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Obesity and associated risk factors among students of health colleges of King Saud University, Saudi Arabia: A cross-sectional study

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Abstract

Objective: To determine the prevalence of obesity and associated risk factors among medical students in Saudi Arabia.

Methods: The cross-sectional study was conducted from December 2012 to March 2013 at King Saud University, Riyadh, Saudi Arabia. Using stratified sampling technique, undergraduate students of either gender from the health colleges were included. Information was collected through a pretested questionnaire. Measurements of the height and weight were noted and body mass index for all the subjects was calculated.

Results: Of the 292 students, 146(50%) were males and 146(50%) were females. Obesity was found in 40(13.7%)students. It was more prevalent among males than females ($p<0.05$) and among those who had chronic diseases ($p<0.001$). Family history of obesity was significantly associated with obesity ($p=0.016$). No significant association was found between physical activity and obesity ($p=0.863$).

Conclusions: There was considerable prevalence of obesity among the medical students. Being male, having family history of obesity, and having chronic diseases were important risk factors.

Keywords: Obesity, Prevalence, Students of health colleges, King Saud University, KSU, Saudi Arabia. (JPMA 67: 355; 2017)

Introduction

Obesity means having too much body fat. It is different from being overweight, which means weighing too much. A person is considered overweight if his or her body mass index (BMI) ranges between 25 and 29.9kg/m^2, while a person is considered obese if the BMI is over 30kg/m^2.[1] Obesity occurs over time when you eat more calories than you use. The balance between calories-in and calories-out differs for each person. Factors that might tip the balance include your genetic makeup, overeating, eating high-fat foods and not being physically active.[2]

Obesity is important as it is considered a growing problem worldwide, specifically among Saudi males and females.[3] Worldwide, the proportion of adults with a BMI of 25 kg/m^2 or greater increased between 1980 and 2013 from 28.8% to 36.9% in men, and from 29.8% to 38.0% in women. Prevalence has increased substantially in children and adolescents in developed countries; 23.8% of boys and 22.6% of girls were overweight or obese in 2013. The prevalence of overweight and obesity has also increased in children and adolescents in developing countries from 8·1% to 12.9% in 2013 for boys and from 8.4% to 13.4% in girls. In adults, estimated prevalence of obesity exceeded 50% in men in Tonga and in women in Kuwait, Kiribati, Federated States of Micronesia, Libya, Qatar, Tonga, and Samoa. Since 2006, the increase in adult obesity in developed countries has slowed down.[4] In Saudi Arabia,obesity was among the major public health problems. A study done in the Kingdom of Saudi Arabia showed that, of the 10,735 participants evaluated, 28.7% were obese (BMI $\geq$30 kg/m^2).

There are a variety of factors that play a role in obesity. This makes it a complex health issue to address. Overweight and obesity result from an energy imbalance. This involves eating too many calories and not getting enough physical activity. Body weight is the result of genes, metabolism, behaviour, environment, culture and socioeconomic status. Behaviour and environment play a large role causing people to be overweight and obese.[5]

Previous studies conducted in Saudi Arabia investigated the prevalence of obesity among Saudi population, but little or no data was available about the prevalence of obesity and associated risk factors among medical students. Epidemiological surveys to determine the prevalence of obesity and associated risk factors are of high importance, especially those targeting university students. Being overweight or obese greatly raises the risk for other health problems; thus, more studies are needed

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among youths to provide evidence-based data to the health authorities to assist in the design of appropriate strategies in controlling obesity in the study areas. The current study was planned to determine the prevalence of obesity among students of the university health colleges and to identify the associated risk factors in Saudi Arabia.

Subjects and Methods

The cross-sectional study was conducted from December 2012 to March 2013 at King Saud University (KSU), Riyadh, Saudi Arabia. Riyadh is the capital and the largest city of Saudi Arabia. It is also the capital of Riyadh Province, and belongs to the historical regions of Najd and Al-Yamama. It is situated in the centre of the Arabian Peninsula on a large plateau, and is home to 5.7 million people, and the urban centre of a region with a population of close to 7.3 million people.[6] KSU is a public university in Riyadh. The university was created to meet the shortage of skilled workers in Saudi Arabia. The student body of KSU consists of about 51,168 students of both genders. The female students have their own disciplinary panel and there is a centre supervising the progress of female students, either personally by female faculty members or by male faculty members via a closed television network.[7]

The study comprised undergraduate students from five major health colleges under KSU: Medicine, Dentistry, Pharmacy, Applied Health Sciences and Nursing. The study sample was collected from each college proportional to the size of the students' population.

