies or craft including board or card games, and playing / practicing a musical instrument); and for social activities (sitting around chatting with friends / using the telephone / hanging out / listening to music and for religious activities). The total time spent on sedentary activities was computed for each component of sedentary activities; if total time spent was more than 2 hours per day, the activities were grouped as sedentary, and if less than 2 hours per day, the activities were grouped as non-sedentary (Hardy et al., 2007). ASAQ has a good to excellent reliability and good face validity in the measurement of a broad range of sedentary behaviors among adolescent (Hardy et al., 2007).

The last section was Newest Vital Sign (NVS) for health literacy measurement (Weiss et al., 2005). The NVS has six-items and was developed to assess a very specific nutritional component of health literacy. The NVS is formatted to pictorially represent an ice cream nutritional label. The label is accompanied by six questions that measure reading and interpretation skills, with emphasis on the numeracy component of health literacy. The total score of NVS was obtained by summing the number of correct answers. The NVS score was categorized into 3 categories first as low for score zero to one, moderate for 2 to 3 and high if score 4 to 6. But later, the NVS score was categorized into 2 groups as 4 and above (unlikely to have low health literacy or adequate health literacy) and less than 4 as limited health literacy Weiss et al. (2005). The NVS-English has been reported to have good internal consistency and criterion validity (Weiss et al., 2005).

The questionnaire in Arabic language was pre-tested among 20 students of Arabic secondary school in Libya for face validity and also to assess the reliability. They were asked to comment on any ambiguity in the questionnaire and adjustment were done on the items highlighted on the comments by the students. The content validity of the questionnaire was assessed by a group of experts which is the supervisory committee. They went through the questionnaire to ensure that wording of its items were clear and that they represent their content domain. The reliability of the questionnaire was assessed by internal consistency using Cronbach's alpha. The Cronbach's alpha values for the PAQ-A, ASAQ and NVS were good with 0.828, 0.974 and 0.940 respectively.

2.3 Data analyses

Data analyses used IBM SPSS version 21.0. Quantitative variables were presented as mean \pm standard deviation (SD) or median and inter-quartile range (IQR) if not normally distributed. For qualitative variables, the number and percentage were reported. All quantitative variables were categorized in the subsequent data analyses. Chi-square tests were conducted to measure the association between two categorical variables. Multiple logistic regression was conducted to compute the adjusted odds ratios (AOR) and 95% confidence interval (95% CI) for the association of health literacy with obesity and overweight after controlling other variables. Level of significant was fixed at $\alpha = 0.05$.

3.0 Results

3.1 Response rate

A total of 202 out of 250 students consented, answered and returned back the questionnaires giving the response rate in this study was 81.0%. There were 10 students who refused to participate in this study, and another 38 students were excluded from final data analyses because of incomplete answered.

3.2 Characteristics of respondents

Table 1: Distribution of respondents by socio-demography, parental background, level of physical activities, sedentary behaviour and health literacy (N=202)

Characteristics	n	%
Gender		
Male	105	52.0
Female	97	48.0
Age group (years)		
14.00 – 16.99	149	73.8
17.00 – 18.99	53	26.2
Parents' education		
High school grade and above	189	93.6
Less than high school grade	13	6.4
Parents' income		
Less than RM6000	54	26.7
≥ RM6000	148	73.3
Physical activity		
Low	91	45.0
Moderate	101	50.0
High	10	5.0
Sedentary behavior		
Yes	127	62.9
No	75	37.1
Health literacy		
Low (0 – 1)	19	9.4
Moderate (2 – 3)	85	42.1
Adequate (4 – 6)	98	48.5

Table 1 shows the distribution of respondents by socio-demography, level of physical activities and health literacy. In this study, there are more males (52.0%) than females (48.0%). The age of the students ranged from 14.37 to 18.93 years, with a mean \pm SD age of 16.20 ± 1.10 years and a median of 16.04 (inter-quartile range = 1.72) years. The median age for females (16.20 years) was slightly higher than that for males (15.97 years). Majority of the students were between 14.00 to 16.99 years old (73.8%), parents with high school grade (93.6%), and their parents have high incomes RM6000.00 and more (73.3%). The percentage of low physical activity, sedentary behavior and low health literacy was 45.0%, 62.9% and 9.4% respectively.

3.3 Body mass index, overweight and obesity

The overall mean \pm SD of BMI was $22.03 \pm 4.00 \text{ kgm}^{-2}$. The mean \pm SD of BMI in female was 22.33 ± 3.86 and slightly higher than male ($21.76 \pm 4.13 \text{ kgm}^{-2}$). Overall, there was 21.3% (95%CI: 15.6%, 27.0%) of overweight and 6.9% (95%CI: 3.4%, 10.4%) of obesity among the respondents. Male had a higher percentage of obesity (9.5%) as compared to female (4.1%), but female had a higher percentage of overweight (25.8%) compared to males (16.2%).

