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Association Between Sleep Quality, Body Mass, And Health Risk Factors in University Students

Nora Alafifa[1]*, Maha Alharithyb[2], Waad Alfawaza[1], Monirah Albloushib[1], Nawaf W. Alruwailia[1], Aghadir Alzahrania[1], Rahaf Alnadharya[1]

[1] Department of Community Health Sciences, College of Applied Medical Sciences, King Saud University, P.O. Box 10219, Riyadh 11433, Saudi Arabia
[2] College of Nursing, King Saud University, Riyadh, PO Box 11433, Saudi Arabia

***Corresponding Author**: walfawaz@ksu.edu.sa

Abstract

Background: Obesity and sleep disorders can adversely affect the quality of life. It is important to recognize the risk factors associated with obesity and sleep disorders to minimize their effects on health. This study aimed to identify the relationship between sleep quality (SQ), body mass index (BMI), and associated health factors such as body composition (fat-free mass (FFM), fat percentage), sex, diet patterns (meal timing, vegetable intake, and caffeine consumption), and unhealthy behaviors (smoking and physical activity) among King Saud University students (KSU). **Methods:** A cross-sectional study was conducted at KSU University, and 184 students were included. Data were collected using a self-administered questionnaire, including sociodemographic information, physical activity, Food Frequency Questionnaire (FFQ), and Pittsburgh Sleep Quality Index (PSQI). In Body 770 was used to measure body composition. Data were analyzed using SPSS statistical software. **Results:** A significant association was observed between SQ and weight gain or loss (p= 0.034). Health-related factors were not associated with SQ. **Conclusion:** The results of this study added to our knowledge of the association between SQ and BMI and increased public awareness of the importance of maintaining a good sleeping quality to achieve healthy body weight, as doing so helps to prevent future health issues brought on by unhealthy body weight.

Keywords: Sleep quality, BMI, health factors, body composition, KSU

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Introduction

In recent decades, the increasing prevalence of overweight and obesity has become a major public health challenge [1]. According to the World Health Organization, they have reached epidemic proportions, and now the number of obese people is more than underweight worldwide, except in Asia and sub-Saharan Africa [2]. Obesity is linked with diseases such as cancer and cardiometabolic diseases such as stroke, heart disease, and type 2 diabetes (T2DM) [3]. T2DM is also a complication of obesity, which can indirectly lead to blindness and kidney disease [4]. BMI has been used to classify overweight and obese individuals. A BMI equal to or greater than 25 kg/m2 indicates overweight, and a BMI more significant than 30 kg/m2 is obesity [5].

Sleep is essential for health and well-being [6]. According to the Saudi Ministry of Health, the recommended sleep duration for adults is seven hours [6]. Sleep has many benefits, such as feeling rested, normal reflexes, positive relationships [7], and good quality of sleep for a long time, which may maintain or lose weight [8-9], improve athletic performance [10-11], affect sugar metabolism, and reduce the risk of T2DM [12-13].

Sleep quality has gained the attention of many recent studies because some have shown that poor sleep is closely associated with adverse health outcomes, particularly cognitive decline in the elderly [14]. Sleeping quality decreased slowly with aging [15]. Other factors that affect Sleeping quality include diet, caffeine intake, and physical activity [16]. This study aimed to identify the relationship between SQ, BMI, and body composition among KSU students, in addition to investigating other associated factors such as body composition (FFM, fat%), sex, diet patterns (meal timing, vegetable intake, and caffeine consumption), and behaviors (smoking and physical activity).

Methods

Study Design

This cross-sectional study was conducted among randomly selected KSU students in Riyadh (male and female). After collecting data from the participants in the CAMS clinic, male students were separated from female students, and each had their own clinic. Ethical approval was granted by the College of Medicine Institutional Review Board of the Kings Saud University (E-23-7468). Written consent to participate in the study was obtained from all those who agreed to participate.