The sample size was estimated using the single population proportion formula: $N = (Z\alpha + Z\beta)^2 ((\rho_1 q_1) + (\rho_2 q_2)) (P_1-P_2)^2$ where, p = prevalence of obesity, $q_1= (1-P_1)$, $q_2= (1- P_2)$ and Z = standard score which corresponds to 1.96. For calculations, a 95% confidence interval (CI) (z) was used. Equal number of males and females in the study were ensured using stratified simple random sampling.

The prevalence of obesity among male and female aged 18-24 years was taken from a previous study[8] as shown below:

PF=15.9 QF=84.1 PM=29.6 QM=70.4 Za=1.96 (95%) ZB=0.842 (80%)

$$N= \{(1.96+0.842)2 [(0.159\times0.841) + (0.296\times0.704)]\} \div \{(0.159 - 0.296)2\} = 292 \text{ participants.}$$

Ethical clearance was obtained from the institutional review board, and informed consent was obtained from all the students. Data was collected using a questionnaire that was developed based on possible risk factors and was pretested in a few subjects similar to the study participants for validity. The questionnaire included information such as socio-demographic characteristics, lifestyle factors, family history of obesity, presence or absence of some chronic diseases. The height and weight of all the subjects were measured.

Data analysis was performed using SAS version 9.2 (SAS Institute, Inc., Cary, NC).

Categorical variables were summarised as frequencies and percentages and contentious variables were summarised as mean and standard deviation. Comparison between groups for categorical variable was done using chi-square test or Fisher's exact test, where for continuous data student t-test or Mann Whitney Utest were used. Multiple logistic regression models with stepwise selection were used to identify multivariate predictors for obesity. To quantify the strength of multivariate association, we used odds ratios (OR) with 95% confidence intervals (CI). $P \leq 0.05$ was considered statistically significant.

Results

Of the 292 students, 146(50%) each were males and

Table-1: Characteristics of the participants.

Variable	Level	N = 292	%
Age	Mean(SD)	21.26(1.21)	-
Gender	Male	146.00	50.0
	Female	146.00	50.0
Nationality	Saudi	281.00	96.2
	Non-Saudi	11.00	3.8
Marital Status	Single	282.00	96.6
	Married	10.00	3.4
Monthly income	Low	28.00	9.7
	Moderate	69.00	23.8
	High	193.00	66.6
	Missing	2.00	-
Father Obese	Yes	34.00	11.6
	No	258.00	88.4
Mother Obese	Yes	59.00	20.2
	No	233.00	79.8
Brothers Obese	Yes	87.00	29.8
	No	205.00	70.2
Dyslipidaemia/Hyperlipidaemia	Yes	12.00	4.1
	No	280.00	95.9
Chronic diseases	Yes	272.00	93.2
	No	20.00	6.8
Body mass index	Underweight	29.00	9.9
	Normal weight	147.00	50.3
	Overweight	76.00	26.0
	Class I obesity	26.00	8.9
	Class II obesity	7.00	2.4
	Class III obesity	7.00	2.4
Body mass index	Non-Obese	252.00	86.3
	Obese	40.00	13.7

Table-2: Covariate analysis of gender and the variables.

