

Prevalence and Factors associated with Overweight and Obesity among Malaysian Post Graduate Students in a Public University

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Abstract:

Overweight and obesity is a major public health problem globally because they increase the burden of non-communicable diseases such as cardiovascular diseases, and cancers. Many studies on overweight and obesity in the universities focused on the undergraduate students and there is little information on post-graduate students. Thus, this study aimed at determining the prevalence and factors associated with overweight and obesity among Malaysian post graduate students in a public university. A cross sectional study was conducted among 945 post-graduate students from six faculties using cluster sampling technique. Information on socio-demographic, level of physical activity, smoking and alcohol intakes, and drug history were obtained using self-administered questionnaire. Body weight and height were measured twice and their means were used in the calculation of body mass index. Overweight and obesity were classified based on World Health Organization cut-off points. The overall prevalence of overweight and obesity were 23.1% (95% CI: 20.4%, 25.8%), and 8.9% (95% CI: 7.1%, 10.7%) respectively. The independent factors of overweight and obesity were male (AOR= 1.49; 95% CI: 1.07, 2.08), aged group of 30 to 34 years (AOR= 2.53; 95% CI: 1.59, 4.04); and 35 to 39 years (AOR=2.05; 95% CI: 1.15, 3.64); other ethnic group (AOR=5.03; 95% CI: 1.75, 14.48); low and moderate physical activity (AOR=11.16; 95% CI 4.67, 26.70) and (AOR=3.16; 95% CI: 1.31, 7.62). In conclusion, almost one third of students were overweight and obese. The only modifiable factor of overweight and obesity in this study was moderate and low level of physical activity.

Keywords: Overweight, Obesity, post-graduates students, supplement use, Malaysia

1.0 Introduction:

Overweight and obesity is a major public health concern because of its association with an increased morbidity and mortality of non-communicable diseases (NCDs). The rate of NCDs burden associated with overweight and obesity worldwide were 58% for type 2 diabetes mellitus, 21% for ischemic heart disease, 39% for hypertensive heart disease, 23% for ischemic stroke, 12% for colon cancer, 8% for post-menopausal breast cancer, 32% for endometrial cancer in women and 13% for osteoarthritis (World Health Organization [WHO], 2003).

The prevalence of obesity is increasing throughout the world's population with an estimation of more than one billion people and more than 300 million people worldwide are overweight and obese respectively and projected to reach 1.5 billion by the year 2015 in almost all countries (WHO, 2012). Overweight and obesity was high in America, Europe, Middle East, and in the Western Pacific Regions of the world (WHO, 2003).

Malaysia is one of the countries in the Asia - Pacific region that has been increasing in industrialization and economic growth for over last two decades, and this ongoing development, urbanization, and industrialization has led to increase in overweight and obesity (Khambalia & Seen, 2010). Based on the National Health and Morbidity Survey (NHMS) reports there has been an increase in the prevalence of overweight over the last decade from 16.6% in the NHMS II in 1996 (Institute for Public Health [IPH], 1997) to 29.1% in 2006 (IPH, 2008). The prevalence of obesity was also noticed to increase dramatically from 4.4% in 1996 (IPH, 1998) to 14.0% in 2006 (IPH, 2008).

Time spent in universities is highly influential in changing adults behavior, particularly with regard to physical activity and other life style (Racette, Deusinger, Strube, Highstein & Singer, 2005). During the past few years, the number of overweight and obese students continues to increase (Sparling, 2007). Despite these challenges of increasing rate of overweight and obesity among college students, yet few researches assessed the factors associated with overweight among college students (Melissa, William, Betty, and Terril, 2007). In Malaysia, majority of studies conducted on overweight and obesity focused more on secondary school students, with limited studies conducted among university students' especially post-graduate students. Considering the high prevalence of overweight and obesity and its consequences for health and economy presently and years to come (Wang, 2007), there is a need to assess the factors associated with these condition, thereby assisting in maintaining a healthy future generations. The general objective of this study was to determine prevalence and factors associated with overweight and obesity among Malaysian post graduate students in a public university.

2.0 Methodology:

This cross sectional study was conducted among Malaysian post-graduate students in a public university. A random cluster sampling was used to select 6 out of 15 faculties. All post-graduate students in the selected faculties were invited to participate in this study. The inclusion criteria for the respondents were registered as full time student, Masters and PhD Programme, student of main campus, and Malaysian. The exclusion criteria were pregnant students, physically disable that cannot stand without support, students that currently on deferment or long medical leave, and students that are out for data collection. The sample size for this study was calculated using the two proportions formula (Lwanga & Lemeshow, 1991) and the estimated sample size was 1206. Data collection was conducted from 14th April 2012 to 31st May 2014.

