Effect of sleep hygiene practices on sleep quality among female medical students and health sciences students of Albaha University, Saudi Arabia
By

Shuruq Hassan Alzahrani *
*Family Medicine senior registrar Ministry of Health, Jeddah city. KSA
Ahmad Shaker Eldsouky**
**Consultant of Family Medicine, Ministry of Health, Al-Baha city. KSA
Ayat Ibrahim AlThobaiti***
***Preventive medicine senior registrar, Ministry of Health, Jeddah city. KSA
Zainab Saeed Algarni****
**** Consultant of Family Medicine, Ministry of Health, Jeddah city. KSA
Razan Adel Alghamdi*****
***** Consultant of Family Medicine, Ministry of Health, Jeddah city. KSA
Nada Hamed Alsafari******
****** Family Medicine senior registrar, Ministry of Health, Jeddah city. KSA
Safia abdullah humaidan*******
******* Consultant of Family Medicine, Ministry of Health, Jeddah city. KSA
Amani Wasal Alsolami********
*******Consultant of Emergency medicine, Ministry of Health, Jeddah city. KSA

Abstract: Background: Numerous studies have shown that change in regular sleep-wake pattern, poor sleep quality and sleep disruption may lead to physical and psychological problems such as disturbance in academic and job performance, reduced work efficiency and learning disabilities.

Objectives: To assess sleep hygiene practices and sleep quality among female medical students and health sciences students, Albaha University, Kingdom of Saudi Arabia

Subjects and methods: A cross-sectional study was conducted in Al-Baha region, south west of Saudi Arabia among a sample of students enrolled in the colleges of medicine and Medical Sciences with its four branches throughout the academic year and internship 2020-2021. The data were collected by a self-administered online questionnaire composed of 3 main sections: personal characteristic of the participants, Pittsburg Quality of Sleep Index (PQSI): to assess the quality of sleep during the past month, the Sleep Hygiene Index (SHI) to assess behaviors that compromise sleep hygiene.

Results: A total sample of 250 female students completed the study questionnaire whose ages ranged from 18 to 26 years old with mean age of 20.8 ± 1.9 years. Most participants were from college of medicine (28.4%), college of laboratory (28.4%), and college of public health (18%) while 14% were from college of nursing. Totally, PSQI score ranged from 3 to 16 points out of 21 points (76%) as only 16% of the females were classified as good sleepers. Overall, the females score of Sleep Hygiene Index ranged from 8-52 with mean score of 27.1 out of 52 (52.1%). Regarding student's daytime sleepiness, totally, students total score ranged from 0 to 22 out of 24 points with mean score of 8.1 (33.8%) and 36.4% of the female students had significant daytime sleepiness. There was a significant intermediate positive correlation between females sleep quality (PSQI) score and sleep hygiene index score (r=.37) and significant positive intermediate correlation with ESS scores (r=.26). Also, Females sleep hygiene index score showed significantly intermediate correlation with daytime sleepiness (r=34).

Conclusion: Only minority of females medical students and were classified as good sleepers with moderate level of sleep hygiene.
Keywords: Pittsburg Quality of Sleep Index, Sleep Hygiene Index, daytime sleepiness, females. Medical students, Saudi Arabia.

Introduction:

Sleep is an active, essential to life physiological process. Its quality is related to physical as well as psychological well-being of the human being.[1] The pattern of sleep varies according to some specific characteristics of subjects such as their age, occupation, their physiologic characteristics, psychosocial background, and physical as well as psychiatric illness.[2]

Most adults often require between six and eight hours for sleeping per night. However, some otherwise healthy persons may be short sleepers, requiring less than 6hours of sleep per night to feel refreshed. Others may need ten or more hours of sleep per night to feel healthy.[3]

Numerous studies have shown that change in regular sleep-wake pattern, poor sleep quality and sleep disruption may lead to physical and psychological problems such as disturbance in academic and job performance, reduced work efficiency and learning disabilities.[4-7]

Sleep disorders have been ignored and improperly understood, putting in mind that nearly one-third of population aged over 18 years report sleep disorders.[6]

The community of medical university students is considered one of communities that appears to be at increased risk for sleep deprivation as a result of demanding academic and clinical duties which could be coexistent with other social and psychological factors put them at greater risk of poor sleeping quality and its subsequent mental and physical upset.[8, 9]

