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Exploring the interplay between stress level, sleep quality, and body composition among university students: A cross-sectional study

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Abstract:

BACKGROUND: High levels of stress and inadequate sleep are contributing factors that influence body composition and physical health. Therefore, this study explored the prevalence and interrelationship between stress level, sleep quality, and body composition among medical undergraduate students at the University of Sharjah.

MATERIALS AND METHODS: This quantitative cross-sectional study was conducted among medical university students in the United Arab Emirates (UAE) ($n = 911$). Anthropometric measurements and body composition analysis (BCA) were carried out. Moreover, perceived stress was measured using the Perception of Stress Scale (PSS)-10, while sleep quality was evaluated using the Pittsburgh Sleep Quality Index (PSQI) questionnaires. A simple linear regression test was used to investigate the relationship between the primary outcome-dependent variable (PSQI and PSS) and the independent variable (BCA). Descriptive and analytical statistics were conducted using SPSS software version 29, with a significance level set at $P < 0.05$.

RESULTS: Around 12% of the students were obese, and most students exhibited moderate stress levels and poor sleep quality. The PSS scores were significant ($P = 0.0001$) and positively associated with the PQSI scores. Sleep quality scores revealed a positive and significant correlation with fat mass (FM) ($P = 0.022$), visceral fat rating (VFR) ($P = 0.011$), and visceral fat surface area (VFSA) ($P = 0.011$), while negatively correlated with total body water percentage ($P = 0.02$). Perceived stress showed a significantly positive correlation with FM ($P = 0.003$) while negatively correlated with fat-free mass (FFM) ($P = 0.000$), muscle mass (MM) ($P = 0.000$), total body water (TBW) ($P = 0.000$), total body water % (TBW%) ($P = 0.000$), bone mass (BM) ($P = 0.000$), and basal metabolic rate (BMR) ($P = 0.000$).

CONCLUSION: The high prevalence of perceived stress and poor sleep quality interact in a directionally significant manner, influencing the physical health and body composition of the students.

Keywords:

Adiposity, behavior, body fat distribution, body weights and measures, sleep quality

Introduction

In the dynamic landscape of university life, students often find themselves navigating a delicate equilibrium between academic demands, social commitments, and personal well-being. As the pursuit of academic excellence becomes increasingly demanding, understanding the intricate relationships among these variables becomes essential for promoting holistic well-being.[1] According to a study in Sharjah, UAE, a 29% prevalence

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of stress has been reported among university students.[2] Moreover, another study reported a 63.5% prevalence of psychological stress among medical students in Saudi Arabia.[3] Previously, it was revealed that an increase in stress level is a significant predictor of poor sleep quality.[4]

Elevated stress and insufficient sleep have been associated with poorer physical health status and altered body composition. Stress, a pervasive aspect of modern life, has been recognized as a significant factor influencing both mental and physical health.[5] Higher perceived stress is associated with emotional eating [6], and the interaction between stress and emotional eating harms body mass index (BMI).[7] Simultaneously, sleep quality, a vital component of overall well-being, is recognized as playing a crucial role in cognitive function, emotional regulation, and metabolic processes.[8] Therefore, sleep is likely a critical factor in maintaining the balance of core body tissues, including bone, fat, and muscle mass. Previous studies have shown that short sleep and chronic poor sleep increase the prevalence of low muscle mass and sarcopenia [9,10], whereas a high BMI is associated with shorter sleep duration.[11]

Given the increasing prevalence of various chronic diseases and comorbidities due to unhealthy lifestyle choices, sleep could be a key target in promoting a healthy body composition up until old age.[12] Poor sleep perpetuates a cascade of metabolic consequences that may not only increase the risk of obesity but also confound weight loss efforts.[13] Considering this, the meta-analytic results showed that longer sleep duration, better sleep quality, and lower insomnia symptoms were associated with a lower body mass index (BMI) and a lower percentage of body fat. In comparison, shorter sleep duration (less than 7 hours) and lower sleep quality were associated with a higher risk of obesity.[14] One study demonstrated that a high BMI was related to higher sedentary behavior in men, which, in turn, was significantly associated with shorter sleep duration.[15]

