Sleep Patterns and Academic Performance among Medicine and Pharm D students in Almaarefa University 2018-2019

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Abstract

Background: Sleep is an important necessity in the human life. The majority of grown-ups require seven and a half to nine hours of sleep every night to work at their full capacity. Sleep deprivation is a common finding in students' academic life.

Objectives: To assess the relation between sleep pattern and academic performance among Al-maarefa University medical and pharmacy students in Riyadh.

Methods: An observational, descriptive, cross-sectional study. Among 162 Medical and Pharm D students. In Almaarefa University, Riyadh. It was done by a questionnaire. Data was analyzed using (SPSS).

Results: Among the included students, Findings regarding the relation between gender and depth of sleep was statistically insignificant, showed that deep sleep is 43% among males and 28% among females was considered statistically significant. Regarding shared or separated rooms, and factors. 66% used separated room. For females the shared rooms amounted to 38% while it was 19% in males. Regarding major, approximately 66% of students reported using separate rooms. For medicine students the separate rooms amounted to 71% while it was 57% among pharmacy students was also statically significant

Conclusion: Sleep pattern and GPA had no relation. However, male students had deeper sleep than females. The percentage of female students in a shared room was higher than males. Finally, medical students had a higher percentage in sharing a room than pharmacy students. Most of the respondents are majoring in medicine, as well as females were triple the number of males, this may have affected the results.

 Key words: sleep, performance, University, student, Saudi Arabia

Introduction

Sleep is an important necessity in the human life(1). It is fundamental for reestablishing mental and physical wellbeing and improving the quality of life. While resting, the mind catches up with regulating a wide assortment of biological needs that keep the body running in perfect condition. This sleep and wake cycle is driven by the circadian rhythm and is affected by a huge number of things including: our daily physical activity, our routines of school and work, the food we eat, the environment we live in and so many more. The majority of adultsrequire along the lines of seven and a half to nine hours of sleep throughout every night to work at their full capacity (3). Lack of sleep and adverse effects linked with sleep issues have been overlooked and poorly understood. As a matter of fact, lack of sleep has been one of the most common issues of our society today. And those who suffer the most due to lack of sleep are the students, due to their academic stressful lifestyle. An examination with a healthy representative group demonstrated that drowsiness may considerably, and substantially affect general wellbeing and life quality (3). The sleep wake cycle of medical science students is characterized by lack of sleep, prolonged onset of sleep, and events of snoozing amid the day. Medical science students are subjected to a huge amount of responsibilities because of academic demands (4). Components identified with poor sleep include caffeine utilization, school related tension, depression, and biological factors (5). A few examinations demonstrated that students' overall work was influenced by students' bedtime and the time they woke up and not the amount of time spent in bed (6).

The bad academic performance related with lack of sleep is a particularly important issue worldwide(7). A practice especially predominant among medical students who feel obliged to undertake excessive workloads and overloaded timetables is to replace sleep with studying(2). However, sacrificing sleep might be fruitless for medical students as it blocks their learning temporarily, and affects life-long wellbeing and the potential to work as therapeutic practitioners(2).

The most remarkably affected area is the prefrontal cortex, which performs higher brain tasks including language, working memory, coherent thinking, imagination, and individuality(8). An evaluation showed that one night of reduced sleep span was followed by diminished memory encoding, which prompted less retention of knowledge, an impact proposing the hippocampus was influenced(8).

In 2017 Cvejic conducted a study in Australia exploring the complex relationship between sleep, autonomic activity, wellbeing and performance in medical students. The aim of this study was to evaluate the impact of sleep-related factors on psychological wellbeing, cognitive task performance and academic standing in medical students. The sample size was 59 undergraduate medical students. The findings stated that poor sleep quality in the month preceding assessment correlated with psychological distress (p<0.001) and reduced nocturnal heart rate variability (p=0.007). Psychological distress also correlated with reduced nocturnal heart rate variability (p=0.031) and less refreshing sleep during the monitoring week (p<0.001), but not with sleep timing parameters. A greater increase in heart rate variability during the transition from awake to sleep significantly predicted better spontaneous cognitive performance (p=0.021). Better academic standing was predicted by consistently short, less refreshing sleep (all p<0.001), along with earlier bedtimes (p=0.004) and greater psychological wellbeing (p=0.009). It concluded that unrefreshing, short-duration sleep and psychological distress are prevalent in medical students during university training and were associated with reduced nocturnal parasympathetic autonomic activity. Achieving higher academic grades was associated with high psychological wellbeing despite consistently short, unrefreshing sleep (2).

Research conducted by Wang in 2016 in China, aimed to examine Chinese adolescents' sleep patterns and school performance in the context of a high-stress academic challenge, on 481 students, The result showed that 21% of the students had bedtimes after 12:00 am, 78% had sleep latency longer than 30 minutes, 15% had wake time earlier than 6:00 am, and the vast majority (94%) had sleep duration less than 8 hours. After adjusting for selected confounders such as academic stress, prolonged sleep latency was associated with poorer self-reported academic performance (p = 0.01), and late bedtime was associated with higher College Entrance Exam (CEE) score. Finally the findings demonstrate that late bedtime, prolonged sleep latency, early wake time, and insufficient sleep are very common in Chinese adolescents preparing for the CEE. Furthermore, prolonged sleep latency is associated with poor academic performance and later bedtime is associated with high CEE scores, whereas no significant association is noted between other variables of sleep patterns and either academic performance or the CEE score (9).

In USA, 2016 Beebe made a study about impact of Multi-Night Experimentally Induced Short Sleep on Adolescent Performance in a Simulated Classroom. The aim of the study was to investigate whether a realistic "dose" of shortened sleep, relative to a well-rested state, causes a decline in adolescents' learning and an increase in inattentive and sleepy behaviors in a simulated classroom setting. The research was carried out on 87 students. The results showed that simulated Classroom Performance (Primary Outcomes), adolescents scored modestly but significantly higher on video quizzes following healthy sleep compared to short sleep, z = 2.18, p = 0.029. Whereas those who scored at or below the median following healthy sleep averaged little change in score (mean rise of 0.2 points). In conclusion, these findings suggest that previously-reported correlations between sleep duration and academic performance reflect true cause-effect relationships (10).

The aim of the study by Cates, 2015 in USA was to determine the quality of sleep among pharmacy students in the didactic portion of the curriculum at one school of pharmacy. The research was carried out on 253 students.