This study was conducted in 2022 to analyze the effect of SQ on BMI among KSU students and to investigate associated factors, such as body composition, sex, dietary patterns, and behaviors. Data were collected between December 2022 and February 2023. The inclusion criterion was KSU students of both sexes aged ≥18 years. The exclusion criteria were pregnant and lactating women and individuals with a confirmed diagnosis of sleep apnea.

Appointments were scheduled in the CAMS clinics to obtain body measurements using an in-body device that measured body mass, FFM, %fat, and fluids. Additionally, a self-report questionnaire was administered to assess the SQ. Data were collected using a PSQI questionnaire, and food frequency was examined and analyzed. The participants were provided with FFM analysis as an incentive for their participation.

In addition to providing a detailed analysis of the full body and segmental body composition, Tanita's wide range of professional analyzers

provide weight, impedance, body %fat, body fat mass, BMI, FFM, estimated muscle mass, total body water, and basal metabolic rate. Even in the most demanding healthcare environment, the Tanita Line of Scales offers high performance, convenience, and longevity. The featured products include convenient carrying cases, height rods, and software.

Assessment tools

The study comprised 184 participants (131 males and 53 females) who completed an electronic questionnaire. Anthropometric measurements were obtained from the subjects, including weight, height, and body composition, using a Tanita device. Participants responded to inquiries regarding self-reported weight fluctuations, PSQI, dietary habits (such as meal timing, vegetable consumption, and caffeine intake), and lifestyle factors (including smoking and exercise).

The PSQI, a publicly available and validated self-assessment instrument, evaluates sleep quality and disturbances over a one-month period. It encompasses seven components: (1) subjective sleep quality, (2) sleep latency, (3) sleep duration, (4) habitual sleep efficiency, (5) sleep disturbances, (6) use of sleep medication, and (7) daytime dysfunction. The PSQI scores range from 0 to 21, with scores of 0-4 indicating "good" sleep and 5-21 signifying "poor" sleep.

Statistical analyses

Statistical analyses were performed using SPSS software. In addition, the results at $p < 0.05$ were considered statistically significant to investigate the association between SQ and BMI. Pearson's chi-square test was used to analyze the effects of SQ on several variables including body weight, meal timing, vegetable intake, and caffeine consumption. The correlation between SQ and other factors, such as body composition, physical activity, sex, and smoking, was analyzed using Spearman's rho test.

Results

This study was conducted with randomly selected students at KSU. The study sample consisted of 184 students. Table 1 shows the sociodemographic characteristics of the study participants. Male participants were more (70%) than females (30 %). Most participants were healthy (94.6%), single (96.7%), and had a bachelor's degree (96.2%). Most participants had a normal BMI, as shown in Figure 1.

Table 1: Sociodemographic characteristics of participants (n=184)

Characteristics	(Mean+-SD), n (%)
Age (years)	
18-20 years old	86 (46.7%)
21-23 years old	89 (48.4%)
24-26 years old	9 (4.9%)
Gender	
Male	129 (70%)
Female	55 (30%)
Weight (kg)	70.6 +-21
Height (cm)	167.6+-17.1
BMI (Kg/m2)	24.7 +- 6.4
Fat percentage	23.2 +-9.3
FFM (kg)	52.5 +-15.7
Academic qualifications	
Bachelor	177 (96.2%)
Diploma	7 (3.8%)
Chronic disease	
No chronic disease	174 (94.6%)
Diabetes	5 (2.7%)
Hypertension	1 (0.5%)
Asthma	4 (2.2%)
Marital status	
Single	178 (96.7%)
Married	6 (3.3%)

Keys - SD: standard deviation, BMI: body mass index, Kg: Kilograms, cm: Centimeters, m2= meters square.

Figure 1. BMI distribution among KSU participants.