Stress, sleep, and BMI are interconnected; that is, high levels of stress lead to shortened and poor sleep[16], while inadequate sleep can exacerbate stress.[17] Conversely, adequate sleep and lower stress levels are associated with a lower body mass index (BMI).[18] Furthermore, a study conducted in Oman among medical university students found that perceived stress was significantly correlated with poor quality sleep and disrupted sleep patterns.[19] Nonetheless, none of the previous works have examined the complex interrelationship between the three components (stress, sleep quality, and anthropometrics) among university students in the GCC region, which has different environmental, economic, and social backgrounds compared to the other tested populations. The novelty of the current work stems from the fact that it is the first to have been conducted in diverse cultural, economic, and socioeconomic contexts, as compared to the published literature. It is well-established that cultural factors can significantly influence behavior, health outcomes, consumer choices, and social interactions. Hence, the current research in diverse contexts can reveal how cultural norms, values, and practices affect specific phenomena.

The university environment, characterized by distinct academic pressures, social dynamics, and lifestyle choices, offers an ideal context for this investigation. This study examined the interplay between stress levels, sleep quality, and body composition among university students in the UAE to identify patterns, correlations, and potential causal relationships.

Materials and Methods

Study design and settings

This study employed a quantitative, cross-sectional design. The eligibility criteria included students registered at the University of Sharjah during the 2018/2019 academic year, aged between 18 and 30, of both sexes, who were willing to participate and sign the consent form. Those under 18 years old, pregnant individuals, individuals with implanted medical devices, or those with chronic illnesses that could impact their regular dietary and lifestyle habits were excluded.

Study participants and sampling

The university's four campuses were utilized for non-probability quota sampling to recruit participants. The recommended sample size of 384 was determined using a valid online sample size calculator, "Raosoft" (http://www.raosoft.com/samplesize.html), with a 5% margin of error, a 95% confidence level, and a 50% response rate. An additional 20% (attributed to attrition rate) was accounted for, resulting in approximately 461 participants. The actual collected sample size was 911 participants.

Data collection tool and technique

Anthropometric assessment and body composition

Height measurements were conducted using a SECA 769 digital column scale (Seca Deutschland, Hamburg, Germany). Participants were asked to stand upright with their heads, shoulder blades, buttocks, calves, and heels in continuous contact with the stadiometer's vertical height rod and their heads aligned in the Frankfurt plane. The participant's height was then measured by placing the horizontal headpiece on top of their head. Height was measured twice without shoes, and the average of the two values was used for each measurement, accurate to the nearest millimeter. The study utilized the body composition analyzer (TANITA

BC-420MA, Tanita Corp., Tokyo, Japan) to measure several anthropometric parameters, including body weight (BW), fat mass (FM), fat-free mass (FFM), bone mass (BM), muscle mass (MM), fat percent, total body water (TBW), basal metabolic rate (BMR), and visceral fat rating (VFR). Visceral fat surface area (VFSA) was obtained by multiplying the visceral fat rating by ten as instructed by the manufacturer's manual.

Demographic form

The socio-demographic information gathered included sex, age, nationality, marital status, place of residence, smoking status, income, college affiliation, and educational level.

Perception of Stress Scale (PSS)

The PSS-10 is a widely used and validated psychological self-reported instrument for measuring the perception of stress. It consists of 10 items that ask respondents about their thoughts and feelings over the past month. Each item is rated on a scale from 0 (never) to 4 (very often), resulting in a total score ranging from 0 to 40. Higher scores indicate greater perceived stress. The scores are categorized as follows: 0–13 (mild stress), 14–25 (moderate stress), and 26 or above (severe stress).[20,21] The reliability and validity of the English and Arabic versions of the PSS were reported by Lee[22] with Cronbach's alpha values for internal consistency reported as 0.85 for the English version and 0.84 for the Arabic version, indicating good reliability and validity.

Pittsburgh Sleep Quality Index (PSQI)

Sleep quality was evaluated using the Pittsburgh Sleep Quality Index (PSQI),[23] a self-administered questionnaire designed to measure sleep quality and disturbances over the past month subjectively. The PSQI includes 19 items that generate seven component scores. Each component is scored on a scale from 0 (no difficulty) to 3 (severe difficulty). These scores are then summed to produce a global PSQI score ranging from 0 to 21, with higher scores indicating poorer sleep quality. Scores from 0 to 4 indicate "good" sleep, while scores from 5 to 21 indicate "poor" sleep.[23] The reliability and validity of the English and Arabic versions of the PSQI have been reported elsewhere,[24,25] with Cronbach's alpha values for internal consistency of 0.83 for the English version and 0.82 for the Arabic version, indicating good reliability and validity.