Sleep hygiene is "a set of sleep-related behaviors that expose persons to activities and cues that prepare them for and promote appropriately timed and effective sleep."[10]

The relationship between sleep deprivation and depression is bi-directional as it has been reported that chronic sleep deprivation may result in depression attributed to the neuro-chemical changes that occur in the brain.[11] On the other hand, depression may lead to sleep disturbance manifested as a symptom of a mood disorder. This is confirmed by a study carried out among health science students and showed significant association between sleep and deprivation depressive symptoms. [12]

Often medical students have inadequate sleep time and difficulty in initiation or maintaining sleep, because of their academic demands and the stresses associated with frequent examinations, which may affect their sleep quality; despite of the importance of the subjects, it has not been studied before among Albaha University female medical students and health sciences students.

Subjects and methods

This cross-sectional study was conducted in Al-Baha region, which is located in the south west of Saudi Arabia. It has a population of 476,172 according to 2017 census. [14] There is one University for females. The university includes college of Medicine and College of Medical Sciences, which contains four braches (Nursing, Laboratory, Pharmacy and public health). The study was carried out specifically in these two colleges.

All students enrolled in the colleges of medicine (n-~=100) and Medical Sciences with its four branches (n~=500), throughout the academic year and Internship 2020-2021 were eligible for inclusion in the study. Students with primary sleep disorders (primary insomnia, obstructive sleep apnea, etc……) and those with chronic health problems were excluded from the study.

The minimum required sample size was calculated using the Raosoft Online sample size calculator, assuming that the total number of students as 600. At 95% confidence interval, 5% margins of error and with consideration of the prevalence of sleeping disorders as 30%, based on a study carried out in Jeddah[15], the calculated minimum sample size was 211 students. To compensate for the possibility of none or incomplete response of the students 250 students will be invited to participate in the study.

Stratified random sample with proportional allocation technique will be adopted. Therefore, 63 female students from college of Medicine and 187 from college of Medical Sciences will be invited to participate in the study. The students from College of Medical Sciences will be distributed on the four divisions, thus ~63 students will be selected from nursing collage, ~45 students will be selected from Public health collage, ~42 students will be selected from Laboratory collage, ~25 students will be selected from Pharmacy collage. Simple random technique from a framework including a complete list of students` names will be used be adopted to select students. These lists will be obtained from the college administration.

The data were collected by a self-administered questionnaire composed of 3 main sections

-Section 1: Personal characteristic of the participants (College, academic level, age, marital status, accommodation, living with children at home, number of roommates, smoking history of chronic health problems, body mass index).

-Section 2: Pittsburg Quality of Sleep Index (PQSI): It is a self report instrument to assess the quality of sleep during the past month and contains 9 self-rated questions from which, 7 component scores are calculated and summed into a global score. The questions are framed in a 4-point Likert type and analyze factors such as sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance and use of sleep medication. Component scores range from 0 to 3 Therefore, the global scores range from 0 (worst sleep quality) to 21 (best sleep quality). A global sum of ">5" indicating a "poor" sleep, its validity produced a sensitivity of 89.6% and a specificity of 86.5% of patients versus control subjects.[15]

-Section 3: The Sleep Hygiene Index (SHI), which is a 13-item scale used to assess behaviors that compromise sleep hygiene. Participants were asked to indicate how frequently they do specific behaviors (always, frequently, sometimes, rarely, never). Total scores range from 0 to 52, with a higher score representing poorer sleep hygiene. It has adequate reliability and validity.[16]

It has been modified to match the Saudi religious and social background.

Self-administered online questionnaires were distributed on the selected students, during their free times then the filled questionnaires were collected automatically. The purpose of the study was explained to all participants.

A pilot study was carried out, on a purposive sample of 20 students, 5 from college of Medicine and 15 from College of Medical Sciences, whose data were excluded from the main study, in order to test the clarity of questions. Approval from the local Research and Ethics committee will be obtained.

Permissions of the deans of the involved colleges were obtained. A verbal consent were taken from every participant before conducting data collection

Data were analysed using SPSS version 25 using two tailed tests with level of significance of 0.05.

