ORIGINAL RESEARCH

Association between sleep pattern and body mass index among undergraduate health colleges' students at Qassim University, Saudi Arabia

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ABSTRACT

Background and objective: Better quality and adequate amount of sleep are essential to have better cognitive performance and by contrast, poor bedrest is related to a diminishing of cognitive and psychological functioning and deteriorating physical health. Recently the quality of sleep among various segments of the population has become a focus of continuous research and investigations, where insufficient sleep may lead to adverse cardio-metabolic effects by influencing body weight, blood pressure, and glucose tolerance. The objective of this study is to explore the associations between sleep patterns and Body Mass Index (BMI) among undergraduate female students in health colleges.

Methods: Across-sectional study was utilized among 288 of undergraduate female students who represent 30% of all undergraduate students in health Colleges of female section, Qassim University. The data regarding their sleeping pattern was collected and calculated by using a validated self-report questioner (Pittsburgh Sleep Quality Index) and Body Mass.

Results: According to PSQI scoring, both categories good and poor sleep maximum according to PSQI scoring; both categories good sleep and poor sleep maximum participant's BMI was normal but no statistically significant association was seen between BMI of poor sleep was higher in overweight and obese participants from all departments and also no statistically significant association was seen between poor sleep and body mass index of participant As for the sleep quality as a single question and sleep duration in relation to BMI for different specialties, only for nursing students there was a statistically significant difference of sleep quality/duration in relation to their BMI.

Conclusions: Frequency of poor sleep was higher in overweight and obese participants but as per findings there was no statistically significant association was detected between PSQI score and BMI of participants.

Key Words: Body mass index, Undergraduate students, Sleep pattern, Sleep quality

1. INTRODUCTION

College is a time for change, when many young adults experience self-sufficiency and freedom from direct supervision for the first time, greater academic and social stresses, and unpredictable schedules are experienced. Major conversions in lifestyle such as unstable diets, and lack of sleep can be harm-

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ful to the students' well-being.[1] Many researches concede that college pupils experience frequent and severe bedtime issues that negatively effect their health and well-being.[2–6] Sleep is a universal part of life and one of the essential behavioral components of sustaining health state.[7, 8] Although the specific functions of sleep are still beyond a comprehensive understanding, a large body of data show it's a serious role in many important somatic, cognitive, and psychological processes.[9]

It is true that sleep is beneficial for powerful conservation and neuronal recuperation,[8] synaptic homeostasis, and brain flexibility. For example, sleep is shown to serve many metabolic, immunity, thermoregulatory, cardio, and respiratory functions, all accountable for the normal brain and body homeostasis.[10, 11] By contrast, sleep dysfunction is linked to the development of physical and psychological issues including cardiovascular problems, diabetes, obesity, anxiety, and all-cause high rates of death[12] and number of studies have supported that the metabolic rate related to interference of normal sleep behaviors may related to the development of obesity, cardiovascular disease, diabetes, and diabetes.[13–26] In the current study, the authors applied cross-sectional study that explore the association between Body Mass Index (BMI) and sleep pattern among undergraduate female students of health colleges in Qassim University.

Sleep pattern and body mass index

There is an increasing acknowledgment and several research findings support an association between underweight (e.g. anorexia), overweight/obesity and weight fluctuation (e.g. weight loss, weight gain) and sleep problems.[27] Concurrent with high rates of obesity among people in the United States, there has been an alteration in sleeping manners.[28, 29] Insomnia and sleep issues have been widely studied in the larg population.[1] The intervening processes between sleep health and BMI are complex and not well understood yet.