2.1 Instruments and Data Collection Methods

Data was collected using self-administered questionnaire. The questionnaire consisted of five sections that were, socio-demographic, behavioural factors, physical activity, steroid used, and the short version of the International Physical Activity Questionnaire (IPAQ) to measure the level of physical activity (IPAQ, 2005). The respondents were questioned on 3 specific

types of activities (walking, moderate-intensity and vigorous-intensity activity) over the past 7-days. Respondents were then classified as having 'low', 'moderate' or 'high' levels of physical activity based on the standard guideline (IPAQ, 2005).

2.1.1 Weight, Height and Body Mass Index Calculation

The weight was measured using Seca 877 mobile flat weighing scale and the measurement was taken to the nearest 0.5 kg. The height was measured using Seca 213 portable stadiometer and the measurement was taken to the nearest 1cm. Two readings were taken for each respondent and their means were used in the calculation of body mass index (BMI). The BMI was calculated using the weight in kilograms divided by height in metres square and the result was expressed in kg/m^2 . Overweight and obesity was defined as BMI of 25.0kg/m^2 to 29.9kg/m^2 and 30.0kg/m^2 and above respectively.

2.2 Data Analysis

The data was analysed using IBM SPSS version 21. Categorical data was summarised using the number of respondent (n) and percentage (%). Continuous data was summarised using measures of central tendency and dispersion. All of the continuous data were converted into categorical. Chi-square test was used to determine the association between two categorical variables. Variables with *P*-value of less than 0.05 was further analysed using simple logistic regression to estimate the crude-odds ratio (COR) and 95% confidence interval (CI). Independent factors of overweight and obesity was determined using multiple logistic regression with enter method and the strength of association was described using adjusted-odds ratio (AOR).

3.0 Results:

Out of the 1367 post graduate students who were approached 303 were ineligible (7 were pregnant and 296 were not Malaysians), giving the eligible respondents of 1064. Out of these, 48 students refused to participate in the study and 80 questionnaires were excluded from the analysis (21 had missing data and 59 had their total time for physical activity exceeded 960 minutes per week) (IPAQ, 2005) and giving the overall response rate of 88.0 % (936/1064).

3.1 Characteristics of the Respondents

Table 1 shows the characteristics of respondents. Majority of the respondents were females (65.5%), Malay ethnic group (79.3%), and single (78.0%). The age of the respondents ranged between 20 to 43 years, with the mean $\pm$ S.D age of 26.94 ± 4.62 and a median of 25 years. The percentage of respondents with a history of smoking was 9.1%, and respondents with a history of alcohol consumption were 12.7%. There were only 0.7% of the respondents who reported on steroid treatment. Among females, there was 4.7% having history of using contraceptive pills / injection. The percentage of low level of physical activity was high (44.6%) and only 70 (7.5%) had high level of physical activity.

Table 1: Characteristics of the respondents

Characteristics (N = 936)	n	(%)
Gender		
Male	323	(34.5)
Female	613	(65.5)
Ethnicity		
Malay	742	(79.3)
Chinese	126	(13.5)
Indian	47	(5.0)
Others	21	(2.2)
Age group (years)		
20 – 24	371	(39.6)
25 - 29	356	(38.0)
30 – 34	117	(12.5)
35- 39	69	(7.4)
40 - 44	23	(2.5)
Marital status		
Single	730	(78.0)
Married	205	(21.9)
Divorced	1	(0.1)
History of Smoking (n = 935)^a		
Yes	85	(9.1)
No	850	(90.8)
History of Alcohol Consumption		
Yes	119	(12.7)
No	817	(87.3)
History of Using Steroid		
Yes	7	(0.7)
No	929	(99.3)
Contraceptive Pills / Injection Used (n= 613)		
Yes	29	(4.7) ^b
No	654	(95.3) ^b
Level of Physical Activity		
Low	417	(44.6)
Moderate	445	(47.5)
High	74	(7.9)