Statistical analysis

Descriptive statistics were conducted for categorical variables using frequencies and percentages, while continuous variables, including PSS-10 and PSQI total scores, as well as anthropometric data, were summarized as means ± standard deviations (SD). BMI was categorized based on WHO criteria: underweight (<18.5 kg/m²) normal weight (18.5–24.9 kg/m²), overweight (25.0–29.9 kg/m²), and obese (>30.0 kg/m²).[26]

The analysis of variance (ANOVA) test and an independent sample T-test were used to assess the differences between categorical variables in terms of the continuous variables. A correlation test was conducted to determine the relationship between two continuous variables. Crosstabs and Chi-square tests were used to assess the correlation between the categorical variables. A simple linear regression model was used to investigate the relationship between the primary outcome-dependent variable (PSQI and PSS) and the independent variables (body composition variables). Data analysis was conducted using IBM SPSS Version 29.0 (USA), with a significance level set at $P < 0.05$.

Ethical considerations

Researchers approached students and asked them to participate in the study after providing a verbal explanation of its significance, objectives, and protocol. Participants who agreed to take part were given an information sheet and a consent form. Written informed consent was obtained from all participants, and the study was conducted in accordance with the Declaration of Helsinki, following approval from the research ethics committee at the University of Sharjah (reference: REC-20-05-26-02-S).

Results

Table 1 presents the sociodemographic characteristics and nutritional status of the surveyed students. The percentage of male and female students was nearly equal (49.5% vs. 50.5%). The age range of students was 18 to 30 years, with the majority (76.5%) under 21 years. Approximately 95.7% of students were single, and less than half (45.2%) belonged to the Arab non-GCC (Gulf Cooperation Council) group. About two-thirds (65.2%) were living with families. About a quarter (23.9%) of the students were smokers, while the monthly family income of 73.5% of the students was below 5,000 AED (approximately $1,360). Regarding the study discipline, almost half of the students (49.7%) were enrolled in medical and health sciences. Most students belong to the first and third academic year. Furthermore, based on BMI, 26.1% of the students were overweight, respectively.

The mean stress level and sleep quality index of the students were 19.36 and 6.95, respectively. The mean PSS and PSQI scores were 19.36 ± 5.74 and 6.95 ± 3.40, respectively. The findings suggested that the majority of students (72.6%) were experiencing moderate stress, while a similar proportion (72.8%) had poor sleep quality [Table 2].

Table 3 summarizes the body composition analysis (BCA) and its distribution based on the students' stress levels (mild, moderate, and severe). BW ($P = 0.022$), height (Ht) ($P = 0.001$), fat% (FP) ($P = 0.001$), FM ($P = 0.020$), FFM ($P = 0.001$), MM ($P = 0.001$), TBW ($P = 0.001$), TBW% ($P = 0.001$), BM ($P = 0.001$), and BMR ($P = 0.001$) were significantly different between mild, moderate, and severe stress levels, while there was no significant difference in the mean level of VFR, VFSA, and BMI.

Table 1: Sociodemographic characteristics and nutritional status of the students (*n*=911)

	Variables	Frequency	%
Sex	Male	451	49.5
	Female	460	50.5
Age group (years)	18 to 21	697	76.5
	22 to 25	204	22.4
	26 to 30	10	1.1
Nationality	UAE Citizen	160	17.6
	Arab, GCC	259	28.4
	Arab, non-GCC	412	45.2
	Non-Arab	80	8.8
Marital status	Single	872	95.7
	Married	39	4.3
Living place	University dorms	293	32.2
	Outside with family	594	65.2
	Outside with friends	24	2.6
Smoking, current	Yes	218	23.9
	No	693	76.1
Monthly income	Less than 1360$ equivalent	670	73.5
	1360$–2720$ equivalent	135	14.8
	More than 2720$ equivalent	106	11.6
College	Humanities	118	13.0
	Applied sciences	340	37.3
	Medical and health sciences	453	49.7
Educational level	1st year	218	23.9
	2nd year	181	19.9
	3rd year	211	23.2
	4th year	246	27.0
	5th year	41	4.5
	6th year	14	1.5
BMI (kg/m^2)	Underweight	61	6.7
	Normal weight	504	55.3
	Overweight	238	26.1
	Obese	108	11.9