The BMI is generally used as a means of correlation between groups related to general mass and can serve as a basic means of estimating adiposity. However, the duality of the BMI is, that, whilst easy-to-use as a general calculation, it is limited in how accurate and pertinent the data obtained from it can be. Generally, the Index is suitable for recognizing trends within sedentary or overweight individuals because there is a smaller margin for errors.[30] High BMI appears associated with breathing difficulties such as apnea.[29] Around the years and following vigorous examinations of the topic, our knowledge of sleep issues has both dramatically extended and significantly changed.[31] Better quality sleep and adequate amount of sleep are necessaryto have improvedcognitive performance and avoid many health

problems and psychiatric disorders.[32] In another side, sleep loss, long-term sleep deprivation and alterations in sleep quality are substantial problems in modern society; also sleep quality may play a role in disease etiology.[33] Recently, the quality of sleep among various segments of the population has become a focus of continuous research and investigation.[34] On the other hand, the prevalence of overweight and obesity, has elevated dramatically over the past decade.[35–37] Body Mass Index (BMI) has been defined by World Health Organization (WHO) as [BMI = weight (kg)/height (meters^2] a widely used measure to evaluate global body fat masses.[38] Al-Nohair[39] illustrated that Gulf countries having the highest rate of obesity and concurrent with the epidemiological transition trend at Kingdom of Saudi Arabia (KSA); the prevalence rate of high BMI and obesity are sharply rising with approximately three-quarters of the female adult population.[40]

According to Al-Nohair,[39] KSA represents one of the top ten countries worldwide in term of obesity. In spite of this accretion of BMI has been observed around all ages juveniles and teenagers reaching 31.8% in 2010.[35] In the same way elevated rates have been estimated among college students; with over one-third reporting BMI $\pm$ 25.[41–43] The association between eating behavior disturbance and sleep difficulties is also documented as Night Eating Syndrome which characterized by recurrent episodes of the night eating, as manifested by eating after awakening from sleep or excessive food consumption after the evening meal.[44] In 2010, Lombardi et al.[45] mentioned that fatigue has been linked to adverse safety outcomes, and poor quality or decreased sleep has been associated with obesity. Moreover, objective measures of sleep showed that this pattern of disordered eating occurs during non-REM sleep and is associated with low sleep efficiency.[46] In addition, Bjorvatn et al.[47] illustrated that short self-reported sleep duration is linked to elevated BMI and may change appetite hormones. An inverse association between BMI and sleep difficulty and sleep duration was reported in other study which performed among University students[48] also, among females rather than males from the general population of China.[49]

Sleep difficulties may represent a risk factor for increasing in BMI. This study may improve the knowledge regarding this public health topic in non-clinical populations, stressing the need for health professionals to pursue strategies to promote adequate sleep and eating patterns to prevent disorders from both areas.The aim of the present study is to explore the associations between sleep patterns and BMI among undergraduate female students in health colleges, at Qassim University through hypothesizing that BMI is associated with sleep pattern and comparison of good sleepers and

those with sleep problems will show increased BMI which is theoretically related to sleep disorders.

2. STUDY METHODOLOGY

During the period of February to May 2015, a cross-sectional survey was planned and conducted with the participation of female students from all the health colleges in Qassim University, KSA. The participants were 288 female students recruited fromhealth Colleges in QassimUniversity (18% Nursing students, 30.3% Pharmacy students, 23.6% Medical students, 16.6% Applied-Medical-Sciences students and 11.5% Dental students) and they represent an approximate of 30% of all undergraduate students in Health Colleges. All enrolled participants were briefed about the purpose of the study and were required to provide signed informed consent before taking part in the study. The study protocol was approved by the Research Center of the College of Nursing, University of Qassim.

2.1 Study setting

Qassim city is located in the center of the Arabian Peninsulaand it is the 7th most populated and 5th densest region. The present study was conducted in the female-section, Health colleges in Qassim University, which accommodates students from all provinces and villages of Qassim region. They include Medical, Nursing, Dental, Pharmacy and Applied Medical Sciences students.

2.2 Tool and data collection procedure

Data were collected using a self-administered questionnaire which compromised of three parts:

A) Demographic information: Containing questions regardingpersonal data as age, college's name.