Descriptive analysis was done using frequency and percentage for different variables including demographic data college type, residence, and medical history besides all items for the used sleep scales.

For different scales, the total score was obtained by summing up all discrete items scores. Mean score with standard deviation and range was estimated for all scales independently. Categorization for Epworth Sleepiness Scaleand Pittsburgh Sleep Quality Indexscales based on attached scales attached scoring methods.For PSQI, global score was calculated after having different components scores (7 components) with score ranged from 0-21). Students who had score of 5 points or more were considered to have good sleep pattern.[17-20] Cross tabulation was used to assessthe relations between students sleep hygiene, sleep quality, and daytime sleepiness using Pearson's chi-square test of significance. Also, relation between different scales scores was tested using Pearson correlation analysis.

Results:

A total sample of 250 female students completed the study questionnaire whose ages ranged from 18 to 26 years old with mean age of 20.8 ± 1.9 years. Most participants were from college of medicine (28.4%), college of laboratory (28.4%), and college of public health (18%) while 14% were from college of nursing. Exact of 67.6% of the students were at bachelor academic level and 6% were at post graduate level. As for accommodation, 72.4% were resident their own homes and 24% were at rented house while 3.6 at Dormitory. Exact of 64% respondents live with children at home and 38.8% had 4-6 room mates while 30% had one roommate. Smoking was reported by 4% while 93.6% females were non-smokers. Exact of 62% of the students had normal weights, 12.4% had overweight, and 6.4% were obese. Chronic health problem including asthma DM, and others was reported by 8.4% female students (table 1).

Table 2 illustrates students sleep quality based on Pittsburgh Sleep Quality Index among female medical students and health sciences students of Albaha University. Exact of 62.8% of the female students rated their sleep as good. Also, sleep latency was good among 51.6% of the students and sleep duration for more than 7 hours was reported by 50% of the students. Sleep efficacy was more than 85% among 10% of the students and sleep disturbance was detected among 70.4% of the students. Exact of 71.6% of the students never used medication to sleep and 33.2% had poor daytime dysfunction. Totally, PSQI score ranged from 3 to 16 points out of 21 points (76%) as only 16% of the females were classified as good sleepers.

Table 3 shows students sleep hygiene based on Sleep Hygiene Index among female medical students and health sciences students of Albaha University. Exact of 85.2% of the female students reported that they frequently / always exercise to the point of sweating within 1 hour of going to bed, 82.4% reported that they frequently / always sleep in an uncomfortable bedroom, 81.2% reported that they sleep on an uncomfortable bed, 70.8% reported that they frequently / always use caffeine, or tobacco within

4hrs of going to bed or after going to bed, 70.8% take daytime naps lasting two or more hours, and 60% frequently/always get out of bed at different times from day to day while only 32% think, plan, or worry when | while in bed. Totally, the females score ranged from 8-52 with mean score of 27.1 out of 52 (52.1%)

Table 4 demonstrates effect of sleep hygiene practices on sleep quality among female medical students and health sciences students of Albaha University. Exact of 23.2% of students take daytime naps lasting two or more hours were good sleepers compared to 10.1% of those who frequently did with recorded statistical significance (P=.005). Also, good sleeping was detected among 23.3% of students who did not stay in bed longer than they should two or three times a week in comparison to 13% of those who frequently did (P=.044). Exact of 28.3% of the students who infrequently do important work before bedtime were good sleepers compared to 13.2% of those who frequently did (P=.012). Also, 27.3% of those who rarely think, plan, or worry when I am in bed are good sleepers compared to 14.3% of those who did (P=.048).