3.4 Association of overweight and obesity with socio-demography characteristics, parental profile, physical activity, sedentary behaviour, and health literacy

Table 2: Association of overweight and obesity and socio-demography factors, parents' background, physical activity, sedentary behavior and health literacy

Variables	Overweight and Obesity		χ^2	df	P- value
	Yes f (%)	No f (%)			
Age (years)			4.497	1	0.034*
14.00 -16.99	48 (32.2)	101 (67.8)			
17.00 -18.99	9 (17.0)	44 (83.0)			
Gender			0.260	1	0.360
Male	28 (26.7)	77 (73.3)			
Female	29 (29.9)	68 (70.1)			
Parents education			0.045	1	0.833
Lower than high school grade	4 (30.8)	9 (69.2)			
High school grade and above	53 (28.0)	136 (72.0)			
Parents income			0.625	1	0.429
RM6000 or less	13 (24.1)	41 (75.9)			
> RM6000	44 (29.7)	104 (70.3)			
Physical activity			3.946	1	0.047*
Low	32 (35.2)	59 (64.8)			
Moderate/high	25 (22.5)	86 (77.5)			
Sedentary behavior			8.791	1	0.003*
No	12 (16.0)	63 (84.0)			
Yes	45 (35.4)	82 (64.6)			
Health literacy			14.462	2	0.001*
Low	12(63.2)	7(36.8)			
Moderate	25(29.4)	60 (70.6)			
High	20 (20.4)	78 (79.6)			

Table 2 shows the association of overweight and obesity with other factors (sociodemographic factors, parents' background, physical activity, sedentary behavior, and health literacy). The percentage of obese and overweight was higher among respondents in the aged group of 14.00 to 16.99 years old, female, parent's income of more than RM6000.00 per month, low physical activity, having sedentary behavior and limited health literacy score. The result showed a significant association between overweight and obesity with age,

physical activity, sedentary behavior, and with health literacy. The results also indicated that there was a significant association between overweight and obesity with health literacy. However, there was no significant association between obesity and overweight with gender, parent's education and parent's income.

Table 3 shows the predictors of overweight and obesity. The multivariate logistic regression was conducted to predict the prevalence of overweight and obesity by using variables that were significantly related to overweight and obesity in the chi-square tests. The odds of being obese

Table 3: Predictors of overweight and obesity

Variables	Crude OR	95% CI	AOR	95% CI
Age (years)				
14.00 -16.99	2.323	1.049, 5.146	2.505	1.096, 5.725
17.00 -18.99	1.000		1.000	
Sedentary behavior				
Yes	2.881	1.407, 5.898	2.620	1.255, 5.470
No	1.000		1.000	
Health literacy				
Limited	2.154	1.142, 4.062	1.963	1.010, 3.814
Adequate			1.000	
Physical activities				
Low	1.866	1.004, 3.466	1.711	0.892, 3.232
Moderate/High	1.000		1.000	

(*) Significant, P -value < 0.05

and overweight among 14.00 to 16.99 years-old respondents was almost 3 times higher as compared to the 17.00 to 18.99 years-old respondents. Sedentary behavior had almost 3 times higher in the odds of being overweight and obese as compared with the non-sedentary behavior group. Furthermore, the odds of overweight and obese was almost 2 times higher in the limited health literacy group as compared to the adequate health literacy group.

4.0 Discussion

This study revealed that more than one-quarter of the respondents was overweight and obese. However, the percentage was lower than other studies in Arabic countries (Al-Junaibi, Abdulle, Sabri, Hag-Ali, & Nagelkerke, 2013; Musaiger et al., 2013; Qadir et al., 2014). It could be due to differences in diet between Arabic students in Malaysia and in their own country. Immigrants such as Arabic students in Malaysia tends to change their food intakes due to lack of availability of typical local products from their home country (Mêjean, Traissac, Eymard-Duvernay, Delpeuch, & Maire, 2008). During the initial immigration transition, their parents may experience stress that affected their diet and physical activity habits (Delavari, Farelly, Renzaho, Mellor, & Swinburn, (2012) which could effected them too. But, the percentage was higher than Malaysia (IHBR, MOH, 2011).

The percentage of overweight was found to be higher among females compared to males, whereas the prevalence of obesity was found to be higher in males compared to females. This

result aligns with the result of a study conducted by Al-Junaibi et al. (2013) among Arabic students. Our study found no significant association between overweight and obesity with gender, a result that is similar to that of Al-Nakeeb et al. (2012). However, this result contradicts the result of some studies among adolescents in Arabic countries, where gender was found to be associated with overweight and obesity (Mahfouz et al., 2011; Musaiger et al., 2013). The differences may be explained by the sample size used in the present study, which was smaller compared to other studies.