The results showed that students in the lower GPA category had higher scores on 2 of 7 components of the PSQI (Pittsburgh Sleep Quality Index, a self-rated instrument that measures sleep habits for a month) and on the global score. Poor sleep quality, indicated by a global PSQI score of greater than 5 was reported by 55% of students. The rate of poor sleeping was 75% among students in the lower GPA category compared to 45.5% of students in the intermediate GPA category and 56.2% of students in the higher GPA category (p=0.003). In conclusion, poor sleep quality was pervasive among surveyed pharmacy students in the didactic portion of the pharmacy school curriculum, especially among those with lower GPAs (11).

A study was conducted by Westrick in USA in 2015. He was studying the relationship between sleep duration and academic performance among student pharmacists. Among 364 student pharmacists >54.7% reported 6 hours of sleep or less at night during weekdays, and >58.1% took naps during the day. The majority (81.7%) reported feeling exhausted when waking up almost every day; there was significant associations between the final grade and sleep duration the night prior to an examination and between semester GPA (p=0.006). The purpose was to identify sleep patterns and frequency of daytime sleepiness and to assess the association between sleep duration and academic performance among student pharmacists (8).

In Portugal, 2014 Duarte made a study about sleep-wake patterns and their influence on school performance. The aim of the study was to characterize sleep-wake patterns and their influence on academic performance for a sample of Portuguese adolescents. The research was carried out on 2094 students. The findings showed that students with high academic achievement have better quality of sleep (67.7%) with statistical significance (P = 0.000). Poor academic achievement is observed between those who have poor sleep quality, also with statistical significance. Since the correlation between morningness/eveningness and school achievement is (r=- 0219), a percentage of 73.05% can be attributed to the effect of morningness/ eveningness on school performance, In conclusion, excessive daytime sleepiness affects most adolescents, observing that older ones and those attending the 11th grade had greater daytime sleepiness (12).

In 2013 in Ethiopia, Lemma assessed the association of sleep quality with academic performance among 2,173 university students (471 females and 1,672 males). Multiple linear regression showed that poor sleep quality was significantly associated with poor academic performance (P=0.002): a unit increase in sleep quality score was associated with 0.012 points reduction in mean CGPA. However, there was no statistically significant association between sleep duration and CGPA. Being male was associated with 0.27 point increase in mean CGPA compared to female (P<0.001); an increase in year of study at the university from second year to third year and from second year to fourth year was associated with 0.62 and 0.19 point increase in CGPA, respectively. The reduction in mean CGPA was progressively higher as students missed more classes. In conclusion, the study findings show association between sleep problems and poor academic performance among university students (13).

In Croatia 2013, Valic conducted a study. The aim was to evaluate sleep habits of dental students and the relationship between sleep habits and academic performance. The participants were 447 dental students. The result showed that high-performing students reported to have the usual amount of sleep the night before an exam, more often than low-performing students (38.8% vs. 21.7%, respectively). Accordingly, low-performing students reported a small amount of sleep more often than high-performing students the night before an examination (39.3% vs. 24%, respectively). Low-performing students reported to stay awake during the night due to computer or TV usage more often than high-performing students (66% vs. 45%; P = 0.001). The percentage of students who reported insomnia symptoms was significantly higher in the low-performing students group compared with the high-performing students group (10.4% vs. 3.1%). There were significant differences in the gender distribution of the two groups, as low-performing students were more often male compared with high-performing students (40.2% vs. 15.5%). Therefore Self-reported academic performance of dental students in Croatia is associated with timing of sleep and wakefulness, rather than with total sleep duration (6).

Gaultney (2010) in USA, conducted a study to examine the prevalence of risk for sleep disorders among college students by gender and age, and their associations with GPA among 1,845 college students. The results showed that about (27%) were at risk for at least one sleep disorder. Students who have sleep disorders or are at risk for at least one disorder had a GPA below 2.00/4.00. Those who reported no sleep disorder had a higher GPA (M = 2.82, SD = .88) than those who reported at least one sleep disorder (M = 2.65, SD = .99). To conclude, many college students are at risk of sleep disorders, and those at risk may also be at risk of academic failure (14).

In 2009 Zailinawati conducted a study of daytime sleepiness and sleep quality among Malaysian medical students. The Sample size of the study was 799 medical students. It was found that these students reported sleeping between 1-11 hours per day (mean 6.6, SD=1.3), only 51.2% slept seven hours or more per night. A minority of the respondents (3.9%) used sleep medication in the past one month. 16.1% of the respondents reported fairly bad to very bad sleep quality. The median General Health Questionnaire (GHQ-12) score was 2 (range 0-12), 41.8% of respondents had psychological distress (GHQ >3). (65.4%) reported moderate to high chance of dozing during the afternoon lecture. The median Epworth Sleepiness Score was 9.0 (range 0-24). Excessive daytime sleepiness (ESS >11) occurred in 35.5% of students. This is statistically significantly more in Phase 2 students when compared to Phase 1 students. In conclusion, daytime sleepiness is highly prevalent in the medical school in this study (15).

In USA (2009), Eliasson published a study that aimed to investigate the relative importance of total sleep time compared to the timing of sleep and wakefulness for academic performance. The study was based on 170 students. It showed that high performers had earlier bed times and earlier wake times compared to poor performers. Students with good academic performance were more likely to take naps regularly than students with poor academic performance (p =0.07). In conclusion, timing of sleep and wakefulness correlated more closely with academic performance than total sleep time and other relevant factors (16).

Yang, 2005 in China, did a study about status and influencing factors on sleep quality in some medical college students. Among 120 medical students, nineteen percent of the medical college students showed poor quality of sleep and the difference between genders was not statistically significant (P > 0.05). Statistically significant (P < 0.05) difference was seen among different levels and correlation was found between sleep quality and depression or anxiety (P < 0.0001); irregular work/rest (P < 0.0001), stress (P < 0.0002). Factors influencing on the quality of sleep in medical college students included: depression, anxiety, irregular work/rest and stress (17).

In 2004, a study lead by Howell in Canada was done for the purpose of examining associations between measures of sleep propensity, sleep quality and academic performance. The sample size was 414 students. The main findings for this study were the following: for students carrying a full course load, GPA was lower among those having poor sleep quality (M= 2.64, SD=O.61, n=92) than among those having a good quality of sleep (M = 2.86, SD = 0.62, n = 113; $t_{,,}$ = 2.52, p < 0.02), whereas for students carrying a partial course load, there was no difference among students having poor sleep quality and those having good quality of sleep. In the prediction of GPA, a main effect for course load also emerged such that students carrying a full course load had higher GPAs than those carrying a partial course load (p < 0.01). In conclusion, in students carrying a full course load, GPA was lower among those having poor sleep quality than among those having a good quality of sleep, whereas for students carrying a partial course load, there was no difference among students having poor sleep quality and those having good quality of sleep. Unlike the effects that emerged for sleep quality scores, sleep propensity did not interact with course load to predict GPA (18).