Note: (^a) – 1 missing data, (^b) – valid percent

3.2 Body Mass Index

The BMI of respondents ranged between 14.93 to 42.71 kgm⁻² with the overall mean $\pm$ SD of 23.80 $\pm$ 4.33 (95% CI: 23.52, 24.67) kgm⁻² and the median (interquartile range) of 23.19 (5.42) kgm⁻². The mean $\pm$ SD of BMI for male (24.73 $\pm$ 4.29; 95% CI: 24.26, 25.20kgm⁻²) was higher than female (23.30 $\pm$ 4.27; 95% CI: 22.96, 23.64kgm⁻²). For aged group, the mean $\pm$ SD of BMI was highest among aged group 30-34 years (23.02 $\pm$ 3.88; 95% CI: 25.01, 26.66kgm⁻²), followed by aged group 40 - 44 years (25.62 $\pm$ 3.50; 95% CI: 24.10, 27.13kgm⁻²) and 35 – 39 years (25.08 $\pm$ 4.30; 95% CI: 24.04, 26.11kgm⁻²). Whereas, for aged group 20 –

24 and 25 – 29 years, the mean $\pm$ SD of BMI was 23.02 ± 3.88 ; 95% CI: 22.62, 23.41 kgm^{-2} and 23.57 ± 4.48 ; 95% CI: 23.10, 24.03 kgm^{-2} respectively. Regarding ethnic groups, the mean $\pm$ SD of BMI was highest among others ethnicity (25.92 ± 5.27 ; 95% CI: 23.52, 28.31 kgm^{-2}), followed by Indian (24.41 ± 3.77 ; 95% CI: 23.31, 25.52 kgm^{-2}), and Malay (23.93 ± 4.40 ; 95% CI: 23.62, 24.25 kgm^{-2}), while Chinese was the lowest (22.34 ± 3.56 ; 95% CI: 21.77, 23.03 kgm^{-2}).

3.1.1 Prevalence of Overweight and Obesity

The prevalence of overweight among the respondents was 23.1% (95% CI: 20.4%, 25.8%), and obese was 8.9% (95% CI: 7.1%, 10.7%). Thus, the combination overall prevalence of overweight and obese was 31.9% (95% CI: 28.9%, 34.9%). For gender, the prevalence of overweight was higher among male (29.4%; 95% CI: 24.4%, 34.5%) than female (19.7%; 95% CI: 16.6%, 22.8%) and also for obese the males had higher prevalence (9.0%; 95% CI: 5.9%, 12.1%) and as compared to females (8.8%; 95% CI: 6.6%, 11.0%). Within ethnicity, Indians (38.3%; 95% CI: 24.4%, 52.2%) had the highest prevalence of overweight, followed by others ethnicities (33.3%; 95% CI: 13.1%, 53.4%), and Malays (22.5%; 95% CI: 19.5%, 25.5%). On the other hand, other ethnicities had the highest prevalence of obesity (23.8%; 95% CI: 5.6%, 42.0%), and followed by Malays (9.8%; 95% CI: 7.7%, 11.9%). Chinese had the lowest prevalence of both overweight (19.0%; 95% CI: 12.2%, 25.8%) and obesity (2.4%).

3.1.2 Association between Overweight, Obesity and Socio-demographic, Behavioural, Factors and Steroid Use

Table 2: Association between overweight, obesity and socio-demographic, behavioural factors and steroid use

Variables	Overweight and Obesity				χ^2	df	P-value
	Yes (n= 299)		No (n= 637)				
	n	(%)	n	(%)			
Gender					9.42	1	0.002*
Male	124	(38.4)	199	(61.6)			
Female	175	(28.5)	438	(71.5)			
					16.60	3	0.001*
Ethnicity							
Malay	240	(32.3)	502	(67.7)			
Chinese	27	(21.4)	99	(78.6)			
Indian	20	(42.6)	27	(57.4)			
Others	12	(57.1)	9	(42.9)			
Age group					29.89	4	<0.001*
20-24	96	(25.9)	275	(74.1)			
25-29	105	(29.5)	251	(70.5)			
30-34	58	(49.6)	59	(50.4)			
35-39	31	(44.9)	38	(55.1)			
40-44	9	(39.1)	14	(60.9)			
Marital status					2.60	1	0.107
Married/Divorced	75	(36.6)	130	(63.4)			
Single	224	(30.6)	507	(69.4)			

