

Trends of Obesity and Overweight among College Students in Oman

A cross sectional study

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اتجاه السمنة و زيادة الوزن عند طلاب المرحلة الجامعية بسلطنة عُمان دراسة مقطعية

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المخلص: الهدف: دراسة العلاقة بين منسب كتلة الجسم و كمية الدهون الكلية والنشاط البدني مع السمنة وزيادة الوزن بين الطلاب العمانيين. الطريقة: دراسة مقطعية شملت 202 طالبا عُمانيا (101 ذكرا و 101 أنثى) من جامعة السلطان قابوس. تم تجميع النتائج أثناء المقابلة الشخصية باستخدام استبيان البحث كما تم قياس الوزن وكمية الدهون الكلية ومعدل النشاط البدني باستخدام جهاز التانيتا، واستخدم شريط مقيس لقياس الطول. النتائج: تم تقسيم العينة حسب منسب كتلة الجسم إلى المجاميع الآتية: ناقصو الوزن (2.48%) وأصحاب الوزن الطبيعي (69.31%) وزائدو الوزن (26.73%) وأصحاب السمنة (1.49%). كما تم تقسيم عينة البحث تبعاً لكمية الدهون الكلية إلى المجموعة ذي الكمية القليلة (26.73%) و المجموعة ذوي الكمية العالية (26.73%) والمجموعة ذوي الكمية العالية جدا (22.28%). لم نجد علاقة معتدلة إحصائياً بين كمية الدهون القليلة ومتوسط عدد ساعات ممارسة الرياضة الأسبوعي (متغير الدلالة = 0.728 - فترة الثقة 95% = 0.448 - 1.119) ومعدل النشاط البدني (متغير الدلالة = 0.728 - فترة الثقة 95% = 0.562 - 0.944)، بينما وجدت علاقة معتدلة إحصائياً بين كلا من كمية الدهون العالية والعالية جداً بالمقارنة بمجموعة الأصحاء حيث كان متوسط ساعات ممارسة الرياضة الأسبوعي (6.73 ± 1.20). أما مستوي المعرفة الغذائية فكان مرتفعاً بين فئة الطلاب الأصحاء مقارنة بمجموعة الطلاب ذوي كمية الدهون القليلة والعالية، والعالية جداً. ولم يكن المستوى المعرفي الغذائي المرتفع ذي دلالة إحصائية معتدلة بالنسبة لمجموعة الطلاب ذوي كمية الدهون القليلة (متغير الدلالة = 0.986 - فترة الثقة 95% بين 0.958 و 1.015) وهذا ينطبق أيضاً على أصحاب كمية الدهون العالية والعالية جداً (متغير الدلالة = 0.984 - فترة الثقة 95% بين 0.961 و 1.008). الخلاصة: مستوى الدهون البدني العالي والعالي جداً كان منتشرًا بين الطلاب ذوي النمط الحياتي الذي يتسم بقلة النشاط البدني، لذلك نوصي بتبني برامج لزيادة المعرفة الغذائية والنشاط البدني لمكافحة مشكلة زيادة الوزن والسمنة بين الطلاب في المرحلة الجامعية

مفتاح الكلمات: السمنة، النشاط البدني، نمط الحياة.

ABSTRACT: Objectives: Body mass index (BMI), total body fat (TBF), and physical activity in relation to obesity and overweight prevalence among Omani students were studied. **Methods:** A cross-sectional study of 202 Omani students (101 males and 101 females) from Sultan Qaboos University (SQU) was carried out. Data were collected by interview using a structured questionnaire. Weight, TBF and physical activity score (PAS) were measured using TANITA scales, and height measured using a standardised measuring tape. **Results:** Subjects were classified based on BMI as: underweight (2.48%), normal weight (69.31%), overweight (26.73%) and obese (1.49%). According to TBF, 32.67% of students had low body fat scores (BFS), 26.73% high BFS and 22.28% very high BFS. Low BFS was insignificantly less likely with the increase in the mean hours of weekly exercising, (odds ratio [OR] = 0.708; 95% confidence interval [CI] = 0.448, 1.119) and the PAS (OR = 0.728; 95% CI = 0.562, 0.944). Among high and very high BFS students, the mean hours of weekly exercising (6.73±1.20) and physical activity scores (7.51±1.67) were higher than those of healthy students. Nutrition knowledge was higher among healthy students compared to low BFS, and high and very high BFS subjects. Higher nutrition knowledge was associated with a non-significant lower risk of low BFS (OR = 0.986; 95% CI = 0.958, 1.015), high and very high BFS (OR = 0.984; 95% CI = 0.961, 1.008). **Conclusion:** High and very high BFS were prevalent among subjects with sedentary lifestyles. Nutritional and physical activity interventions should be introduced to combat the problem of overweight students.