In 2015, Mirghani published an article about the association between good sleep quality and better academic performance among medical students in Sudan. The aim of this study was to assess the relationship between sleep quality and academic performance among Sudanese medical students. The sample was 165 medical students. A significant difference (p < 0.001) between the excellent and average groups was found for overall sleep quality. The mean sleeping hours were (7 ± 1.9) and (6.3 ± 1.9) for the excellent and pass groups respectively (p < 0.05). A significant difference (p < 0.001) between the excellent and average groups was found for weekday and weekend bedtime, weekend wake-up time, and weekend wake-up delay. Besides, snoring was present in 9.2 % of the excellent group versus 28 % in the pass group (p < 0.005). A well-built relationship was perceptible between good sleep quality and high academic performance (7).

In 2016 Elagra conducted a study in Saudi Arabia regarding the association between sleep quality and academic performance among dental students. The aim was to investigate the sleep patterns of dental students from different academic levels and to determine the effect of sleep patterns on the academic performance of students. The sample size was 546 undergraduate female students. About 64.8% students described their sleep as good or very good whereas the remaining described their sleep as bad or very bad. The mean number of sleep hours at night for all students was 5.85 ± 1.853. The students who slept 8 hours or more at night were (21.1%). There was no significant difference between the proportion of students who slept ≥8 hours in the nonclinical group with those in the clinical group. In general, GPA had a significant negative weak correlation with Pittsburgh Sleep Quality Index (PSQI) scores. It can be concluded that dental students tend to have poor sleep quality, which is unknown to them. Poor sleep quality was associated with lower academic performance, especially in clinical years (19).

Alsaqqaf, 2016 in KSA, conducted a study to determine sleep habits and sleep quality in medical students during their clinical years using validated measures; and to investigate associations with academic performance and psychological stress. The research was carried out on a sample of 320. The findings were the students acquired on average, 5.8 hours of sleep each night, with an average bedtime at 01:53. Approximately 8% reported acquiring sleep during the day, and not during night time. Poor sleep quality was present in 30%, excessive daytime sleepiness (EDS) in 40%, and insomnia symptoms in 33% of students. Multivariable regression models revealed significant associations between stress, poor sleep quality, and EDS. Poorer academic performance and stress were associated with symptoms of insomnia. In conclusion, sleep deprivation, poor sleep quality, and EDS are common among clinical year's medical students. High levels of stress and the pressure of maintaining grade point averages may be influencing their quality of sleep (20).

A study by Bahammam, 2015 in KSA, was designed to assess sleep patterns among male medical students at different academic levels. Among 129 medical students, total sleep time at night + nap of the whole group was 5.9 +/- 1.6 hours. Twenty-nine students were defined to have excessive daytime sleepiness, 83.3% of students reported napping during the daytime more than twice per week. Analysis of the sleep pattern of male medical students revealed that this group is sleep deprived, which in turn may affect their academic performance (21).

In 2012 a study was conducted in the Kingdom of Saudi Arabia by Abdulghani. The aim was to examine the prevalence of sleep disorders among medical students and investigate any relationship between sleep disorder

and academic performance. The sample size was 491 students. Findings on the Epworth Sleepiness Scale (ESS) score demonstrated that 36.6% of participants were considered to have abnormal sleep habits, with a statistically significant increase in female students (p= 0.000). Sleeping between 6–10h per day was associated with normal ESS scores (p=0.019) as well as the academic grades 3.75. Abnormal ESS scores were associated with lower academic achievement (p=0.002). In conclusion a high prevalence of sleep disorder information of daytime sleepiness (DTS) was found in this study on three groups of medical students. It showed that female students have more sleep disorder than male students. Analysis of the relationship between sleep disorders and academic achievement shows a significant relationship with (DTS) and academic grades (4).

BaHammam executed a study to assess the relationship between sleep habits and sleep duration with academic performance in medical students at 2012 in Saudi Arabia, with a sample size of 410 students (males: 67%). The final analysis included 115 students; (28%) had "excellent" performance, and 295 students (72%) had "average" performance. The "average" group had a higher Epworth Sleepiness Scale score and a higher percentage of students who felt sleepy during class. In contrast, the "excellent" group had an earlier bedtime and increased total sleep time during weekdays. To conclude, decreased nocturnal sleep time, late bedtimes during weekdays and weekends and increased daytime sleepiness are negatively associated with academic performance in medical students(22).

Study design:
The study is an observational, descriptive, cross-sectional design.

Study area and population:
This study was conducted in Almaarefa University for Science and Technology (UM) in Diriyah, which was established by Dr. Zaid Alzamil in 2009. It consists of various colleges including medicine; pharmacy (Pharm D.), applied sciences, Nursing, Respiratory Care, Emergency Medical Services, Computer Science, Information Systems and industrial engineering. Diriyah is a city in Saudi Arabia located on the north-western outskirts of the Saudi capital, Riyadh. Diriyah was the original home of the Saudi royal family; it served as the capital of the Emirate of Diriyah under the first Saudi dynasty from 1744 to 1818. The population of the study was Medical and Pharm D students excluding preparatory year students.

Sample size and technique:
The data had been collected from 162 students who were selected by non-probability quota sampling technique.

Data collection tool:
A questionnaire specially designed for this study was used. It was constructed in two sections; the first is for personal information, the second is about sleep patterns and factors affecting sleep quality.

Data collection method:
The questionnaire was distributed after checking the validity and reliability by pilot study. A link for it was sent via Almaarefa university student email.

Data analysis:
The data was cleared, coded, and entered using SPSS. Suitable statistical tests were used for data analysis and the results were presented in tables and graphs as percentages.

Ethical consideration:
Permission was taken before the participants opened the questionnaire link. Data was used for research purposes only. Privacy and confidentiality was maintained.