GCC=Gulf Cooperation Council. Categorization of descriptive data was used to present this table

Table 4 compares body composition parameters and stress levels based on the students' sleep quality (good vs. poor). Fat percent ($P = 0.010$), height ($P = 0.013$), TBW% ($P = 0.029$), VFR ($P = 0.052$), VFSA ($P = 0.054$), and stress levels ($P = 0.001$) were significantly different between the good and poor sleep quality groups. Moreover, FP, VFR, VFSA, and perceived stress scores were significantly higher in the group with poor sleep quality than in the group with good sleep quality.

Table 5 presents the correlation between sleep quality index, stress level, and body mass index (BMI). Interestingly, the results suggested that a high-stress level is significantly correlated with high sleep quality scores (poorer sleep quality) ($P = 0.0001$). However, there was no significant correlation between BMI, stress level, and sleep quality ($P = 0.141$ and 0.872, respectively).

This study employed correlation analysis to investigate the relationship between stress level, sleep quality, and body composition. Intriguingly, the findings revealed that sleep quality has a significant positive association with FM ($r = 0.076$, $P = 0.022$), VFR ($r = 0.085$, $P = 0.011$), and VFSA ($r = 0.084$, $P = 0.011$) while having a significant negative association with TBW% ($r = -0.077$, $P = 0.020$) and height ($r = -0.066$, $P = 0.046$). Moreover, stress level showed a significant positive association with FM ($r = 0.098$, $P = 0.003$) while having a significant negative association with FFM ($r = -0.202$, $P = 0.000$), MM ($r = -0.196$, $P \leq 0.001$), TBW ($r = -0.182$, $P \leq 0.001$), TBW% ($r = -0.194$, $P \leq 0.001$), BM ($r = -0.195$, $P \leq 0.001$), BMR ($r = -0.173$, $P \leq 0.001$), weight ($r = -0.083$, $P = 0.012$), and height ($r = -0.178$, $P \leq 0.001$) [Table 6].

Table 7 compares BMI categories of students based on sleep quality and stress levels, highlighting significant findings. Regarding sleep quality, obese students with poor sleep quality had a significantly higher mean BMI (34.98 ± 4.84) compared to those with good sleep quality (33.19 ± 2.84, $P = 0.021$). In terms of stress levels, significant differences were observed in the normal weight and overweight categories. Students with a normal weight exhibited higher proportions of moderate stress (378, 57.2%) compared to mild (62, 48.4%) and severe stress levels (64, 52.5%), with a statistically

Table 2: Stress level and sleep quality of the students (*n*=911)

Variable	Mean±SD	Category	Frequency	%
Perceived Stress Scale (PSS)	19.36±5.74	Mild stress level (0–13)	128	14.1
		Moderate stress level (14–25)	661	72.6
		Severe stress level (≥26)	122	13.4
Pittsburgh Sleep Quality Index (PSQI)	6.95±3.40	Good sleep quality (0–4)	248	27.2
		Poor sleep quality (5–21)	663	72.8