For age group, the younger age group was also found to be significantly associated with overweight and obesity. By contrast, the prevalence of overweight and obesity was significantly higher among older adolescents in previous studies (Alemu, Atnafu, Yitayal, & Yimam, 2014; Malik & Bakir, 2006). The education and income of the parents were not significantly associated with overweight and obesity, an outcome contrary to other studies conducted that found a significant association between the occurrence of obesity and the education and income of parents (Alemu et al., 2014; Kant & Graubard, 2013; Heidi-Ullmann, Bittenheim, Goldman, Pebley, & Wong, 2011). This finding can be explained by the fact that most of the respondent's parents are highly educated with high income, given that they came to Malaysia to study.

The result of this study indicated that associated factors to overweight and obesity among Arabic secondary school students in Malaysia were age group (14-16yrs), sedentary behavior and low health literacy. Our result showed that the prevalence of overweight and obesity (28%) lower than previously studies on Arabic adolescents (Al Junaibi et al., 2013; Bener & Kamal, 2005; Musaiger et al., 2013). However, differences between this study and other studies in methodology, sample selection, or sample size.

According to the results, there was a significant association of overweight and obesity with physical activity in the bivariate analysis but not in the multivariate analysis. This finding can be explained by the significant association between health literacy and physical activity. As such, health literacy, which is a predictor of overweight and obesity, can be the variable confounding the effect of physical activity. In the multivariate analysis, the adjusted OR for association of overweight and obesity to low physical activity was 1.593, which showed an inverse association with overweight and obesity. This result is in the same line as those of numerous previous studies. The findings of all these studies point out a significant association between overweight and obesity with physical activity, as in the finding of this study (Al-Haifi et al., 2013; Al-Nakeeb et al., 2012; Kelishadi et al., 2007; Patrick et al., 2004). However, another study has found that, among adolescent Arab students, no significant association exists between physical activity and overweight and obesity (Al Junaibi, et al., 2013).

About 62.8% of respondents had sedentary behavior. In comparison, this number is lower than the prevalence found in a survey conducted among Saudi adolescents, in which about 84% of males and 91.2% of females log in more than 2 hours of screen time every day (Al-Hazaa, Nada, Hana, Dina, & Musaiger, 2011). In this study, sedentary behavior was measured by calculating the time spent on screen per week, which has a significant association with overweight and obesity in both bivariate and multivariate analysis. The adjusted OR of being overweight and obese among students with sedentary behavior was 2.36 higher than those with non-sedentary behavior, consistent with findings from another studies who found a significant association between time spent watching television daily and the risk

of obesity (Micklesfield et al., 2014; Musaiger et al., 2013). Furthermore, Sisson et al. (2009) reached the same conclusions among adolescents in the US from the national health and nutrition examination survey conducted from 2001 to 2006, which provided data to evaluate sedentary behavior.

More than half of the respondents had limited health literacy. Another study done in China among adolescents obtained a similar results (Lam & Yang, 2012). In terms of the prevalence of low health literacy among overweight and obese students, this study showed that 63.2% of respondents with low health literacy were overweight and obese, a finding that was different from those of a study among US adolescents by Chari et al. (2014), who found that the prevalence of low health literacy among overweight and obese participants was 46.6%. The results of this study also showed a significant association between overweight and obesity and low health literacy. A similar significant result obtained from this study was also observed in many studies conducted on children and adolescents (Sharif & Blank, 2010; Chari et al., 2014). Hence, this study has similar results with most other studies in terms of the significant association between health literacy and overweight and obesity.

As in all studies, our study has limitations and strengths. First, generalizability is limited because this sample consisted of only Arabic secondary school students in Kuala Lumpur and Putrajaya, Malaysia. Second, there is a limitation in causal inferences owing to the use of a cross-sectional design. The finding of our study brings up a very important issue as a contributing factor to overweight and obesity, namely, health literacy. Given that the prevention and treatment of obesity are one of the challenges of public health professionals, this finding will contribute to addressing this problem.

5.0 Conclusion and recommendation

The prevalence of overweight and obesity among Arabic secondary school students in Kuala Lumpur and Putrajaya was found to be high. Health literacy was also found to be a strong predictor. Cohort study should be conducted in future to determine the association of low health literacy and the risk of obesity and overweight. The intervention step to prevent adolescent obesity should start at school by improving health literacy in an early age.

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Declaration

Authors declare that the article has not been published previously or concurrently for any other journal.

Authors contribution

The 1st author carried out the research, analysed the data and drafting of the article and was assisted by the 2nd and 3rd authors.

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