Table 1: Personal Information

	Frequency	Percent
Medicine	99	61%
Pharma	63	39%
Total	162	100%

Level

	Frequency	Percent
4	9	6%
5	16	10%
6	15	9%
7	43	27%
8	12	7%
9	33	20%
10	9	6%
11	12	7%
12	3	2%
13	10	6%
Total	162	100%

Age group

	Frequency	Percent
19-21	53	33%
22-24	79	49%
25 and above	30	19%
Total	162	100%

Gender

	Frequency	Percent
Female	125	77%
Male	37	23%
Total	162	100%

Marital status

	Frequency	Percent
Single	156	96%
Married	6	4%
Total	162	!00%

Results

Table 2 shows the relation between sleep pattern and GPA. In this table, duration hours and GPA are discussed. According to the results it shows that 80% of the people who sleep less than 6 hours showed an increase in GPA. As the amount of sleep increased the percentage decreased, for example only 77% of the population who slept 6-8 hours had an increase in GPA. So sleep seems to be inversely proportional to GPA. This difference between duration hours and GPA was statistically insignificant. As for bedtime and GPA, the results demonstrated that the earlier the students slept, the lower their GPA was. 33% of the students who slept earlier than 09:00 PM had a decrease in their GPA, whereas only 19% of the students who slept from 09:00PM-12:00AM had a decrease in their GPA. And even more, only 16% of the students who slept after 12:00AM had a decrease in their GPA. So the earlier the students sleep, the worse their GPA. Yet this difference between bedtime and GPA was statistically insignificant. In the same table, Sleep environment (rooms) and GPA are explored, and it seems that 80% of the students who sleep in shared rooms have increased GPAs, while it was 77% percent among those who sleep in separate rooms. This difference between sleep environment (rooms) and GPA was statistically insignificant. Speaking of sleep environment and GPA, 78% showed an increase in GPA. 18% of students who tended to sleep in a quiet room and 10% of those who tended to sleep in a noisy room showed a decrease in GPA. This difference was statistically not significant. Regarding the correlation between the depth of sleep and GPA, 78% showed an increase in GPA. 27% accounted for people getting deep sleep, while it was 57% for normal depth and 16% for light sleep. This difference between deep, normal and light sleep in contrast with increased GPA was statistically not significant.

Table 2: Sleep Pattern and GPA

Duration hours and GPA

	Decreased	Steady	Increased	Total
<6 hours	14 (18%)	2 (3%)	63 (79%)	79 (49%)
6 – 8 hours	12 (16%)	5 (7%)	56 (77%)	73 (45%)
>8 hours	3 (30%)	0	7 (70%)	10 (6%)
Total	29 (18%)	7 (4%)	126 (79%)	162

Bedtime and GPA

	Decreased	Steady	Increased	Total
< 9 o'clock	1 (33%)	0	2 (67%)	3 (2%)
9-12 o'clock	16 (19%)	6 (7%)	61 (73%)	83 (51%)
> 12 o'clock	12 (16%)	1 (1%)	63 (83%)	76 (47%)
Total	29 (18%)	7 (4%)	126 (79%)	162

Sleep Environment (rooms) and GPA

	Decreased	Steady	Increased	Total
Separate	20 (19%)	5 (4%)	82 (77%)	107 (66%)
Shared	9 (16%)	2 (4%)	44 (80%)	55 (34%)
Total	29 (18%)	7 (4%)	126 (79%)	162

Sleeping Environment and GPA

	Decreased	Steady	Increased	Total
Quite	28 (18%)	7 (5%)	117 (77%)	152 (94%)
Noisy	1 (10%)	0	9 (90%)	10 (6%)
Total	29 (18%)	7 (4%)	126 (79%)	162

Depth of sleep and GPA

	Decreased	Steady	Increased	Total
Deep	7 (16%)	2 (5%)	34 (79%)	43 (27%)
Normal	20 (21%)	4 (4%)	72 (75%)	96 (59%)
Light	2 (9%)	1 (4%)	20 (87%)	23 (14%)
Total	29 (18%)	7 (4%)	126 (79%)	162

Table 3 shows the relation between sleep duration and factors. Regarding major and duration of sleep, only a slight difference was observed between both groups. The percentages related to sleeping less than 8 hours were 94% for medicine students and 94% for pharmacy students. As for sleeping less than 6 hours, percentages were 60% and 40% for medicine and pharmacy students respectively. However, these differences among both groups had no significance. 95% of both male and female students claimed they are single. 48% of single students sleep less than 6 hours. On the other hand, 67% of married students do. The relation between marital status and duration of sleep was of no significant value, as shown in Table 3. As for the relation between gender and duration of sleep, Hours of sleep were classified into three categories: Less than 6 hours of sleep, 6-8 hours and more than 8 hours of sleep. The majority of respondents reported obtaining less than 6 hours of sleep (49%). Females represent 81% while males were 19%. Few respondents (6%) sleep more than 8 hours; females represent 80%. In relation to duration and level of study, levels are classified into: Pre-clinical (4-7) and Clinical (8-13). The majority (52%) of pre-clinical respondents obtain less than 6 hours of sleep while only 8% sleep more than 8 hours. Approximately half (51%) of respondents from clinical levels sleep 6-8 hours whereas 46% sleep less than 6 hours.

Table 3: Sleep Duration and Factors

Major and Duration

	<6 hours	6 – 8 hours	>8 hours	Total
Medicine	47 (48%)	46 (46%)	6 (6%)	99 (61%)
Pharmacy	32 (51%)	27 (43%)	4 (6%)	63 (39%)
Total	79 (49%)	73 (45%)	10 (6%)	162

Marital status and Duration

	<6 hours	6 – 8 hours	>8 hours	Total
Single	75 (48%)	71 (46%)	10 (6%)	156 (96%)
Married	4 (67%)	2 (33%)	0	6 (4%)
Total	79 (49%)	73 (45%)	10 (6%)	162

Gender and Duration

	<6 hours	6 – 8 hours	>8 hours	Total
Male	15 (41%)	20 (54%)	2 (5%)	37 (23%)
Female	64 (51%)	53 (42%)	8 (7%)	125 (77%)
Total	79 (49%)	73 (45%)	10 (6%)	162

Duration and Level of study

	<6 hours	6 – 8 hours	>8 hours	Total
4	5 (56%)	2 (22%)	2 (22%)	9 (6%)
5	10 (63%)	6 (37%)	0	16 (10%)
6	5 (33%)	8 (53%)	2 (13%)	15 (9%)
7	23 (54%)	17 (40%)	3 (6%)	43 (27%)
8	7 (58%)	4 (33%)	1 (9%)	12 (7%)
9	15 (45%)	18 (55%)	0	33 (20%)
10	2 (22%)	7 (78%)	0	9 (6%)
11	6 (50%)	6 (50%)	0	12 (7%)
12	1 (33%)	1 (33%)	1 (33%)	3 (2%)
13	5 (50%)	4 (40%)	1 (10%)	10 (6%)
Total	79 (49%)	73 (45%)	10 (6%)	162