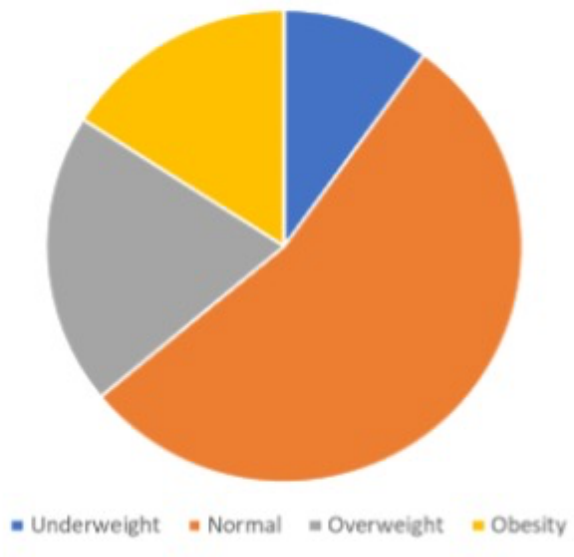

Figure 2. Sleep quality Among the Participants of the study.

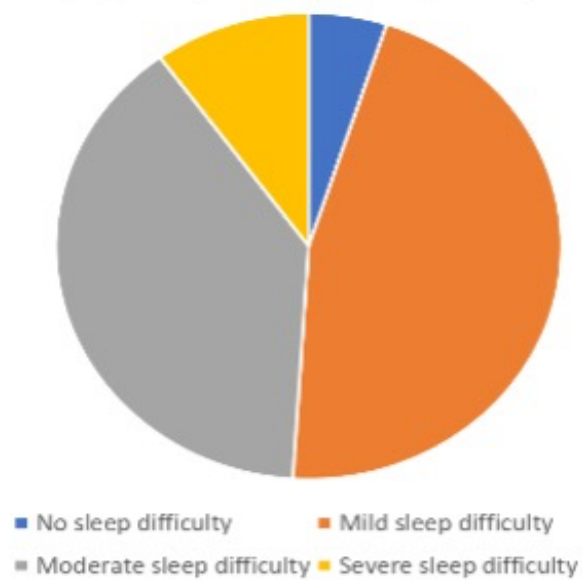

Table 2. The impact of sleep quality on body weight was assessed using Pearson's chi-squared tests (n=184).

	How would you rate your sleep quality?				p
	Fairly good	Good	Fairly bad	Bad	
Did you gain or lose weight?					
Gain	32	7	8	18	0.034
Lose	25	8	6	9	
No change	42	22	20	9	

The study's results were analyzed using Pearson Chi-square tests to determine the impact of SQs shown in Figure 2 on body weight, meal timing, vegetable intake, and caffeine intake.

We found a significant relationship between SQ and weight gain or loss, equal to 13.67, with a corresponding P-value <0.05, as shown in Table 2. However, SQ did not significantly affect the meal timing, vegetable intake, or caffeine intake.

Chi-square analysis was conducted to examine the association between self-reported sleep quality and the frequency of vegetable consumption (Table 3).

Table 3. Sleep quality and its relationship with factors such as vegetable intake, meal timing, and caffeine consumption (n=184).

	How would you rate your sleep quality?				p
	Fairly good	Good	Fairly bad	Bad	
What is your average weekly vegetable intake?					
3-4 times weekly	16	15	12	9	0.007
5-6 times weekly	11	0	1	1	
1-2 times weekly	56	14	15	14	
Never	4	3	4	7	
Daily	12	5	2	5	
When do you eat your meals?					
Daytime	8	5	0	1	0.000
Night-time	20	13	22	17	
Distributed	71	19	12	18	
How much caffeine do you consume?					
1 cup = 250ml	Fairly good	Good	Fairly bad	Bad	0.133
4 cups or less daily	75	31	23	30	
More than 4 cups	12	1	6	6	
Not consuming caffeine beverages	12	5	5	0	