Discussion:

The current study aimed to sleep hygiene practices and sleep quality among female medical students and health sciences students, Albaha University. Sleep expertspropose that normal people mostly need about seven hours of sleep per day. But recently, many surveys in different countries revealed that the average needed sleep duration is very less than this amount. [21-23] Studies were conducted at different regions of the world have recommended that different sleep disorders are relatedto psychiatric and/or somatic problems and social life disorders.[22, 24-26] Sleep deprivation causes impaired mood, judgment, ability to learn and maintain information.[27, 28]

The current study revealed that more than three quarters (84%) of the female students were poor sleepers irrespective that half of them sleep for more than 7 hours daily with no need for medication among three quarter of the students. The lowest sleep quality was for students rating of sleep efficacy. Regarding sleep hygiene, the study results showed that the females score was 27.1 out of 52 (52.1%) which mean that the female students had moderate level of sleep hygiene. The most reported practices were doing exercise to the point of sweating within 1 hour of going to bed, sleeping in an uncomfortable bedroom, and they sleep on an uncomfortable bed. All these reported negative sleep experiences may explain poor sleep quality regardless sleep duration. As for daytime sleep, the current study revealed that students had mean score of 8.1 out of 24 (33.8%) with only one third had significant daytime sleep.

When relating sleep quality with students sleep practices and its effect on daytime sleepiness, the study showed that there was a significant relation between taking daytime naps lasting two or more hours, stay in bed longer than needed, thinking, planning, or worry when in bed all with poor sleep quality. Generally, increased sleep hygiene index score was associated with significant increased PSQI score which means more poor practices were associated

with poor sleep quality among the students. The study also revealed that significant day time sleepiness was higher among poor sleepers than good sleepers and higher PSQI score was associated significantly with higher ESS scale.

All these findings were concordant with what was reported by Unal KS et al [29] who found that the sleep hygiene score was 20.5 out of 21 which means very poor sleep quality and the daytime Sleepiness total scores of the students was 7.7 out of 24. There was a negative correlation between sleep quality and daytime sleep which means bad effect of sleep quality on students' daytime sleepiness. Also, Kaur G et al [30] in India found that the average Sleep Hygiene index score (SHI) was 31and majority of the study population (three quarters) had poor sleep hygiene. Problem of poor sleep hygiene was found to be significantly more in professional courses. Students with poor sleep hygiene doubled odds of poor sleep quality and more than two and half times likelihood of excessive daytime sleepiness. In Nigeria, James BO et al[32] found that 32.5% of medical students had poor sleep quality.Presence of a chronic physical illness, use of sleep medications and irregular sleep schedules were the most significant determinants of poor sleep quality.

Regionally, similar findings were reported by Nojomi M et al[32] who assessed the sleep pattern among medical students and residents. The authors found that 43% and 48% of students had gone to bed later than usual one to three times a week. Also, students with noise in their living place, and students who worked full-time while studying, and was less in person who did exercise.In Morocco, El Hangouche AJ et al[33] assessed prevalence of excessive daytime sleepiness, sleep quality and psychological distress as well as assess their association with low academic performance among students. Almost one-third of the students (36.6%) had excessive daytime sleepiness, and this was more frequently observed in female students (43% vs 20.1%). More than half (58.2%) of the students were poor sleepers (PSQI ≥5), while 86.4% of them had psychological distress. Al-Kandari S et al[34] in Kuwait revealed that a large proportion of university students suffered poor sleep quality. Sleep quality was strongly correlated with sleep hygiene practice (P<.001) but not with sleep hygiene knowledge. Medical students showed poorer sleep hygiene awareness and poor sleep quality compared with students from other non-medical colleges.

In Saudi Arabia, the situation was not so different. A study was conducted in Jeddah[35] among students and estimated high prevalence of sleep disorder among students (36.6%), specifically female students. Also, there were a significant relationship between sleep disorder and academic performance and with abnormal Epworth Sleepiness Scale (ESS) scores, total sleeping hours, and academic performance. Also, Almojali AIet al [36] estimated the prevalence of poor sleep quality and investigated its association with stress among medical students. A high prevalence of stress and poor sleep quality (53% and 76%, respectively) were detected among study students. Stress was a significant predictor for poor sleep quality in a multivariate regression analysis. Also, poor sleep quality was significantly associated with academic performance.

Strengths and limitations:
Up to our knowledge, this is the first study of its kind in Albaha that aims to assess sleep hygiene practices and sleep quality among female medical students and health sciences students in Albaha University, Kingdom of Saudi Arabia. However, some limitations should be addressed. First of all, there are some limitations inherent in its cross-sectional design, including the possibility of recall bias due to the use of self-administered questionnaires. Also, conduction of the study in one university setting could impact the generalizability of results.