Keywords: Obesity; Physical Activity; Lifestyle; Students; Oman.

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ADVANCES IN KNOWLEDGE

1. Information gained through this study on the prevalence of overweight, and obesity among in the student population at Sultan Qaboos University can help in predicting related diseases in middle and old age.
2. Nutrition knowledge was generally very poor (below 60%) among the studied population regardless of body weight or body fat.

APPLICATION TO PATIENT CARE

1. In order to maintain a quality life style, students need to follow a regular physical activity regime and be aware of good nutrition.
2. Students with poor malnutrition and a sedentary lifestyle may develop increasingly unhealthy habits which may lead to them having higher disease risk factors.
3. Using the information from this study, weight reduction can be achieved through a programme to monitor body composition and fitness levels.
4. The knowledge obtained from this study can encourage young people to initiate an active life style early in their lives thus preventing the onset of hypokinetic diseases.

THE PREVALENCE OF OBESITY AND overweight among adults has drastically increased during the past decade. Anthropometric indices such as body mass index (BMI) and total body fat (TBF) analyses are used widely for assessing the physical well-being of adults. Worldwide, obesity and sedentary lifestyles have been involved in the aetiology of many noncommunicable diseases (NCDs) among adults.¹⁻³

Recent reports suggested that there was a direct relationship between adolescent fatness and increased risk of cardiovascular diseases.^{4,5} Health-related fitness parameters were more dependent on the anthropometrical parameters in obese than in control adolescents.⁵ Cardiovascular disease is the leading cause of mortality among adults, and a systematic analysis of population health data revealed that, among the nine risk factors of heart attacks and strokes, six risk factors are modifiable, while three are non-modifiable risk factors; these include increasing age, male gender and family history of cardiovascular disease (CVD).^{6,7} The six modifiable risk factors that are the focus of current research for primary prevention are 1) increased blood cholesterol; 2) increased blood pressure (hypertension); 3) cigarette smoking; 4) lack of regular physical exercise; 5) type 2 diabetes, and 6) obesity.

According to the World Health Organization and the American College of Sports Medicine, the most important risk factors of NCDs in Arab countries are high blood pressure; high blood cholesterol level; inadequate intake of fruit and vegetables; overweight or obesity; physical inactivity, and smoking. Five of these risks are closely related to improper diet and physical inactivity.⁸⁻¹⁰

Primary prevention of NCDs among adolescents can be achieved through early screening for associated risk factors, and health education on the various risks of obesity and a sedentary lifestyle. This study was conducted to: 1) determine the body mass index (BMI), TBF and physical activity score (PAS) of a sample of college aged students and so assess the prevalence of underweight, overweight and obesity; 2) evaluate the physical activity of all study participants, and 4) determine the relationship between the study participants' body composition (the relative amounts of various components in the body, such as percentage of body fat) and their general nutritional knowledge.

Methods

A cross-sectional survey was conducted on the Sultan Qaboos University (SQU) campus during the period August 2010 to June 2011. Enrollment in the study was on voluntary basis and it included 202 students (101 male and 101 female) from five colleges at SQU. The inclusion criteria were to be healthy subjects who were free of any endocrine disorders or any chronic diseases. The research data were collected by means of a questionnaire. The questionnaire form was composed of two sections: general and anthropometric information, and nutrition knowledge questions. Ethics committee approval for conducting the study was obtained from office of the Advisor for Academic Affairs at Sultan Qaboos University.