Categorization of descriptive data was used to present this table

Table 3: Comparison of body composition based on stress levels

Body composition	Mean (SD)				P
	Overall	Mild stress	Moderate stress	Severe stress	
Weight	70.06 (18.30)	74.01 (17.93)[b]	69.65 (18.22)[a]	68.12 (18.68)[a]	0.022*
Height	168.33 (9.91)	1.71 (0.01)[a]	1.68 (0.10)[b]	1.66 (0.01)[c]	<0.001*
Fat%	22.41 (9.64)	21.06 (9.35)[a]	21.88 (9.56)[a]	26.68 (9.31)[b]	<0.001*
FM	16.39 (10.30)	16.30 (10.87)[ab]	15.97 (10.21)[a]	18.79 (9.93)[b]	0.020*
FFM	53.75 (13.10)	57.99 (13.28)[a]	53.81 (12.75)[b]	49.01 (13.32)[c]	<0.001*
MM	51.01 (12.44)	54.97 (12.53)[a]	51.01 (12.26)[b]	46.83 (12.05)[c]	<0.001*
TBW	38.06 (9.01)	40.70 (8.90)[a]	38.01 (8.98)[b]	35.35 (8.52)[c]	<0.001*
TBW%	54.91 (6.50)	55.84 (6.21)[a]	55.12 (6.54)[a]	52.52 (6.01)[b]	<0.001*
BM	2.71 (0.61)	2.90 (0.63)[a]	2.71 (0.60)[b]	2.50 (0.60)[c]	<0.001*
BMR	1,652.43 (374.08)	1767.10 (384.58)[a]	1650.50 (368.47)[b]	1542.6 (361.27)[c]	<0.001*
VFR	3.11 (3.42)	3.31 (3.23)	3.01 (3.52)	3.02 (3.03)	0.751
VFSA	31.06 (34.20)	33.20 (32.72)	30.80 (35.12)	30.25 (30.33)	0.738
BMI	24.51 (5.03)	24.97 (44.43)	24.41 (5.11)	24.55 (5.20)	0.512

Fat%=Fat percent, FM=Fat mass, FFM=Fat-free mass, MM=Muscle mass, FM=Fat mass, TBW=Total body water, TBW%=Total body water %, BM=Bone mass, BMR=Basal metabolic rate, VFR=Visceral fat rating, FVSA=Visceral fat surface area, BMI=Body mass index, ANOVA=analysis of variance test was used to perform this table. *Different letters in the same row indicate significant difference

Table 4: Comparison of body composition and perceived stress scale based on sleep quality

Body composition	Mean (SD)		P (independent sample *t*-test)
	Good sleep quality *n*=248	Poor sleep quality *n*=663	
Weight	70.03 (17.05)	70.07 (18.76)	0.980
Height	169.66 (10.39)	167.83 (9.68)	0.013*
Fat%	21.07 (9.53)	22.91 (9.64)	0.010*
FM	15.49 (9.91)	16.73 (10.43)	0.106
FFM	54.92 (13.17)	53.32 (13.06)	0.101
MM	52.01 (12.53)	50.63 (12.39)	0.137
TBW	38.82 (9.02)	37.77 (8.99)	0.119
TBW%	55.68 (6.37)	54.63 (6.53)	0.029*
BM	2.75 (0.62)	2.69 (0.61)	0.175
BMR	1679.23 (375.85)	1642.40 (373.20)	0.186
VFR	2.75 (2.68)	3.24 (3.65)	0.052*
VFSA	27.50 (26.80)	32.40 (36.51)	0.054*
BMI	24.15 (4.51)	25.64 (5.21)	0.187
PSS	16.70 (5.51)	20.35 (5.50)	0.001*

Fat%=Fat percent, FM=Fat mass, FFM=Fat-free mass, MM=Muscle mass, FM=Fat mass, TBW=Total body water, TBW%=Total body water %, BM=Bone mass, BMR=Basal metabolic rate, VFR=Visceral fat rating, FVSA=Visceral fat surface area, BMI=Body mass index, PSS=Perceived stress scale. *Significant difference at $P<0.05$. Independent sample *t*-test descriptive data was used to present this table

Table 5: Correlations between PSQI, PSS, and BMI (*n*=911)

Variables	Correlation	*P*-value
PSS vs. PSQI	0.309	*P*=0.0001*
BMI vs. PSQI	0.049	*P*=0.141**
BMI vs. PSS	-0.005	*P*=0.872

PSQI= Pittsburgh sleep quality index, PSS= Perceived stress scale, BMI= body mass index, *Significant difference at $P<0.05$. **Significant difference at $P<0.001$

significant difference ($P = 0.042$). Overweight students showed a significant association with moderate stress levels, accounting for 161 (24.4%) compared to severe stress levels (31, 25.4%, $P = 0.037$).

Discussion

It is alarming that the sleep quality and perceived stress levels of university students require special attention. This cross-sectional study identified that the percentages of students with moderate stress and poor-quality sleep were high. The percentages of overweight and obesity were reported at 26.1% and 11.9%, respectively. Furthermore, the findings suggested that poor sleep quality and high-stress levels were reflected in the body composition of the students.