Table 4 shows the relation between sleep interruption and factors. 20% of total number of students have never experienced interrupted sleep, 36% rarely experienced interrupted sleep, 31% usually experienced interrupted sleep, and 12% claimed that they always suffered from interrupted sleep. 33% of females tended to have interrupted sleep rarely. It was 49% in males. This difference between genders was statistically not significant. For married students 50% tended to have rarely interrupted sleep, while single students were 36%. This difference between marital status and interrupted sleep was also statistically not significant. Regarding major and interrupted sleep, there was no statistical significant difference in sleep pattern; about 60% of medicine students have continuous sleep, whereas it is 50% among pharmacy students. This is clearly shown in Table 4.

Table 4: Sleep Quality and Factors

Gender and interrupted sleep

	Never	Rarely	Usually	Always	Total
Male	24 (19%)	41 (33%)	42 (34%)	18 (14%)	125 (77%)
Female	9 (24%)	18 (49%)	8 (22%)	2 (5%)	37 (23%)
Total	33 (20%)	59 (36%)	50 (31%)	20 (12%)	162

Marital status and interrupted sleep

	Never	Rarely	Usually	Always	Total
Single	33 (21%)	56 (36%)	48 (31%)	19 (12%)	156 (96%)
Married	0	3 (50%)	2 (33%)	1 (17%)	6 (4%)
Total	33 (20%)	59 (36%)	50 (31%)	20 (12%)	162

Major and interrupted sleep

	Never	Rarely	Usually	Always	Total
Medicine	19 (19%)	41 (41%)	25 (25%)	14 (14%)	99 (61%)
Pharmacy	14 (22%)	18 (29%)	25 (40%)	6 (9%)	63 (39%)
Total	33 (20%)	59 (36%)	50 (31%)	20 (12%)	162

Table 5 shows the relation between sleep depth and factors. Findings regarding the relation between gender and depth of sleep, showed that deep sleep is 43% among males and 28% among females. This difference was considered statistically significant (p= 0.0088). The relation between major and depth of sleep shows that 26% in medicine and 27% in pharmacy have deep sleep. For medicine students, the students who had normal sleep depth amounted to 55%, while among pharmacy students it was 65%. Students of medicine who reported they have light sleep were 18%, on the other hand pharmacy was only 8%. This difference between major and depth of sleep was statistically insignificant. The finding showed that 27% of single students have deep sleep while 17% of married students do. For single students the normal sleep amounted to 59% while 67% of married students had normal sleep. 14% of single students used to experience light sleep while it was 17% for married students. This difference between marital status and depth of sleep was statistically insignificant.

Table 5: Sleep Quality and factors
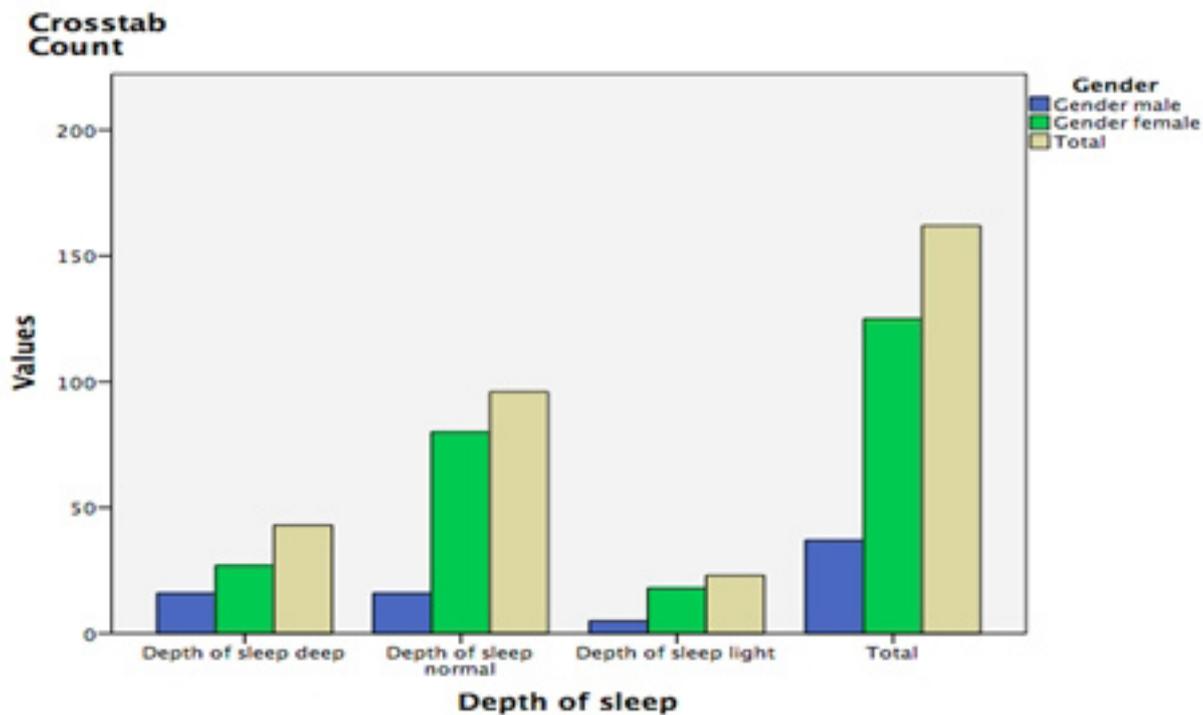
Depth of sleep and gender

	Deep	Normal	Light	Total
Male	16 (43%)	16 (43%)	5 (14%)	37 (23%)
Female	27 (22%)	80 (64%)	18 (14%)	125 (77%)
Total	43 (27%)	96 (59%)	23 (14%)	162

P-value = 0.0088 significant

Depth of sleep and major

	Deep	Normal	Light	Total
Medicine	26 (26%)	55 (55%)	18 (18%)	99 (61%)
Pharmacy	17 (27%)	41 (65%)	5 (8%)	63 (39%)
Total	43 (27%)	96 (59%)	23 (14%)	162