B) Anthropometric information: Body Mass Index was calculated based on self-reported body weight (kg) divided by squared height (m^2). The BMI was then split into four categories: underweight, normal weight, overweightand obesity. According to the WHO, underweight (BMI < 18.5), normal weight (BMI between 18.5-24.9) overweight (BMI between 25-29.9) and obese (BMI $\pm$ 30.00).[38]

C) Pittsburgh Sleep Quality Index (PSQI) is an effective self-report instrument used to measure the quality and patterns of sleep for adults. It differentiates "poor" from "good" sleep bymeasuring seven domains: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction over the last month (see Figure 1). Each of the sleep components yields a score ranging from 0 to 3, with 3 indicating the greatest dysfunction. Component points range from 0 to 3 and are summed to get a global score, which is from 0 to 21. Highest score suggest greater sleep disturbance; a global score more than 5 suggests a specific disturbance. There are five extra questions have to be completed by a bed partner if there is one. The PSQI has high test-retest reliability and good validity in the psychometric evaluation.[50–52] The present study was utilized for the Arabic version of Pittsburgh Sleep Quality Index,which developed by Suleiman et al.,[53] using back translation technique and psychometrically tested in different studies[53,54] which confirmed its validity and reliability for measuring sleep disturbances among Arabic clinical population.

The PSQI consists of three parts:

Part I: It included questions about the personal problems faced by the student during sleep as cold, heat, cough, snoring and waking up to go to the bathroom.

Part II: It contained questions to assess the quality of sleep and some other problems that may disturb sleep.

Part III: Questions on the student's participation in the same room or the same bed for the history of problems noticed during sleep. Data collected was reviewed on a daily basis, and entry process was conducted concurrently with data collection.

2.3 Data analysis

Data entry and analysis was done by using SPSS 20. Quantitative variables (Age & BMI) were given by mean $\pm$ SD. Qualitative variables were shown by using frequency table and percentages. Chi-square test was used to see the relation between PSQI score and body mass index as well as the association between body mass index and sleep duration. *p*-value < .05 was taken as significant.

2.4 Ethical considerations

The proposal of the investigation was approved by the Research Center of college of Nursing, Qassim University. It was made clear that participant's privacy was to be respected and the study would be anonymous. In addition, participants were given the right to refuse to complete the questionnaire, and the data collected will only be used for scientific purposes. The consent of the students would be sought to participate and that non-participation would not be penalized.

3. RESULTS

A total of 288 female University students from different health colleges (Applied Medical Sciences [AMS] 48, Dentistry 33, Medicine 68, Nursing 52 & Pharmacy 87) were involved in the present research. Mean age of all participants was 21.75 $\pm$ 1.86 years. Mean body mass index of participants was 23.16 $\pm$ 5.03. As per BMI criteria of WHO, 37

participants were underweight, 124 participants were normal, 52 were overweight and 75 were obese (see Table 1).

3.1 Participants' sleeping quality and their BMI

Participants whose sleep quality was poor as per PSQI scores among them 41.8% their BMI was normal, 27.1% of participants were obese and 18.7% were overweight. However participants whose sleep quality was good among them, 51.4% their BMI was normal, 18.9% were obese and 13.5% were overweight. Although for both categories good sleep and poor sleep majority of participants their BMI was normal but still no statistically significant association (*p*-value = .500) was seen between BMI and PSQI scores (see Table 2).

Figure 1. Components of Pittsburgh Sleep Quality Index (PSQI)

Table 1. Mean age and BMI distribution among participants

Health colleges	AMS	Dentistry	Medicine	Nursing	Pharmacy	Total
No.	48	33	68	52	87	288
Age	21.50 ± 1.48	20.91 ± 1.79	21.03 ± 1.00	23.42 ± 2.62	21.76 ± 1.40	21.75 ± 1.86
BMI	22.91 ± 4.76	22.13 ± 3.33	23.09 ± 6.54	24.03 ± 5.34	23.23 ± 4.10	23.16 ± 5.03
Under Weight	3 (6.3%)	4 (12.1%)	11 (16.2%)	9 (17.3%)	10 (11.5%)	37
Normal	26 (54.2%)	16 (48.5%)	32 (47.1%)	13 (25%)	37 (42.5%)	124
Over Weight	9 (18.8%)	7 (21.2%)	11 (16.2%)	11 (21.2%)	14 (16.1%)	52
Obese	10 (20.8%)	6 (18.2%)	14 (20.6%)	19 (36.5%)	26 (29.9%)	75