CONCLUSION:
Only minority of females medical students were classified as good sleepers and a considerable proportion had significant daytime sleepiness. This study documents that most of the female students were poor sleepers with moderate level of sleep hygiene.

RECOMMENDATIONS:
Based on the study`s results and their discussion, the following are recommended:
1. Health education and training campaigns are needed to raise Practicing of sleep hygiene.
2. Posters and booklets at University Campus can greatly increase the knowledge and improve the Practicing of sleep hygien among students.
3. Encouraging health care workers to play more active role in providing information regarding Practicing of sleep hygiene for Students and families.
4. Further larger study using different design approach such as qualitative and analytical quantitative included students from different Universities and colleges is recommended to have a comprehensive overview of the situation in Albaha.

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Table 1. Bio-demographic data of female medical students and health sciences students of Albaha University

Bio-demographic data		No	%
Age in years	18-19	59	23.6%
	20-22	148	59.2%
	23+	43	17.2%
College	Medicine	71	28.4%
	Pharmacy	28	11.2%
	Nursing	35	14.0%
	Public health	45	18.0%
	Laboratory	71	28.4%
Academic level	High School	66	26.4%
	Bachelor	169	67.6%
	Postgraduate	15	6.0%
Marital status	Single	233	93.2%
	Married	17	6.8%
Accommodation	Owned house	181	72.4%
	Rented house	60	24.0%
	Dormitory	9	3.6%
Living with children at home	Yes	160	64.0%
	No	90	36.0%
Number of roommates	one	75	30.0%
	2-3	78	31.2%
	4-6	97	38.8%
Smoking	Non-smoker	234	93.6%
	Current smoker	10	4.0%
	Ex-smoker	6	2.4%
Smoking	Non-smoker	234	93.6%
	Cigarette	10	4.0%
	Moasal	1	.4%
	Shisha	5	2.0%
Body mass index	Underweight	48	19.2%
	Normal	155	62.0%
	Overweight	31	12.4%
	Obese	16	6.4%
Chronic health problems	Yes	21	8.4%
	No	229	91.6%

Table 2. Students sleep quality based on Pittsburgh Sleep Quality Index among female medical students and health sciences students of Albaha University.

PSQI components		No	%
Subjective sleep quality	Very good	60	24.0%
	Fairly good	97	38.8%
	Fairly bad	65	26.0%
	Very bad	28	11.2%
Sleep latency	Very good	33	13.2%
	Fairly good	96	38.4%
	Fairly bad	71	28.4%
	Very bad	50	20.0%
Sleep duration	> 7 hours	125	50.0%
	5-6 hours	67	26.8%
	< 5 hours	58	23.2%
Sleep efficiency	> 85%	25	10.0%
	75-84%	19	7.6%
	65-74%	27	10.8%
	< 65%	179	71.6%
Sleep disturbance	Very poor	21	8.4%
	Fairly poor	155	62.0%
	Fairly good	68	27.2%
	Very good	6	2.4%
Use of sleep medication	Not during the past month	179	71.6%
	Less than once a week	37	14.8%
	Once or twice a week	21	8.4%
	Three or more times week	13	5.2%
Daytime dysfunction	Very good	69	27.6%
	Fairly good	98	39.2%
	Fairly bad	57	22.8%
	Very bad	26	10.4%
Global PSQI score	Poor sleepers	210	84.0%
	Good sleepers	40	16.0%
	Range (0-21)	3-16	
	Mean $\pm$ SD	9.3 $\pm$ 2.9	

Table 3. Students sleep hygiene based on Sleep Hygiene Index among female medical students and health sciences students of Albaha University.