Depth of sleep and marital status

	Deep	Normal	Light	Total
Single	42 (27%)	92 (59%)	22 (14%)	156 (96%)
Married	1 (17%)	4 (67%)	1 (16%)	6 (4%)
Total	3 (27%)	96 (59%)	23 (14%)	162

Table 6 shows the relation between bed time and factors. Only 2% of female students tended to sleep before 09:00 PM, while no male students claimed to sleep before the same time. Students who sleep between 09:00 PM to 12:00 AM were 51% of both male and female students. 46% of females claimed to sleep after 12:00 AM, while male students were 49%. This difference between bedtime and gender was statistically insignificant. In relation to bedtime and major, (56%) of students majoring in medicine sleep between 09:00 PM to 12:00 AM, while (44%) of students majoring in pharmacy sleep between 09:00 PM to 12:00 AM. Students who reported they sleep after 12:00 AM were mostly those majoring in pharmacy (56%), and (41%) of medicine students sleep after 12:00 AM. Only (3%) of medicine students sleep before 09:00 PM while no pharmacy students reported they sleep before 09:00 PM. The result was not significant. According to bedtime in regards to marital status, the majority of those who are single (51%) and of those who are married (67%) sleep between 09:00 PM and 12:00 AM As for the people who noted that they sleep after 12:00 AM, (47%) were single and (33%) were married. On the other hand, only (2%) of singles sleep before nine PM while none of those who are married noted that they sleep before 09:00 PM. The result was not statistically significant.

Table 6.

Bedtime and gender

	<9 o'clock	9-12 o'clock	>12 o'clock	Total
Male	0	19 (51%)	18 (49%)	37 (23%)
Female	3 (2%)	64 (51%)	58 (47%)	125 (77%)
Total	3 (2%)	83 (51%)	76 (47%)	162

Bedtime and major

	<9 o'clock	9-12 o'clock	>12 o'clock	Total
Medicine	3 (33%)	55 (55%)	41 (41%)	99 (61%)
Pharmacy	0	28 (44%)	35 (56%)	63 (39%)
Total	3 (2%)	83 (51%)	76 (47%)	162

Bedtime and Marital status

	<9 o'clock	9-12 o'clock	>12 o'clock	Total
Singe	3 (2%)	79 (51%)	74 (47%)	156 (96%)
Married	0	4 (67%)	2 (33%)	6 (4%)
Total	3 (2%)	83 (51%)	76 (47%)	162

Table 7 shows the relation between sleeping environment and factors. In sleep pattern regarding quiet or noisy environment, 94% tended to sleep in a quiet environment. For females, those who claimed to sleep in a noisy environment were 5%, while it was 11% in males. This difference between genders was statistically not significant, as shown in Table 7. Medicine students who slept in a noisy environment were 6%, as well as pharmacy students (6%). However statistically it is not significant. For single students, those who tended to sleep in a noisy environment were 6%, while for married students it was 0%. This difference was also statistically of no significance. As can be seen in Table 7, sleeping environment was not a significant predictor of level of study.

Table 7:

Sleeping Environment and gender

	Quiet	Noisy	Total
Male	33 (89%)	4 (11%)	37 (23%)
Female	119 (95%)	6 (5%)	125 (77%)
Total	152 (94%)	10 (6%)	162

Sleeping Environment and major

	Quiet	Noisy	Total
Medicine	93 (94%)	6 (6%)	99 (61%)
Pharmacy	59 (94%)	4 (6%)	63 (39%)
Total	152 (94%)	10 (6%)	162

Sleeping Environment and marital status

	Quiet	Noisy	Total
Single	146 (94%)	10 (6%)	156 (96%)
Married	6 (100%)	0	6 (4%)
Total	152 (94%)	10 (6%)	162

Sleeping Environment and level of study

	Quiet	Noisy	Total
4	8 (89%)	1 (11%)	9 (6%)
5	15 (94%)	1 (6%)	16 (10%)
6	14 (93%)	1 (7%)	15 (9%)
7	41 (95%)	2 (5%)	43 (27%)
8	12 (100%)	0	12 (7%)
9	30 (91%)	3 (9%)	33 (20%)
10	8 (89%)	1 (11%)	9 (6%)
11	11 (92%)	1 (8%)	12 (7%)
12	3 (100%)	0	3 (2%)
13	10 (100%)	0	10 (6%)
Total	152 (94%)	10 (6%)	162

Table 8 shows the relation between sleep pattern, regarding shared or separated rooms, and factors. 66% used a separated room. For females the shared rooms amounted to 38% while it was 19% in males. This difference between gender was statistically significant (p=0.0279). Regarding major, approximately 66% of students reported using separate rooms. For medicine students the separate rooms amounted to 71% while it was 57% among pharmacy students. This finding was also statistically significant (p=0.0562). As seen in Table 8 65% of single students tended to be sleeping in separate rooms while 83% of married students did. This was statistically not significant. When all the variables previously shown to be related to sleeping room were entered into the model simultaneously the only variables that remained significant

Table 8:

Sleeping Room and gender

	Separate	Shared	Total
Male	30 (81%)	7 (19%)	37 (23%)
Female	77 (62%)	48 (38%)	125 (77%)
Total	107 (66%)	55 (34%)	162

P-value = 0.0279 significant

Sleeping Room and marital status

	Separate	Shared	Total
Single	102 (65%)	54 (35%)	156 (96%)
Married	5 (83%)	1 (17%)	6 (4%)
Total	107 (66%)	55 (34%)	162

Sleeping Room and major

	Separate	Shared	Total
Medicine	71 (71%)	28 (28%)	99 (61%)
Pharmacy	36 (57%)	27 (43%)	63 (39%)
Total	107 (66%)	55 (34%)	162

P-value = 0.0562 significant

Sleeping Room and study level

	Separate	Shared	Total
4	3 (33%)	6 (67%)	9 (6%)
5	10 (63%)	6 (37%)	16 (10%)
6	12 (80%)	3 (20%)	15 (9%)
7	32 (74%)	11 (26%)	43 (27%)
8	7 (58%)	5 (42%)	12 (7%)
9	23 (70%)	10 (30%)	33 (20%)
10	6 (67%)	3 (33%)	9 (6%)
11	7 (58%)	5 (42%)	12 (7%)
12	0	3 (100%)	3 (2%)
13	7 (70%)	3 (30%)	10 (6%)
Total	107 (66%)	55 (34%)	162