Table 2. Participants' sleeping quality according to their BMI

BMI	PSQI Score		Total
	Good Sleep (< 5)	Poor Sleep (> 5)	
Under Weight (< 18.5)	6(16.2%)	31(12.4%)	37
Normal Weight (18.5-22.99)	19(51.4%)	105(41.8%)	124
Over Weight (23-24.9)	5(13.5%)	47(18.7%)	52
Obese (> 25)	7(18.9%)	68(27.1%)	75
Total	37	251	288

Note. Chi-Square Test = 2.366, *p*-value = .500.

3.2 Participants' sleeping quality according to their health colleges

Table 3 showed the association between PSQI scores and BMI of participants from different health colleges. As per findings no statistically significant association was detected between PSQI scores and BMI of participants from the different health colleges. However as per observed trend it was seen that frequency of poor sleep was higher in over weight and obese students from all health colleges but still no statistically significant association was seen between poor sleep and BMI of participants.

Table 3. Participants' sleep quality and BMI according to their health colleges

Health College	PSQI Score	Under Weight (< 18.5)	Normal Weight (18.5-22.99)	Over Weight (23-24.9)	Obese (> 25)	χ^2 Test	p-value
AMS	Good Sleep (≤ 5)	0 (0.0%)	2 (7.7%)	1 (11.1%)	0 (0%)	1.322	.721
	Poor Sleep (> 5)	3 (100%)	24 (92.3%)	8 (88.9%)	10 (100%)		
Dentistry	Good Sleep (≤ 5)	1 (25%)	5 (31.3%)	0 (0%)	2 (33.3%)	2.939	.401
	Poor Sleep (> 5)	3 (75%)	11 (68.8%)	7 (100%)	4 (66.7%)		
Medicine	Good Sleep (≤ 5)	2 (18.2%)	6 (18.8%)	1 (9.1%)	0 (0%)	3.382	.336
	Poor Sleep (> 5)	9 (81.8%)	26 (81.3%)	10 (90.9%)	14 (100%)		
Nursing	Good Sleep (≤ 5)	2 (22.2%)	2 (15.4%)	1 (9.1%)	2 (10.5%)	0.955	.812
	Poor Sleep (> 5)	7 (77.8%)	11 (84.6%)	10 (90.9%)	17 (89.5%)		
Pharmacy	Good Sleep (≤ 5)	1 (10%)	4 (10.8%)	2 (14.3%)	3 (11.5%)	0.146	.986
	Poor Sleep (> 5)	9 (90%)	33 (89.2%)	12 (85.7%)	23 (88.5%)		

3.3 Participants' sleeping pattern and BMI according to their health colleges

For nursing students only the time to fall into sleep has a significantly different in relation to their body mass index. However for other health specialties (AMS, Dentistry, Medicine & Pharmacy) no statistically significant differences were detected in time to fall in sleep in relation to their BMI. As for sleeping hours none of the participants from all specialties show any statistically significant difference in relation to their body mass index (see Table 4).

Table 4. Participants' sleeping pattern and BMI according to their health colleges