The increased incidence of depression and stress is a global public health issue among university students. The present study revealed that the percentage of students experiencing moderate stress was high (72.6%), a finding supported by previous studies conducted in Malaysia and Saudi Arabia, which reported that the majority of university students suffer from moderate stress.[27,28] A recent study found moderate to severe stress and depression levels among university students in Bangladesh, ranging from 25% to 71%.[29] Poor sleep quality may have a negative impact on social, physical, and mental health, as well as the quality of life of university students.[30] Previously, it was suggested that stress leads to an increase in the indicators of metabolic syndrome via poor sleep quality and inadequate eating habits in university students.[31]

This study's findings revealed that most students suffer from poor sleep quality, aligning with a Chinese study that reported one-third of participants as having poor sleep quality.[32] The prevalence of poor-quality sleep among college students in China was 31%, which is lower than our findings. A recent study in the USA found that 42% of college and university students experience poor sleep quality.[33] Similarly, in Saudi Arabia, 77% of

Table 6: Association of sleep quality and perceived stress with body composition of the students (*n*=911)

Body Composition	PSQI		PSS	
	R	*P* (A simple linear regression test)	*r*	*P* (A simple linear regression test)
BMI	0.049	0.141	−0.005	0.872
FM	0.076*	0.022	0.098**	0.003
FFM	−0.048	0.146	−0.202**	<0.001
MM	−0.045	0.171	−0.196**	<0.001
TBW	−0.039	0.239	−0.182**	<0.001
TBW%	−0.077*	0.020	−0.194**	<0.001
BM	−0.038	0.251	−0.195**	<0.001
BMR	−0.032	0.34	−0.173**	<0.001
VFR	0.085*	0.011	−0.003	0.923
VFSA	0.084*	0.011	−0.004	0.912
Weight	0.015	0.652	−0.083*	0.012
Height	−0.066*	0.046	−0.178**	<0.001

Fat%=Fat percent, FM=Fat mass, FFM=Fat-free mass, MM=Muscle mass, FM=Fat mass, TBW=Total body water, TBW%=Total body water %, BM=Bone mass, BMR=Basal metabolic rate, VFR=Visceral fat rating, FVSA=Visceral fat surface area, BMI=Body mass index. *Significant difference at *P*<0.05. **Significant difference at *P*<0.001

Table 7: Comparison of BMI categories of the students based on sleep quality and stress levels

Variables	BMI classification			
	Underweight	Normal weight	Overweight	Obese
Sleep quality				
Good sleep quality	*n*=17	*n*=144	*n*=59	*n*=28
	17.01 (0.99)	22.05 (1.71)	27.02 (1.35)	33.19 (2.84)
Poor sleep quality	*n*=44	*n*=360	*n*=179	*n*=80
	17.51 (0.87)	21.97 (1.85)	27.14 (1.42)	34.98 (4.84)
P (Chi-Square)	0.060	0.636	0.544	0.021*
Stress level				
Mild stress level	6 (4.7%)	62 (48.4%)	46 (35.9%)	14 (10.9%)
Moderate stress level	46 (7.0%)	378 (57.2%)	161 (24.4%)	76 (11.5%)
Severe stress level	9 (7.4%)	64 (52.5%)	31 (25.4%)	18 (14.8%)
P (Chi-Square)	0.164	0.042*	0.037*	0.079

GSQ=Good sleep quality, PSQ=Poor sleep quality, BMI=Body mass index, *Significant difference at *P*<0.05

medical college students reported poor sleep quality[3], and in Malaysia, the figure was 76.8% among female university students.[34] Additionally, a study in Iran indicated that dental students experienced poor sleep quality and moderate stress levels.[35] Medical students are particularly vulnerable to poor sleep quality and high stress, which can lead to attention issues and poor academic performance. Previous research has documented a prevalence rate of poor sleep quality of 68% among undergraduate medical students in Yemen.[36]

The transition to university is associated with changes in body composition and stress levels; however, the relationship between stress and anthropometric indicators remains poorly elucidated in this population.[37] Our study observed significant changes in body composition parameters—weight, body fat percentage (BF%), FM, FFM, MM, TBW, and BMR in relation to stress levels. This suggests severe stress may contribute to weight gain and obesity, supported by other research showing that male college students with higher perceived stress tend to gain more weight.[38]