The results revealed a statistically significant relationship between these variables ($\chi^2(12) = 27.186$, $p = 0.007$). Individuals who consumed vegetables more frequently were more likely to report higher sleep quality, whereas those who rarely or never consumed vegetables were more prone to reporting lower sleep quality. This study also investigated the relationship between sleep

quality and meal timings (Table 3). A significant association was observed between these variables ($\chi^2(6) = 29.070$, $p < 0.001$). Participants who distributed meals throughout the day reported the highest sleep quality, whereas those who primarily consumed meals during nighttime hours were more likely to report poor sleep quality. Furthermore, this study examined the relationship between sleep quality and caffeine consumption (Table 3). No significant correlation was found between the two variables ($\chi^2(6) = 9.816$, $p = 0.133$). This finding suggests that the quantity of caffeine consumed within the measured range did not significantly influence the perceived sleep quality.

Additionally, Spearman's rho test was used to analyze the correlation between SQ and other factors, such as body composition, physical activity, gender, and smoking. There was no significant correlation between sleep quality and other factors, with corresponding P-values of > 0.05.

Discussion

This study investigated the relationship between SQ and BMI among KSU students, as well as investigating other associated factors such as body composition (FFM, fat%), gender, diet patterns (meal timing, vegetable intake, and caffeine consumption), and behaviors (smoking and physical activity). The results showed that poor SQ and BMI were positively correlated ($p < 0.05$).

Furthermore, our results are consistent with studies that found that poor SQ is linked to higher BMI and obesity, independent of age and sex [17-19]. On the other hand, cross-sectional studies conducted on university students found that SQ is inversely related to BMI, and poor SQ is more prevalent in females than males [18 ; 20].

According to our study, SQ had no significant effect on diet patterns, including meal timing, vegetable intake, or caffeine consumption. However, many studies have shown that unhealthy eating habits, such as skipping breakfast, replacing meals with snacks, and low intake of vegetables, fruits, dairy products, lean meat, legumes, sweets, and sugary soft drinks, can contribute to poor SQ [21-22]. Higher caffeine consumption is also associated with worsening SQ among university students [23-24].

A systematic review and meta-analysis of moderate-to-high-intensity physical activity in university students demonstrated an association with improved sleep quality (SQ) and a weak negative correlation with sleep duration [25]. The present study found no correlation between physical activity and poor SQ or body mass index (BMI). In contrast, Amiri et al. observed that regular exercise improved SQ among overweight male college students [26]. However, dieting and exercising for weight loss were not significantly associated with SQ among university students (Claydon et al. 2023). This investigation indicates that body composition and smoking did not significantly affect BMI or SQ among college students.

This study has several strengths. First, no study has determined the relationship between body composition and smoking based on its impact on BMI and SQ among KSU students in Saudi Arabia. Second, the study used a validated PSQI questionnaire, and the FFQ was translated into Arabic. Finally, the weight, height, and weight of the trained students were obtained using Tanita equipment. However, this study has several limitations. The cross-sectional design of this study prevents the establishment of causal relationships. The sample size was relatively small, and the majority of participants were Saudis within the same age group, exhibiting a

normal BMI and good SQ. Consequently, these findings may not be generalizable to other ethnic groups or individuals of various ages.

Conclusion

This study demonstrated a positive correlation between poor sleep quality (SQ) and weight fluctuations, meal timing and vegetable intake among King Saud University (KSU) students. However, no significant correlation was observed between SQ and other associated factors, including body composition (fat-free mass and fat percentage), sex, dietary patterns (caffeine consumption), and behavioral factors (smoking and physical activity) among KSU students. The findings of this research could be used in future studies to enhance participants' awareness of the impact of SQ on body mass index (BMI), and improvements in SQ may potentially mitigate weight gain among university students. Future studies should use longitudinal designs and incorporate larger and more diverse cohorts. The implementation of awareness campaigns emphasizing the benefits of proper sleep hygiene could potentially reduce weight-related health risks in the university population.

Ethics approval and consent to participate

Consent to participate in the study was obtained from all the participants. This study was approved by the Institutional Review Board of the College of Medicine of Kings Saud University (E-23-7468).

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Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this study.

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