Body Mass Index	Q-2: Duration to fall in Sleep									
	AMS		Dentistry		Medicine		Nursing		Pharmacy	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
< 18.5 (Under Weight)	54.00	57.86	21.25	10.31	36.55	43.20	20.33	12.69	26.00	10.75
18.5-22.99 (Normal)	36.73	33.67	32.69	28.61	19.53	15.47	44.23	36.16	34.24	43.88
23-24.9 (Over Weight)	21.89	16.07	45.00	35.82	23.00	18.88	20.27	11.99	28.93	28.97
> 25 (Obese)	35.00	34.24	23.67	21.13	23.79	18.37	48.42	32.41	28.35	17.66
f-test	0.83		0.89		1.49		3.74		0.27	
p-value	.48		.46		.23		.02*		.85	
Body Mass Index	Q-4: Sleeping Hours									
	AMS		Dentistry		Medicine		Nursing		Pharmacy	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<18.5 (Under Weight)	6.66	3.78	5.75	0.95	6.0	2.19	7.66	2.50	7.0	2.58
18.5-22.99 (Normal)	5.8	2.20	6.9	2.32	6.03	2.25	7.23	2.31	5.52	2.26
23-24.9 (Over Weight)	4.83	1.06	5.14	1.34	6.45	2.54	6.0	1.56	6.39	1.44
>25 (Obese)	4.70	2.21	8.50	3.20	5.60	2.13	5.89	2.02	5.50	2.54
f-test	1.27		2.71		0.29		2.16		1.55	
p-value	0.29		0.06		0.83		0.11		0.21	

*p < .05

3.4 Sleeping problems among all health colleges' students in relation to their BMI

None of the characteristics showed statistically significant difference for body mass index of the participants except among participants from dentistry and college of medicine who wake up at night to use the bathroom and it was significantly associated with body mass index (see Table 5).

In the last month, how frequent have you had sleeping troubles because you

- Q-5a: can't sleep
- Q-5b: wake up during midnight or early morning Q-5c: wakeup for bathroom
- Q-5d: cannot breath
- Q-5e: snoring or coughing loudly

- Q-5f: feel too cold during sleep
- Q-5g: feel too hot during sleep
- Q-5h: had bad dreams
- Q-5i: have pain during sleep
- Q-5j: pain during sleep

3.5 Sleeping time and components

According to Table 6, time of sleep was significantly associated with quality of sleep (*p*-value = .000), actual sleep hours (*p*-value = .000), percentage of time in bed sleeping (*p*-value = .003) and overall sleep disturbance score (*p*-value = .017). No statistically significant association was found for falling a sleep (*p*-value = .164), using sleeping aid medication (*p*-value = .921) and day time dysfunction (*p*-value = .122).

Table 5. Sleeping problems among health colleges' participants in relation to their BMI