The study questionnaire was designed to collect sociodemographic data and general nutritional knowledge as determined by 10 multiple-choice questions, each with three possible answers. The questionnaire was pre-tested in a pilot study

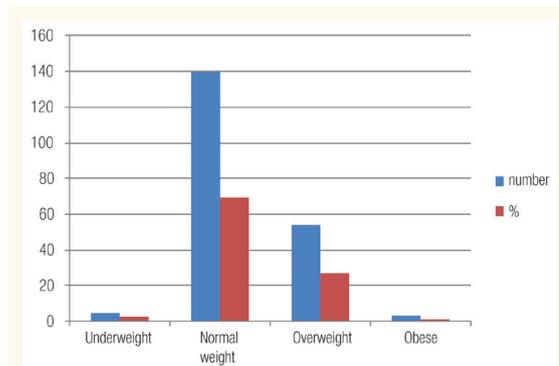


Figure 1: Numbers and percentage of underweight, normal, overweight and obese students based on body mass index classification.

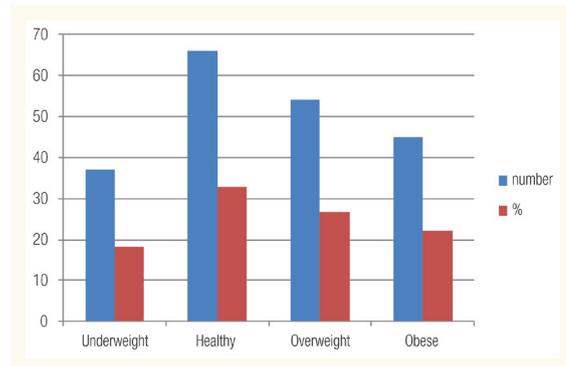


Figure 2: Numbers and percentage of underweight, normal, overweight and obese students based on total body fat classification.

on a sample of 20 students to assure its validity, reliability and reproducibility before conducting the study. Examples of the questions asked to assess the nutritional knowledge were: A) What type of dietary fibre is helpful in lowering blood cholesterol level? B) What are good sources of vitamin B₁₂? C) What are the nutrients that raise low density lipoprotein (LDL)-cholesterol levels? D) What is the highest source of energy? For all study participants, the study questionnaire was completed during a personal interview with one of the researchers.

After questionnaire completion, the weight (recorded to the nearest 0.5 kg); TBF percentage (ranges for women aged 20–39: <20% = underfat; 21–33% = healthy; 34–38% = overfat, and 39–46% = obese; ranges for men aged 20–39: <8% = underfat; 8–20% = healthy; 21–25% = overfat and 26–46% = obese) and PAS (on a scale of 1 [resting] to 9 [very active]) of each participant were determined using the TANITA Body Fat Scale Analyzer 300A (Tanita Corp., Tokyo, Japan). Height was measured to the nearest 0.5 cm using a standardised tape measure. The BMI for every subject was calculated as weight in kilograms divided by height in metres squared (kg/m²) and categorised as normal (BMI = 18–25) or overweight (BMI >25) [Figures 1 and 2].

Data analysis was done using the Statistical Package for Social Sciences (SPSS-PC, Version 17, IBM, Chicago, Illinois, USA). The scores on nutritional knowledge were computed as the percentage of correct responses to the set of questions (ranging from 0% to 100%). Univariate logistic regression analysis was used to calculate the odds ratio (OR) and associated confidence interval (CI). The significance of the results was judged at the 5% level and $P = <0.05$ was considered significant.

Results

This study included 202 students (101 male and 101 female) from five colleges at Sultan Qaboos University whose mean age was 21.22 ± 1.37 years. The mean percentage scores of enrolled students in nutrition knowledge were 56.46 ± 13.50 ; ranging from a minimum of 25% to a maximum of 85%. All students reported exercising weekly; 38.61% reported exercising 4 to 6 hours a week, and 30.69% reported exercising 7 to 9 hours a week. The PAS of 44.06% of the students ranged from 7 to 9. Based on BMI, more than two thirds of enrolled students were of normal weight (69.31%), 26.73% were overweight while obese students constituted only 1.49% of the sample. In contrast, based on percentage of body fat only, one third was healthy (32.67%) with normal body fat scores (BFS), while almost half of them had high (26.73%) or very high BFS (22.28%).