Covariate	Level	Gender		P-value
		Male N=146	Female N=146	
Nationality	Saudi	145 (99.32)	136 (93.15)	0.006
	Non-Saudi	1 (0.68)	10 (6.85)	
Monthly income	Low	22 (15.17)	6 (4.14)	0.003
	Moderate	28 (19.31)	41 (28.28)	
	High	95 (65.52)	98 (67.59)	
Physical Activity	Yes	97 (66.9)	60 (41.1)	<.001
	No	48 (33.1)	86 (58.9)	
Obesity in Family members	Yes	84 (57.53)	74 (50.68)	0.240
	No	62 (42.47)	72 (49.32)	
Father Obese	Yes	18 (12.33)	16 (10.96)	0.715
	No	128 (87.67)	130 (89.04)	
Mother Obese	Yes	29 (19.86)	30 (20.55)	0.884
	No	117 (80.14)	116 (79.45)	
Brothers Obese	Yes	42 (28.77)	45 (30.82)	0.701
	No	104 (71.23)	101 (69.18)	
Dyslipidaemia/Hyperlipidaemia	Yes	9 (6.16)	3 (2.05)	0.077
	No	137 (93.84)	143 (97.95)	
Chronic diseases	Yes	14 (9.59)	6 (4.11)	0.064
	No	132 (90.41)	140 (95.89)	
Body mass index	Underweight	6 (4.11)	23 (15.75)	<.001
	Normal weight	52 (35.62)	95 (65.07)	
	Overweight	51 (34.93)	25 (17.12)	
	Class I obesity	24 (16.44)	2 (1.37)	
	Class II obesity	6 (4.11)	1 (0.68)	
	Class III obesity	7 (4.79)	0 (0)	

Table-3: Covariate analysis of body mass index (BMI) and the variables.

Covariate	Level	BMI		P-value
		Non-Obese N=252	Obese N=40	
Gender	Male	109 (74.66)	37 (25.34)	<.001
	Female	143 (97.95)	3 (2.05)	
Monthly income	Low	24 (85.71)	4 (14.29)	0.358
	Moderate	56 (81.16)	13 (18.84)	
	High	170 (88.08)	23 (11.92)	
Physical Activity	Yes	135 (85.99)	22 (14.01)	0.741
	No	117 (87.31)	17 (12.69)	
Obesity in Family members	Yes	129 (81.65)	29 (18.35)	0.012
	No	123 (91.79)	11 (8.21)	
Father Obese	Yes	25 (73.53)	9 (26.47)	0.021
	No	227 (87.98)	31 (12.02)	
Mother Obese	Yes	51 (86.44)	8 (13.56)	0.972
	No	201 (86.27)	32 (13.73)	
Brothers Obese	Yes	70 (80.46)	17 (19.54)	0.059
	No	182 (88.78)	23 (11.22)	
Dyslipidaemia/Hyperlipidaemia	Yes	5 (41.67)	7 (58.33)	<.001
	No	247 (88.21)	33 (11.79)	
Chronic diseases	Yes	11 (55)	9 (45)	<.001
	No	241 (88.6)	31 (11.4)	
Fast Food Daily	One meal	5 (71.43)	2 (28.57)	0.595
	Two meals	116 (87.22)	17 (12.78)	
	Three meals	111 (85.38)	19 (14.62)	
	More than 3 meals	20 (90.91)	2 (9.09)	
Anxiety	Yes	49 (83.05)	10 (16.95)	0.416
	No	203 (87.12)	30 (12.88)	

females.The mean age of the students was 21.2±1.2 years (range: 18-24 years). Overall, 193(66.6%) students had a high income, 69(23.8%) had an intermediate income and 28(9.6%) had low income. Overall 40(13.7%) were obese; 37(25.3%) in males and 3(2.1%) in females (Table-1).

Besides, 29(9.9%) students were under weight, 147(50.3%) were normal weight, 76(26.0%) were overweight, 26(8.9%) had obesity World Health Organisation (WHO) class-1, 7(2.4%) had obesity class-2 and 7(2.4%) had obesity class-3 (Table-2).[9]

Male students were more likely to get obesity compared to female students (p< 0.001) (Table 3). A total of 20(6.8%) students had chronic diseases, and of those 9(45%) had obesity and 11(55%) were none-obese. The obesity increases among the students suffering from chronic diseases than those who did not have chronic diseases (p<0.001). Obesity increased among students who had

Table-4: Multiple logistic regression model.

Covariate	Level	Response = Obese			
		Odds Ratio	95%CI Low	95%CI Up	P-value
Gender	Male	18.51	5.26	65.09	<.001
	Female	Reference			
Family Monthly income	Low	0.87	0.25	3.03	0.833
	Moderate	3.12	1.26	7.76	0.014
	Higher	Reference			
Father Obese	Yes	3.72	1.32	10.49	0.013
	No	Reference			
Dyslipidaemia/hyperlipidaemia	Yes	10.99	2.59	46.58	0.001
	No	Reference			

family history of obesity (p< 0.01). In the univariate analysis, no statistically significant difference was observed between obesity in students who had physical activity versus those who did not have (p=0.741).