Health College	BMI	Q-5a				Q-5b			Q-5c			Q-5d			Q-5e			Q-5f			Q-5g			Q-5h			Q-5i			Q-5j		
		0	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
AMS	Under Weight	0	0	2	1	1	1	1	1	2	0	3	0	0	3	0	0	1	1	1	0	3	0	1	1	1	3	0	0	3	-	0
	Normal	6	5	5	10	8	6	12	10	14	2	21	2	3	24	1	1	14	10	2	10	8	8	13	12	1	19	6	1	25	-	1
	Over Weight	1	2	2	4	4	2	3	5	2	2	6	1	2	6	3	0	5	2	2	3	5	1	4	1	4	6	3	0	9	-	0
	Obese	1	3	2	4	2	4	4	5	2	3	8	1	1	10	0	0	3	5	2	4	6	0	4	4	2	6	3	1	10	-	0
p-value		.795				.907			.302			.932			.124			.645			.135			.133			.805			.834		
Dentistry	Under Weight	1	0	2	1	3	1	0	4	0	0	3	0	1	4	-	0	3	1	0	3	1	0	2	2	0	4	0	-	4	-	0
	Normal	4	2	4	6	8	4	4	11	5	0	14	1	1	16	-	0	8	3	5	9	4	3	4	9	3	13	3	-	14	-	2
	Over Weight	0	3	1	3	4	2	1	5	0	2	4	1	2	7	-	0	6	0	1	2	2	3	2	3	2	5	2	-	7	-	0
	Obese	3	1	0	2	4	1	1	2	4	0	5	1	0	5	-	1	4	2	0	2	3	1	4	1	1	6	0	-	6	-	0
p-value		.346				.932			.016*			.547			.200			.359			.532			.532			.403			.520		
Medicine	Under Weight	2	1	4	4	1	3	7	9	2	0	8	2	1	11	0	-	3	5	3	5	5	1	6	2	3	11	0	0	11	-	0
	Normal	8	5	12	7	11	9	12	14	8	10	29	1	2	30	2	-	14	14	4	20	7	5	13	14	5	25	4	3	31	-	1
	Over Weight	3	4	1	3	4	1	6	2	6	3	11	0	0	11	0	-	7	3	1	4	5	2	6	4	1	9	2	0	11	-	0
	Obese	2	4	4	4	6	2	6	9	4	1	12	1	1	14	0	-	9	2	3	7	7	0	5	8	1	9	3	2	14	-	0
p-value		.685				.450			.032*			.504			.509			.320			.330			.515			.412			.767		
Nursing	Under Weight	1	3	1	4	1	1	7	5	2	2	6	2	1	8	0	1	6	3	0	5	3	1	5	2	2	7	2	0	9	-	0
	Normal	2	4	1	6	4	2	7	5	6	2	10	3	0	13	0	0	8	4	1	6	6	1	7	5	1	10	3	0	13	-	0
	Over Weight	4	1	2	4	2	5	4	5	3	3	8	3	0	10	0	1	4	4	3	3	4	4	6	3	2	7	2	2	11	-	0
	Obese	0	3	5	11	1	6	12	6	8	5	14	4	1	18	1	0	12	5	2	9	7	3	8	7	4	15	1	3	18	-	1
p-value		.234				.232			.843			.873			.534			.549			.604			.921			.418			.621		
Pharmacy	Under Weight	3	2	3	2	2	5	3	7	3	0	9	1	0	9	1	0	5	5	0	4	5	1	4	4	2	7	3	0	9	-	1
	Normal	11	12	5	9	10	13	14	18	13	6	29	8	0	37	0	0	20	12	5	20	12	5	14	14	9	23	12	2	37	-	0
	Over Weight	3	5	3	3	7	2	5	5	4	5	12	2	0	13	0	1	10	3	1	6	5	3	7	4	3	11	2	1	13	-	1
	Obese	4	5	6	11	5	9	12	14	7	5	21	4	1	25	1	0	17	9	0	10	8	8	14	9	3	20	5	1	26	-	0
p-value		.649				.377			.419			.764			.155			.312			.588			.854			.774			.134		

*p < .05.

4. DISCUSSION

The present study was designed to explore the associations between sleep patterns and BMI among undergraduate female students in health colleges. Our study adds to the literature the inclusion of a sample 288 of undergraduate

female health colleges' students, their sleep pattern has been measured by Pittsburgh Sleep Quality Index (PSQI), which was used to assess sleep quality of participants and its association with Body Mass Index which measured by (KG/M²). Research searching the link between sleep and BMI among

adolescents, suggest that the relationship is complex.[55,56] Most previous studies have shown an inverse association between BMI and sleep difficulty and duration.[43,57,58] Even with the different age group as Soares et al.,[48] who con-

ducted his study among university students or specific gender as Xinag et al.,[49] who targeted females rather than males from the general population in China.