Sleeping room and major

Shared   Separate

Sleeping room and gender

Share   Saparate
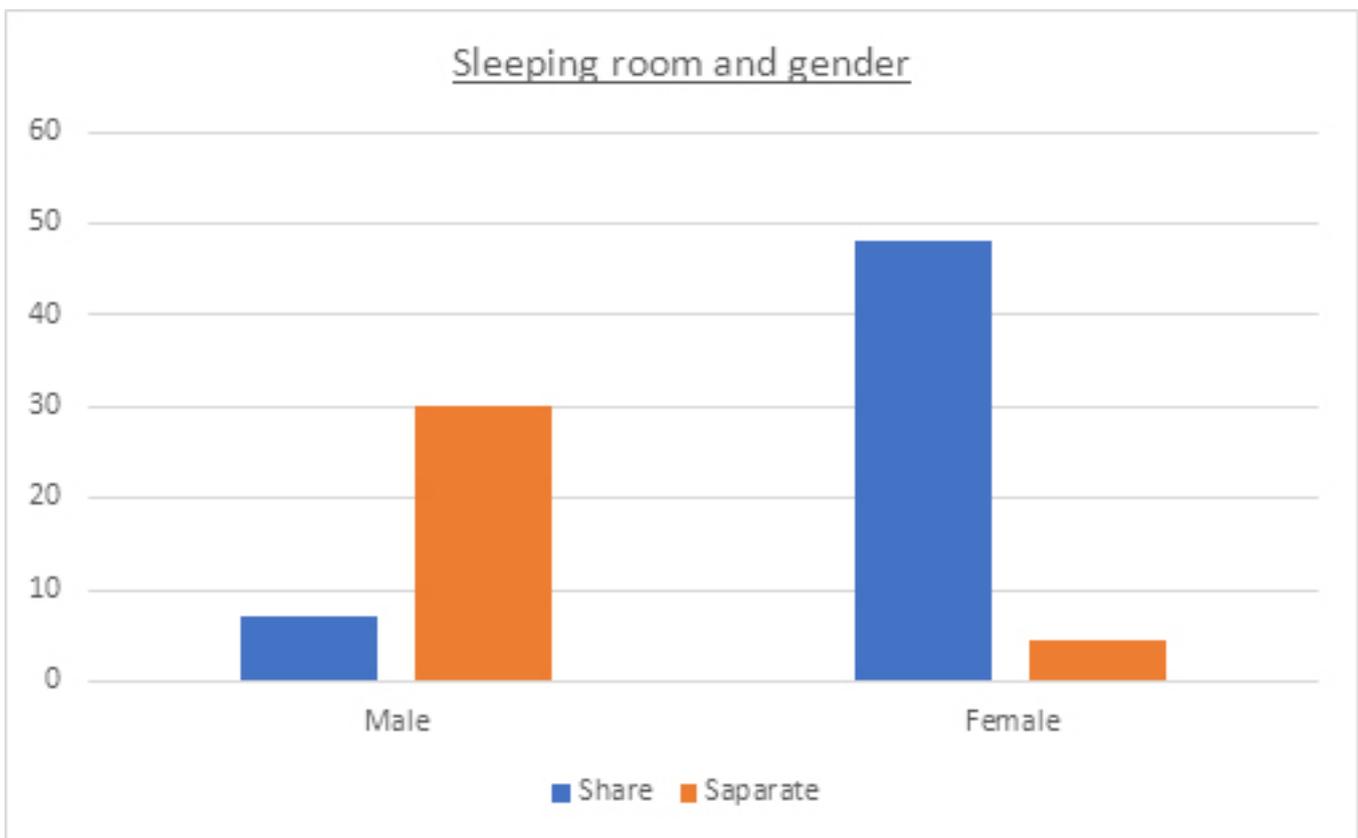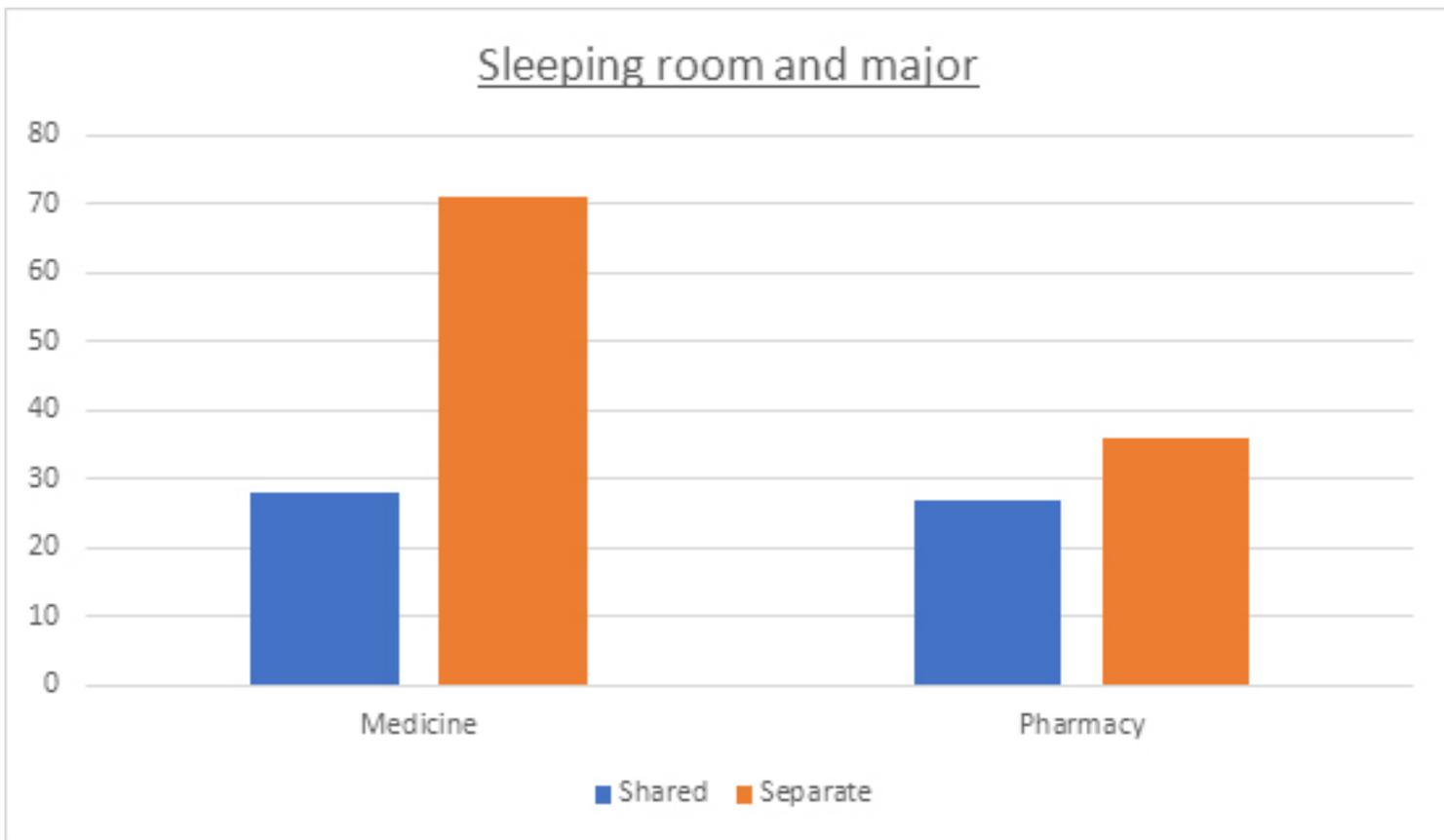
Discussion