Sleep Hygiene Index	Never		Rarely		Sometimes		Frequent		Always	
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**
I take daytime naps lasting two or more hours.	61	24.4%	51	20.4%	65	26.0%	30	12.0%	43	17.2%
I go to bed at different times from day to day.	9	3.6%	44	17.6%	82	32.8%	58	23.2%	57	22.8%
I get out of bed at different times from day to day.	20	8.0%	45	18.0%	85	34.0%	61	24.4%	39	15.6%
I exercise to the point of sweating within 1 hr of going to bed.	104	41.6%	56	22.4%	53	21.2%	22	8.8%	15	6.0%
I stay in bed longer than I should two or three times a week.	22	8.8%	51	20.4%	71	28.4%	41	16.4%	65	26.0%
I use caffeine, or tobacco within 4hrs of going to bed or after going to bed.	72	28.8%	45	18.0%	60	24.0%	31	12.4%	42	16.8%
I do something that may wake me up before bedtime (for example: play video games, use the internet, or clean).	15	6.0%	30	12.0%	57	22.8%	61	24.4%	87	34.8%
I go to bed feeling stressed, angry, upset, or nervous	23	9.2%	50	20.0%	71	28.4%	62	24.8%	44	17.6%
I use my bed for things other than sleeping (for example: watch television, read, eat, or study).	25	10.0%	27	10.8%	60	24.0%	42	16.8%	96	38.4%
I sleep on an uncomfortable bed (for example: poor mattress or pillow, too much or not enough blankets).	103	41.2%	45	18.0%	55	22.0%	24	9.6%	23	9.2%
I sleep in an uncomfortable bedroom (for example: too bright, too Stuffy, too hot, too cold, or too noisy).	95	38.0%	55	22.0%	56	22.4%	24	9.6%	20	8.0%
I do important work before bedtime (for example: pay bills, schedule, or study).	16	6.4%	30	12.0%	81	32.4%	50	20.0%	73	29.2%
I think, plan, or worry when I am in bed.	11	4.4%	22	8.8%	47	18.8%	65	26.0%	105	42.0%
Overall SHI score (0-52)	Range (8-52)					Mean ± SD (27.1 ± 7.4)				

Table 4. Effect of sleep hygiene practices on sleep quality among female medical students and health sciences students of Albaha University

Sleep hygiene (practices)		PSQI sleep quality				P-value
		Poor sleepers		Good sleepers		
		No	%	No	%	
I take daytime naps lasting two or more hours.	Never / Rarely	86	76.8%	26	23.2%	.005*
	Frequently	124	89.9%	14	10.1%	
I go to bed at different times from day to day.	Never / Rarely	44	83.0%	9	17.0%	.826
	Frequently	166	84.3%	31	15.7%	
I get out of bed at different times from day to day.	Never / Rarely	52	80.0%	13	20.0%	.307
	Frequently	158	85.4%	27	14.6%	
I exercise to the point of sweating within 1 hr of going to bed.	Never / Rarely	136	85.0%	24	15.0%	.656
	Frequently	74	82.2%	16	17.8%	
I stay in bed longer than | should two or three times a week.	Never / Rarely	56	76.7%	17	23.3%	.044*
	Frequently	154	87.0%	23	13.0%	
I use caffeine, or tobacco within 4hrs of going to bed or after going to bed.	Never / Rarely	95	81.2%	22	18.8%	.257
	Frequently	115	86.5%	18	13.5%	
I do something that may wake me up before bedtime (for example: play video games, use the internet, or clean).	Never / Rarely	36	80.0%	9	20.0%	.419
	Frequently	174	84.9%	31	15.1%	
I go to bed feeling stressed, angry, upset, or nervous	Never / Rarely	58	79.5%	15	20.5%	.208
	Frequently	152	85.9%	25	14.1%	
I use my bed for things other than sleeping (for example: watch television, read, eat, or study).	Never / Rarely	41	78.8%	11	21.2%	.255
	Frequently	169	85.4%	29	14.6%	
I sleep on an uncomfortable bed (for example: poor mattress or pillow, too much or not enough blankets).	Never / Rarely	120	81.1%	28	18.9%	.129
	Frequently	90	88.2%	12	11.8%	
I sleep in an uncomfortable bedroom (for example: too bright, too Stuffy, too hot, too cold, or too noisy).	Never / Rarely	124	82.7%	26	17.3%	.481
	Frequently	86	86.0%	14	14.0%	
I do important work before bedtime (for example: pay bills, schedule, or study).	Never / Rarely	33	71.7%	13	28.3%	.012*
	Frequently	177	86.8%	27	13.2%	
I think, plan, or worry when I am in bed.	Never / Rarely	24	72.7%	9	27.3%	.048*
	Frequently	186	85.7%	31	14.3%	

P: Pearson X^2 test
* P < 0.05 (significant)