Table 2 portrays the determinants of overweight and obesity. The enrolled students were classified into three categories including normal weight ($n = 140$), underweight ($n = 5$), overweight and obese ($n = 57$). Overweight or obesity were encountered among 77.78% of male students and 27.78% of female students. The risk of overweight and obesity was 3.8 times higher among male students (OR = 3.843; 95% CI = 1.950, 7.572). The mean age of overweight and obese students (21.07 ± 0.90 years) was slightly lower than that of students with normal weight (21.22 ± 1.79 years). The risk of overweight and obesity was lower with the increase in age yet insignificant (OR = 0.885; 95% CI = 0.669, 1.171). There was no relation in respect to excess risk of low, high or very high BFS with the type of college attended. The percentage of students who were

Table 1: Description of students enrolled in the study

Characteristic	No.	%
Gender		
Male	101	50.00
Female	101	50.00
Age (years)		
18–20	49	24.26
21–23	145	71.78
24–25	8	3.96
SQU College:		
Medicine	40	19.80
Agriculture	40	19.80
Education	44	21.78
Engineering	38	18.81
Nursing	40	19.80
Nutritional Knowledge		
25–30	21	10.40
40–54	69	34.16
55–69	76	37.62
70–85	36	17.82
Exercises (hours/week)		
2–3	62	30.69
4–6	78	38.61
7–9	62	30.69
Physical Activity Score		
1–3	49	24.26
4–6	64	31.68
7–9	89	44.06
Body mass index		
Underweight (<18)	5	2.48
Normalweight (18-25)	140	69.31
Overweight (>25)	54	26.73
Obese (>40)	3	1.49
Body fat scores		
Underweight	37	18.32
Healthy	66	32.67
Overweight	54	26.73
Obese	45	22.28

overweight and obese was the lowest (12.96%) among those who scored 70% to 85% on the

nutrition knowledge questionnaire. Relative to this category of students, the risk of overweight and obesity was higher among those who had lower scores on nutrition knowledge, yet it was not statistically significant.

The majority of overweight and obese students was exercising for more than 3 hours a week and had a physical activity scores ranging from 4 to 9. Among overweight and obese students, the odds of exercising for 4 to 6 hours a week was 2.939 (95% CI = 1.255, 6.884) and the odds of exercising for 7 to 9 hours a week was 2.788 (95% CI = 1.152, 6.749). Among this group, the odds of physical activity scores of 4 to 6 was 4.5 (OR = 4.545; 95% CI = 1.431, 14.438) and increased to 5.8 for physical activity scores of 7 to 9 (OR = 5.893; 95% CI = 1.934, 17.955).

As illustrated in Tables 3 and 4, the study subjects were classified as healthy (normal BFS) (n = 66, 32.67%), low BFS (n = 37, 18.32%) and high or very high BFS (n = 99, 49.2%). The majority of female students (90.91%) were healthy. All underweight students were female and 95.96% of male students had either high or very high BFS. The risk of high or very high BFS was 237.5 times among male students relative to female students (OR = 237.5; 95% CI = 64.35, 876.51). Increase in students' age was associated with an insignificantly higher risk low BFS (OR = 1.198; 95% CI = 0.848, 1.692) as well as high or very high BFS (OR = 1.045; 95% CI = 0.791, 1.380). There was no relation in respect to excess risk of low, high or very high BFS with the type of college attended.

The mean percentage of score on nutrition knowledge was slightly higher among healthy students (58.33±13.93) compared to those who had low BFS (56.78±13.64) as well as those who had high or very high BFS (55.53±12.88). Higher nutritional knowledge was associated with an insignificantly lower risk of having a low BFS (OR = 0.986; 95% CI = 0.958, 1.015) as well as having a high or very high BFS (OR = 0.984; 95% CI = 0.961, 1.008).

The mean hours of weekly exercising were slightly higher among healthy students (3.65±1.19) relative to those with low BFS (3.41±0.67). Among the latter, the physical activity score (3.66±1.52) was lower than that of healthy students (4.26±1.87). The likelihood of a low BFS was insignificantly lower with the increase in the mean hours of weekly exercising (OR = 0.708; 95% CI = 0.448, 1.119) and the physical activity scores (OR = 0.728; 95% CI = 0.562, 0.944).