Smoking (n = 935)^a					4.73	1	0.030*
Yes	36	(42.4)	49	(57.6)			
No	262	(30.8)	588	(69.2)			
Alcohol Consumption					1.60	1	0.206
Yes	32	(26.9)	87	(73.1)			
No	267	(32.7)	550	(67.3)			
Contraceptive Pills/Injection (n = 613)					0.014	1	0.906
Yes	8	(27.6)	21	(72.4)			
No	167	(28.6)	417	(71.4)			
Steroids use					NA	NA	0.219 ^b
Yes	4	(57.1)	3	(42.9)			
No	295	(31.8)	634	(68.2)			
Level of Physical Activity					86.25	2	<0.001*
Low	197	(47.2)	220	(52.8)			
Moderate	96	(21.6)	349	(78.4)			
High	6	(8.1)	68	(91.9)			

Note: (*) – significant $P < 0.05$; (^a) – 1 missing data ; (^b) – P - value for Fisher's Exact Test

Table 2 shows the association between overweight and obesity with socio-demographic, behavioural factors and steroid use. The results shows that there was a significant association between overweight and obesity and gender ($P = 0.002$). The prevalence of overweight and obesity was significantly higher in males (38.4%) than in females (28.5%). There was also a significant association between overweight and obesity with ethnicity ($P < 0.001$) and age group ($P < 0.001$). For marital status, the prevalence of overweight and obesity was slightly higher in married/divorced group (36.6%) than single group (30.6%). However, there was no significant association between overweight and obesity with marital status. For behavioural factors, the result indicated that there was a significant association between overweight and obesity with smoking ($P = 0.030$) and level of physical activity ($P < 0.001$). The prevalence of overweight and obesity was higher in respondents who have never consumed alcohol (32.7%) than respondents with a history of consuming alcohol (26.9%). However, the result showed that there was no significant association between overweight and obesity with alcohol consumption and contraceptive pills / injection used and steroid used.

3.1.5 Factors of Overweight and Obesity

Table 3: Crude- and adjusted-odds ratio of socio-demographic, smoking and level of physical activities for overweight and obesity

Variables	COR	(95% CI)	AOR	(95% CI)
Gender				
Female	1.00		1.00	
Male	1.56	(1.17, 2.07)*	1.49	(1.10, 2.08)*
Ethnicity				
Chinese	1.00		1.00	
Malay	1.75	(1.11, 2.76)*	1.58	(0.97, 2.57)
Indian	2.72	(1.32, 5.57)*	1.94	(0.89, 4.21)
Others	4.89	(1.87, 12.81)*	5.03	(1.75, 14.48)*

Age range				
20 - 24	1.00		1.00	
25 - 29	1.20	(0.87, 1.66)	1.04	(0.74, 1.47)
30 - 34	2.82	(1.83, 4.33)*	2.53	(1.59, 4.04)*
35 - 39	2.34	(1.38, 3.96)*	2.05	(1.15, 3.64)*
40 - 44	1.84	(0.77, 4.39)	1.77	(0.69, 4.58)
Physical Activity				
High	1.00		1.00	
Moderate	3.12	(1.31, 7.40)*	3.16	(1.31, 7.62)*
Low	10.15	(4.31, 23.90)*	11.16	(4.67, 26.70)*
Smoking				
Never	1.00		1.00	
Ever smoked	1.65	(1.05, 2.60)*	1.24	(0.73, 2.10)

Note: (*) –Significant, $P < 0.05$

Table 3 shows the crude odds ratio and adjusted odds ratio from simple logistic regression and multiple logistic regressions. The result indicated that the independent factors of overweight and obesity based on the adjusted odds ratio and 95% CI were male, others ethnicity, aged group 30-34 years and 35 – 39 years, moderate and low level of physical activity. The crude and adjusted odd ratios did not have much different among males. Male student had almost 1.5 times more likely to develop overweight and obesity than female student. For ethnicity, based on crude odds ratio, the Malay, Indian and others ethnic groups were more likely to be overweight and obese than Chinese. However, in the multiple logistic regression the adjusted-odds was 5 times higher in developing overweight and obesity than Chinese. Respondent within the age groups of 30 to 34 and 35 to 39 years were 2.5 times and 2 times higher in getting overweight and obese respectively than aged group of 20 to 24 years. For physical activity, the crude and adjusted - odds ratio of moderate physical activity was not much different. Those with moderate level of physical activity had more than 3 times higher in getting overweight and obesity than high level of physical activity. Furthermore, for low level of physical activity, the adjusted odd ratio was higher than the crude odd ratio. In the multiple logistic regression, the adjusted-odds for those with low level of physical activity was 11 times higher in getting overweight and obesity than high level of physical activity. In this final model, only smoking status was not significantly associated with overweight and obesity.