Table 6. Sleeping time and components among participants

Sleep Components		Sleeping Time		Total	Chi-Square Test	*p*-value
		Before or at 12 Pm	After 12 Pm			
Quality of sleep	Very Good	33 (61.1%)	21 (38.9%)	54	30.12	.000
	Fairly Good	55 (49.5%)	56 (50.5%)	111		
	Fairly Bad	16 (20%)	64 (80%)	80		
	Very Bad	12 (27.9%)	31 (72.1%)	43		
Falling sleep	≤ 15 min	49 (45%)	60 (55%)	109	5.10	.164
	16-30 min	48 (42.5%)	65 (57.5%)	113		
	31-60 min	15 (30.6%)	34 (69.4%)	49		
	> 60 min	4 (23.5%)	13 (76.5%)	17		
Actual Sleep Hours	> 7 hours	48 (48%)	52 (52%)	100	26.97	.000
	6-7 hours	28 (54.9%)	23 (45.1%)	51		
	5-6 hours	29 (45.3%)	35 (54.7%)	64		
	< 5 hours	11 (15.1%)	62 (84.9%)	73		
Percentage oftime in bed sleeping	> 85%	75 (35.4%)	137 (64.6%)	212	14.04	.003
	75%-84%	8 (36.4%)	14 (63.6%)	22		
	65%-74%	14 (63.6%)	8 (36.4%)	22		
	< 65%	17 (65.4%)	9 (34.6%)	26		
Take medicine to aid in sleep	Not in past month	106 (40.9%)	153 (59.1%)	259	0.492	.921
	< once a week	6 (33.3%)	12 (66.7%)	18		
	1-2 times a week	3 (37.5%)	5 (62.5%)	8		
	≥ 3 times a week	1 (33.3%)	2 (66.7%)	3		
Daytime dysfunction	0	9 (52.9%)	8 (47.1%)	17	5.796	.122
	1-2	51 (44.3%)	64 (55.7%)	115		
	3-4	45 (39.8%)	68 (60.2%)	113		
	5-6	11 (25.6%)	32 (74.4%)	43		
Overall sleep disturbance score	1-4	13 (56.5%)	10 (43.5%)	23	10.22	.017
	5-8	63 (47%)	71 (53%)	134		
	9-12	36 (30.5%)	82 (69.5%)	118		
	> 12	4 (30.8%)	9 (69.2%)	13		

One study showed that short self-reported sleep duration is linked to elevated BMI and may change appetite hormones[47] and in addition, a very recent study by Peltzer and Pengpid[59] confirmed an association between short sleep duration and increased BMI. In 2010, Lombardi et al.[45] reported that poor quality or decreased sleep has been associated with obesity, this study's assumption supported by our observed finding; frequency of poor sleep was higher in over weight and obese participants as rate of 45.8% from all participants but still no statistically significant association

was seen between poor sleep and body mass index of participants within the PSQI scoring. Otherwise, sleep quality and duration to fall into sleep in relation with BMI–as a single question–found nursing students only had statically association between sleep quality/duration to fall in sleep and BMI. Also, we found participants from dentistry and medicine colleges who were waking up at night to use bathroom was significantly related with body mass index. In contrast, sleep difficulties at baseline are associated with current and long-time lower BMI,[27,47] but the inverse association is not con-

firmed. Lower BMI is not a significant predictor of sleep difficulties over time.[60] Report on the association of sleep and BMI in the clinical sample and in community samples are mixed and do not show a consistent association between sleep patterns and BMI.[61] However, the inverse association between sleep difficulties and BMI[49, 62] is unexpected considering the findings of most studies on sleep restriction and weight/obesity which revealed that short/long sleep and weight increase/obesity are associated.[62, 63] There are some proofs that sleep education programs and cognitive behavior interventions can improve sleep in college students.[65]

The current study has restrictions that should be addressed. First the study was designed as an exploratory study depending on a reasonably limited evidence showing that continues disturbanceof sleep can produce increased body weights by altering metabolic function. Our investigation was based on self-reported data including sleep period rather than direct measurements. BMI values were also limited to self-report, rather than actual weight and height measures or more sophisticated assessments of adiposity. However, although individuals generally underreport weight and overreport height, the correspondence between anthropometric and self-report measures tend to be high (generally above .94; e.g.[64, 65]) and it is unlikely that small inaccuracies in BMI would have dramatically impacted our correlational findings. Second, we have not measured students' level of daily physical activity or dietary intake. Third, in addition to measurement limitations, the characteristics of the research entrants-college students-limit the generalizabilityof our results to the general

population. The nature of the study precludes conclusions about the real relationship between sleep disturbances and BMI. Finally, we cannot rule out the possibility that our results are due to other extraneous variables or to chance. Future researches would benefit from collecting different data points prospectively using objective measurements of obesity and sleep.

5. CONCLUSION

The results of our study suggested that there's no association between sleep pattern and body mass index among undergraduate female health colleges' students at Qassim University, according to PSQI. As well, a suggested high prevalence of poor sleep quality. Finally, we recommended regulating of eating behavior, daily activity, stress and activate time management in order to improve sleep quality.

CONFLICTS OF INTEREST DISCLOSURE

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