Table 2: Determinants of overweight and obesity based on body mass index

Characteristic	Normal weight (n = 140)		Overweight/Obese (n = 57)		OR	95% Confidence Interval
	No.	%	No.	%		
Gender						
Male	59	42.14	42	77.78	3.843	1.950, 7.572
Female	81	57.86	15	27.78		
SQU College						
Agriculture	31	22.14	8	14.81	1	
Medicine	27	19.29	12	22.22	0.680	0.240, 1.929
Education	25	17.86	16	29.63	1.172	0.443, 3.096
Engineering	28	20.00	10	18.52	1.687	0.662, 4.301
Nursing	29	20.71	11	20.37	0.942	0.346, 2.563
Nutritional Knowledge						
25–39	13	9.29	6	11.11	1.912	0.536, 6.819
40–54	48	34.29	20	37.04	1.726	0.650, 4.583
55–69	50	35.71	24	44.44	1.989	0.763, 5.184
70–85	29	20.71	7	12.96	1	
Exercises (hours/week)						
2–3	49	35.00	9	16.67	1	
4–6	50	35.71	27	50.00	2.939	1.255, 6.884
7–9	41	29.29	21	38.89	2.788	1.152, 6.749
Physical Activity Score						
1–3	40	28.57	4	7.41	1	
4–6	44	31.43	20	37.04	4.545	1.431, 14.438
7–9	56	40.00	33	61.11	5.893	1.934, 17.955
Age (years)						
X ± S	21.22±1.79		21.07±0.90		0.885	0.669, 1.171
Min–Max	18–25		19–23			

Among students with a high or very high BFS, the mean hours of weekly exercising (6.73 ± 1.20) and physical activity scores (7.51 ± 1.67) were higher than those of healthy students. Relative to healthy students, students with a high or very high BFS were 4.6 times more likely to exercise (OR = 4.641; 95% CI = 3.034, 7.101) and their physical activity scores were 2.3 times higher (OR = 2.311; 95% CI = 1.828, 2.922).

On the nutritional knowledge scale, the mean scores of female students (57.04 ± 14.031) were slightly higher than those of male students (55.87 ± 12.983) yet not statistically significant (t

= 0.614, $P = 0.540$). On the other hand, the mean physical activity score of male students (7.75 ± 1.081) was significantly higher than that of female students (3.60 ± 1.670) where $t = 20.925$, $P = 0.000$. Also, male students spent significantly more time exercising weekly (6.84 ± 1.037) than female students (3.36 ± 0.701) where $t = 27.986$, $P = 0.000$.

Discussion

In our study, the whole population was similar in their eating/dietary habits as well as in residential status, thus eliminating the dietary factor

Table 3: Determinants of percentage of body fat

Characteristic	Healthy (n = 66)		Underweight (n = 37)		OR	95% CI	Overweight/ Obese(n = 99)		OR	95% CI
	No.	%	No.	%			No.	%		
Gender										
Male	6	9.09	0	0.00			95	95.96	237.500	64.353, 876.512
Female	60	90.91	37	100.00			4	4.04		
College										
Agriculture	14	21.21	7	18.92	1		19	19.19	1	
Medicine	11	16.67	8	21.62	1.455	0.402, 5.260	21	21.21	1.407	0.515, 3.840
Education	14	21.21	7	18.92	1	0.277, 3.608	23	23.23	1.211	0.464, 3.156
Engineering	12	18.18	8	21.62	1.333	0.373, 4.768	18	18.18	1.105	0.405, 3.020
Nursing	15	22.73	7	18.92	0.933	0.261, 3.343	18	18.18	0.884	0.334, 2.339
Age (years)										
$\bar{X} \pm S$	21.11±1.14		21.38±1.13		1.198	0.848, 1.692	21.16±1.12		1.045	0.791, 1.380
Min–Max	18–25		20–25				18–24			
Nutritional knowledge (%)										
$\bar{X} \pm S$	58.33±13.93		56.78±13.64		0.986	0.958, 1.015	55.53±12.88		0.984	0.961, 1.008
Min–Max	30–85		36–81				33–84			
Exercise (hours/week)										
$\bar{X} \pm S$	3.65±1.19		3.41±0.67		0.708	0.448, 1.119	6.73±1.20		4.641	3.034, 7.101
Min–Max	2-8	2-5			3-9					
Physical Activity Score										
$\bar{X} \pm S$	4.26±1.87		3.66±1.52		0.728	0.562, 0.944	7.51±1.67		2.311	1.828, 2.922
Min–Max	1-9		1-8				1-9			

Legend: OR = odds ratio; CI = confidence interval

contribution in the aetiology of overweight and obesity. Nutrition knowledge was generally very poor (below 60%) among the studied population regardless of body weight or body fat. There was a gender variation in PAS and number of hours spent in exercising every week; males spent more hours exercising, due to cultural norms such as males having more access to fitness clubs and outdoors physical activities than their female peers. The rate of PAS and number of hours of exercising per week were higher in overweight and obese subjects, perhaps because of the need they expressed to lose weight as observed during the interview session.