4.0 Discussion:

The overall prevalence of overweight and obesity among post-graduate student of UPM from this study was 23.1% and 8.9%. The result from this study was low as compared to prevalence of 29.1% and 14.0% for overweight and obesity respectively, from the National Health and Morbidity Survey III (NHMS III) (Institute for Public Health, 2008). Another study by Mohamud et al., (2011) was also reported even higher prevalence of overweight (33.6%) and obesity (19.5%). These low prevalence of overweight and obesity in this study might be explained with the fact that in this study the respondents were mainly young adults but in the NHMS III and Mohamud et al., (2011) the respondents were adults in all age groups (young adults, middle aged population and older population).

In this study the prevalence of overweight and obesity was found to be higher in males compared to females and males were more likely to develop overweight and obesity than

females. This result was in line with study conducted by Mahmood et al (2013) among undergraduate medical students in which they found the prevalence of overweight and obesity was significantly higher among male (47.7%) than female (15.9%) and male gender was a predictor (adjusted OR=4.96; 95% C.I: 3.02, 8.15) of overweight and obesity. Studies conducted among adult populations also indicated that male was an independent factor of overweight and obesity (Calamusa, et al., 2012; Cho & Juon, 2006). On the other hand, Mohamud et al., (2011) indicated that the prevalence of overweight was higher in male than female but the prevalence of obesity was higher in female than male. And male was less likely to develop overweight and also obesity.

For ethnicity, the prevalence of overweight and obesity was highest among others ethnic group followed by Indian and Malay. Chinese had the lowest prevalence for both. Adjusted odds ratio showed that only others ethnic group was more likely to get overweight and obesity. Whereas, Mohamud et al., (2011) showed that the prevalence of overweight and obesity was highest among Indian. However, the prevalence of overweight was lowest among others ethnic group and Chinese had the lowest prevalence of obesity. In the same study, only others ethnic group had higher chances of developing overweight than the Malay, Chinese and Indian were less likely to get overweight. On the other hand, only Indian had higher odds and the Chinese was less likely of developing obesity than Malay.

The prevalence of overweight and obesity was highest among age group of 30 – 34 years, followed by age group of 35 to 39 and of 40 to 44 and lowest in age group of 20 to 24. However, only age group of 30 to 34 and 35 to 39 were more likely to be overweight and obese. On the contrary, Mohamud et al., (2011) revealed that the prevalence of overweight was highest among aged group 60.0 to 69.9 years and for obesity, the highest prevalence was aged group of 40.0 to 49.9. However, the age was not an independent factor of overweight and obesity. Cho and Juon (2006) also reported that there was no association between overweight and obesity with age. Study by Calamusa et al., (2012) indicated that older age group of 40 to 59 and 60 to 79 were more likely to have overweight and obesity issues than aged group of 18 to 39 years.

In this study, moderate level and low level physical activity respondents were more likely to get overweight and obesity than high physical activity. However, Dupuy et al. (2011) found that moderate and vigorous physical activity person was less likely to become overweight and obese than low physical activity. Al-Hazzal et al (2012) showed that overweight and obesity were significantly and inversely associated with vigorous physical activity levels.

The findings in this study showed no significant association between smoking with overweight and obesity in multivariate analysis. Cho and Juon (2006) also reported that there was no association between overweight and obesity with smoking. On the other hand, Calamusa et al., (2012) reported that former smoker was more likely be overweight and obese than non-smoker. Lack of association between overweight and obesity with smoking found in this study might be explained with the fact that number of non-smoking respondents was small compared to previous study that found association between smoking with overweight and obesity Calamusa et al., (2012). In addition, majority were experimental smokers, and smoking less than 100 cigarettes might be insufficient to cause changes in body weight of an individual.

The overall percentage of contraceptive use among female respondents was only 4.7%. This was relatively very low as compared to a study conducted by Huber and Ersek (2009) in the United State of America. The low percentage of contraceptive used from this study might be explained by the fact that majority of the female respondents were not married. No significant association was found from logistic regression between glucocorticoid steroid use with overweight and obesity. This result is in line with the result of a study to determine use of steroids for weight improvement among patient with chronic obstructive airway disease Sharma et al. (2010).

5.0 Conclusion:

In conclusion, almost one third of the post-graduate students were either overweight or obese. The only modifiable factor of overweight and obesity in this study was moderate and low level of physical activity. Thus, the prevention of overweight and obesity activities among this post-graduate student should be focused on to increase physical activity.

Ethical

Ethical approval was obtained from the Ethics Committee for Human Study of the university.

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