Interestingly, while our findings indicated that BF% is significantly influenced by stress levels among university students, a study involving school children under ten years old revealed no significant relationship between stress and body fat percentage (BF%).[39] Additionally, we found that MM decreases with increasing perceived stress, which contrasts with a study that noted an increase in MM among Nigerian undergraduate medical students as perceived stress rose.[40] These discrepancies could stem from differences in sample size and participant age. After conducting correlation analyses, our study revealed that BMI and BF% showed a non-significant negative correlation with PSS scores. This aligns with previous studies that found no significant correlation between BMI and perceived stress among male adolescents and female university students, as well as during the coronavirus disease (COVID-19) outbreak.[41] However, one study noted a significant negative correlation between PSS and BF% among collegiate females.[42] Our data also indicated substantial relationships between PSS and FM, MM, TBW, BM, and BMR, consistent with findings from earlier research. Changes in PSS negatively correlated with weight among both male and female students, while another study found a positive association between changes in perceived stress and weight in females only.[43]

University students are at a heightened risk for sleep problems.[44] Such issues contribute to obesity, as shorter sleep duration and poor sleep quality are linked to behavioral, metabolic, and endocrine changes that promote weight gain.[45] Conversely, obesity can exacerbate sleep problems, with individuals suffering from obesity more likely to experience sleep-disordered breathing.[46] Notably, our study found no significant association between PSQI scores and BMI, FFM, MM, BM, or BMR. Similar to our findings, a study showed no significant association between sleep quality and FM or MM among male university students.[47] In contrast, another study found that the PSQI global score was negatively associated with bone mineral content, density, and lean mass index while being positively associated with FM percentage among middle-aged adults.[48] Additionally, it has been suggested that a high body fat percentage could lead to poor sleep quality among 288 female university students in Saudi Arabia.[49] Our study indicates that fat percentage, TBW%, visceral fat rating (VFR), and VFSA may impact sleep quality, consistent with findings that PSQI scores are influenced by body water content in young adults.

Limitations and strengths

Although the current work is the first to examine the interrelationship between stress, sleep quality, and body anthropometrics among university students in the GCC countries, there are some limitations. First, due to the cross-sectional design of this study, the causal relationship between stress level, sleep quality, and factors could not be determined. Second, the study only covered university students in the Sharjah emirate, so the results may not be generalized to the entire country's undergraduate population. Regarding the strength of this study, it has recruited students from diverse academic backgrounds, cultures, and nationalities, including those from Arab and non-Arab countries.

Conclusion

The present study concluded that poor sleep quality and moderate stress levels are prevalent among university undergraduate students. Moreover, a significant interplay exists between sleep quality, stress levels, and body composition. Addressing this interplay is vital for fostering a healthier and more productive student population. By implementing targeted interventions and promoting a culture of well-being, educational institutions can significantly enhance student health outcomes and academic success. Sleep quality and stress management programs are required through tailored strategies and health promotion interventions aimed at fostering a healthier and more balanced lifestyle for university students, thereby promoting their holistic development and success. To address this study's findings, universities should implement sleep quality improvement programs and stress management interventions, emphasizing awareness and practical strategies to improve students' well-being. Regular health monitoring, physical activity initiatives, and collaborative wellness programs involving healthcare and academic professionals can support healthier lifestyles and better educational outcomes.

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Author's contribution

Conceptualization: MF, LCI
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Formal analysis: DNA
Funding acquisition: -
Investigation: MF, MM, SS, SR, RT, HM, LK, AWA
Methodology: MF, MM, SS, SR, RT, HM, LK, AWA, DNA
Project administration: MF, LCI, MM, SS, LS, ASA
Resources: -
Software: DNA
Supervision: MF, LCI, MM, LS, ASA
Validation: MF, LCI
Visualization: DNA
Writing—original draft: DNA, FZ, MM, SS,
Writing—review and editing: MF, DNA, LCI, LS, ASA, MM, SS

Ethical considerations

Researchers approached students and asked them to participate in the study after providing a verbal explanation of its significance, objectives, and protocol. Participants who agreed to take part were given an information sheet and a consent form. Written informed consent was obtained from all participants, and the study was conducted in accordance with the Declaration of Helsinki, following approval from the research ethics committee at the University of Sharjah (reference: REC-20-05-26-02-S).

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Conflict of interest

All authors declare no conflict of interest.

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