BMI is not the perfect measure for assessing overweight and obesity for all population groups,¹¹ body fat percentage being a better indicator for classifying the prevalence of overweight and

obesity.^{12,13} In our study, the majority of female students were healthy, while male students scored higher in overweight and obesity than female students, which is consistent with recent reports from other Arab countries.^{14,15} In the 2008 Yahia, *et al.* study on Lebanese students, the prevalence of overweight and obesity was more common among male students compared to females (37.5% and 12.5% versus 13.6% and 3.2%, respectively).¹⁴ The lower rate of obesity among female students might be because of their desire to be slimmer due to their concern with body image during adolescence.¹⁶

A recent study conducted in Kuwait of 787 students (48% males and 52% females) reported that 354 students were physically inactive, and that obesity was more prevalent in males (13%) than in females (10.5%).¹⁷ It seems that in the Gulf

Table 4: Gender differences in nutritional knowledge, physical activity score and exercise

Knowledge and Physical activity	Male (n = 101)		Female (n = 101)		t-test	P value
	X	S	X	S		
Nutritional knowledge (% of correct answers)	55.87	12.983	57.04	14.031	0.614	0.540
Physical activity score (TANITA)	7.75	1.081	3.60	1.670	20.925	0.000
Physical activity (Hours/week)	6.84	1.037	3.36	0.701	27.986	0.000

countries societal perceptions encourage females to be slimmer. This assumption was supported by the fact that all 5 underweight students were female as compared to male in this studied sample. Obviously, pictures of movie stars and models in fashion magazines and mass media have a strong impact on girls' body shape and image perception.¹⁶ In addition, the results of general nutritional information for females support their desire for health and good body composition. Anecdotal evidence seems to indicate that female university students in this region see the shape and weight of fashion models as the ideal body shape and figure to attain in order to get married early after graduation, especially in Oman.

Contrary to this finding, a research study in the south of Brazil studied a group of 738 public university students (59.2% males) with regards to their physical activity participation and weight gain. They found that female and overweight students were less involved in physical activity, and the prevalence of inadequate physical activity participation was 30.8%.¹⁸ Cultural differences may affect societal perceptions towards lifestyle and body image and genders on the one hand, while, on the other hand, overweight students are usually less active due to their lower physical fitness. Physical inactivity, disordered eating perceptions, and disordered eating behaviour are associated with increased rates of overweight and obesity.^{19,20} Identification of these risk factors in obese youths may increase the understanding of weight loss barriers and facilitate the treatment of adolescent obesity.

Eating and physical activity behaviours appear to be determined by a complex interplay between motivation and self-regulatory skills as well as the unique social and physical environment of college life.²¹ Moreover, there appear to be gender differences in how these determinants impact behaviour.²² In this study, female responses were

different to those of males as shown in Table 4.

Although this study has some limitations and may be subject to bias given the small sample size, its findings are consistent with the general trends of an increasing prevalence of obesity, decreasing engagement in physical activity, the emergence of numerous resultant health risks and the great cost of obesity necessitating heightened efforts toward controlling and reducing this trend. Increased physical activity among college students would be helpful in preventing overweight and obesity and their resulting chronic diseases such as type 2 diabetes mellitus, coronary heart disease, stroke, osteoporosis, some forms of cancer, and gall bladder disease. Behavioural modifications, dietary intervention studies, and health education to promote the benefits of being physically active should be instituted to increase the practice of sports and other physical activities in order to control and decrease obesity-related morbidity and mortality.

Conclusion

Physical inactivity and lack of basic nutritional knowledge about healthy foods and energy dense foods were the main factors associated with overweight and obesity among the study participants. Overweight and obesity, if not managed, will be involved in the aetiology of noncommunicable diseases among this high risk group of the Omani population. There is a need to adopt nutritional and physical activity awareness strategies and intervention programmes on the SQU campus to combat the problem of overweight among its students.

CONFLICT OF INTEREST

The authors declared no conflict of interest and state that no funding was received for this work.

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