Multiple logistic regression model was also worked out (Table-4).

Discussion

Prevalence of obesity was higher among women (33.5% vs 24.1%). Among men, obesity was associated with marital status, diet, physical activity, diagnoses of diabetes, hypercholesterolaemia and hypertension. Among women, obesity was associated with marital status, education, history of chronic conditions, and hypertension.[10] Worldwide, at least 2.8 million people die each year as a result of being overweight or obese, and an estimated 35.8 million (2.3%) of global disability-adjusted life years (DALYs) are caused by overweight or obesity. Overweight and obesity lead to adverse metabolic effects on blood pressure, cholesterol, triglycerides and insulin resistance. Risks of coronary heart disease, ischaemic stroke and type 2 diabetes mellitus increase steadily with increasing BMI, a measure of weight relative to height. Raised BMI also increases the risk of cancer of the breast, colon, prostate, endometrium, kidney and gall bladder. Mortality rates increase with increasing degrees of overweight, as measured by BMI.[11]

In the present study, the prevalence of obesity and associated risk factors were estimated among university students. The prevalence of obesity was estimated to be 13.7%. Our data is in agreement with previous reported study done in Kuwait.[8] Furthermore, Seubsman S et al[12] observed higher prevalence rates of obesity in study done in the Thailand Open University among males with strong association. Similar high prevalence rates were reported among adults, where estimated prevalence of obesity exceeded 50% in men in Tonga and in women in Kuwait, Kiribati, Federated States of Micronesia, Libya, Qatar, Tonga, and Samoa.[4] In contrast, lower prevalence rates were reported in both genders in lower middle income countries (7%).[11] In the current study, the prevalence of obesity among students of the health colleges in KSU was much lower than that reported earlier in Saudi Arabia by Mansour et al,[13] who found 35.5% of adult Saudi people had obesity. These variations might be due to increase in the community awareness about obesity and its related risk factors. Another factor could be the implementation of different prevention programmes at community level which promote leaner and consequently healthier community. This overall decline in obesity prevalence is very good news for the country, especially because there have been few success stories in decreasing obesity levels in other countries resulting from health interventions. Over the last decade, the Saudi Ministry of Health (SMOH) has implemented several public health programmes to reduce obesity. Most of these programmes have focussed on awareness and behavioural changes.[14] However,it is too early to determine whether the decline seen in this study is due to SMOH efforts.

According to the WHO classification, most of obese participants were class-I obesity with a percentage of 8.9%, class-II and class-III were the same, which were approximately 2.4%. Also, we found that overweight participants were approximately 26%. Those overweight participants are at high risk to get class-I obesity. It also showed the underweight participants, which was approximately 9.9%. The rest of the participants were normal weight (50%). The obesity in the current study was found to be more prevalent among male students compared to female students and the association was statistically significant. It has been postulated that females are more prone to getting obesity[13] than males but our study showed that males were more prone. Many studies showed that females were at high risk of getting obese more than males, but in a different age group other than the age group we studied, such as menopausal females and married women (post-pregnancy and hormonal changes).[4,10]

According to bivariate analyses, obesity was significantly prevalent among those who had family history of obesity, specially the father and the brother (p= 0.01). A study done in the West Bank showed that there was a relationship between obesity and family history of obesity in both genders.[15] This may be explained by the fact that obesity is associated with genetic and familial factors.[5] Furthermore, the same study in West Bank showed that obesity was a risk factor for chronic diseases, especially hyperlipidaemia. According to the report of WHO for 2002 which declared that obesity and overweight are the biggest risk factors for non-communicable diseases like high blood pressure, high concentrations of cholesterol in the blood in Gulf region.[16,17] Finally, there was no significant result related to lifestyle or physical activity.

We emphasise that the provision of healthcare services, personal education and promotion of lifestyle modification by both governmental and non-governmental organisations can reduce this high prevalence. We advise people who have family history of obesity to control their weight by lifestyle modification and to visit specialists for more information. Also, people with chronic diseases should take their medications

regularly and comply with their treatment plans. Males should be more aware about their high risk of getting obese and should try to control their weights with lifestyle modification activities.

Conclusion

The prevalence of obesity was alarming. Being male, having family history of obesity and having chronic diseases were risk factors for contracting obesity.

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