Each table is discussed thoroughly in a separate paragraph starting from table 2, where sleep duration and GPA being inversely related was a surprising finding, as most people would expect that the more a person sleeps, the better their performance. In a study in the USA in 2015(11), a study in 2016 by Beebe(10), a study conducted by Westerick(8) in USA, and Bahammam at 2012 in Saudi Arabia(21) the opposite was found, but as the p value was insignificant, just like the study in 2013 in Ethiopia (13), the reason may be due to individual variability, because some people perform better with more hours of sleep, while others feel less stressed by sleeping less and saving time for studying. This difference between bedtime and GPA was statistically insignificant. The conclusion that bedtime and GPA have a reciprocal relation was unexpected, as most would think that sleeping earlier would increase the GPA and not decrease, but since the P value is insignificant we cannot confirm that the later you sleep the better your GPA. A study in Saudi Arabia by Bahammam in 2012(22) states the opposite, while a study by Wang in 2016 in China(9) states that the later the bedtime the higher the GPA. However, this behavior is considered unhealthy in the long run. The no association finding between sleep environment and GPA was unpredicted, but the explanation could be that to each their preference. It depends on what the individual is used to. The finding that there is not much difference between quiet and noisy room and decreased GPA was unexpected. This finding might be due to the students getting used to sleep in noisy rooms for a long time. Therefore, students can remain accustomed to their sleeping pattern. There is no association between sleep depth and GPA, this was unexpected. This could be because each person has different sleep pattern since childhood. Further studies on this matter should be conducted.

The majority of students in this study slept less than 8 hours per day, which is considered less than the recommended duration for adequate sleep. The same results were found in a study conducted by Westrick in USA 2015, where more than 54.7% of student pharmacists reported 6 hours of sleep or less (8). However, this finding was expected among medicine and pharmacy students; it may be attributed to their heavy study loads, continuous exams and sometimes practical training in hospitals being at times in the early morning then at other times late at night, which may confuse their sleep cycle hence affect their duration of sleep. This exact behavior shouldn't be maintained as sleep duration should be sufficient to allow normal functioning of body and mind. As for the marital status of students where 94.9% were single, it indicates that marriage among medicine and pharmacy students is not a common choice during studying years. This could be as a result of the busy life style which doesn't suit the burdensome house responsibilities and duties that usually come along with marriage. Thus this reasonable behavior should be sustained. According to the study females sleep less than males, which was expected. This might be because females tend to have more responsibilities

and put more effort in their studying. More hours of sleep should be obtained for optimum health and well-being. The findings showed no significant association between duration of sleep and level of study, which wasn't expected. Further studies should be conducted.

The finding that males rarely have interrupted sleep in comparison to females was expected. This could be because females are more stressed about the following day tasks and more susceptible to hormonal fluctuations. This is not a recommended behavior and it is better to be changed. There was no correlation between major and interrupted sleep; this could be because each person has their own sleep pattern without major being an influential factor, and there is no problem if this behavior is sustained.

The findings that males have deeper sleep more than females was excepted. This may be due to the biological phases of a woman's life and the hormonal shifts that accompany them, making women more likely to experience disruptions during their sleep. The findings also showed that there is no association between depth of sleep and major, as well as the relation between depth of sleep and marital status.

Findings showed that the majority of the students sleep between 09:00 PM to 12:00 AM. It could be because of the responsibilities the students have. Students who sleep before 09:00 PM were merely 2% of females while no male noted that they sleep before 09:00 PM. This could be because they have to focus on their studies.

The findings showed no significant association between major and bedtime. This was expected and could be because each student has a different way in managing their time regardless of their major. A greater percentage of respondents reported they sleep between 09:00 PM to 12:00 AM, in order to attain a balanced lifestyle. This manner should be promoted. The findings that the majority of the respondents who sleep between 09:00 PM to 12:00 AM were married, was expected. This may be because people who are single are mostly young and focused on their academics only, so they risk a couple of hours of night time sleep in order to get more studying done, while married people have a lot more responsibilities and they need as much energy as they can during the day. The habit of sleeping between 09:00 PM to 12:00 AM should be sustained as it is optimal for the maintenance of the circadian rhythm and sleep-wake cycle. Sleeping during the night helps in improving mental health and development as well as immunity. People should achieve optimal sleep in order to maintain a healthy lifestyle.

According to the study, females tended to sleep in a noisier environment more than males, and that was expected. It might be because females tend to sleep in a shared room more than males. This is recommended for the researchers to focus on this subject and to know the reasons behind that. There was also no association between noisy environment and major. This may be

because each student has his own environment whether they are a medical or pharmacy student, so major is not an influential factor to this point.

The finding that single students living in noisy environments are more than married students was expected. This could be because single students have a higher chance of living with a large number of roommates rather than the married ones. However it is subjective to each individual and depends on one's pattern of living usually since childhood. No correlation was found between students regarding the sleeping environment and level of study.

As for the finding regarding sleeping room gender, there were statistically significant differences between male and female students. Females used shared rooms more than males which was expected. This could be because females like to be close and their privacy matters bringing them more together.

The finding that medical students used separated rooms more than pharmacy students could be because medical students needed to focus more. Based on findings, it was surprising that married students used separate rooms higher than single students, which might be because many students living in student house are from outside Riyadh. A significant correlation was not found between sleeping room and marital status. There was no significant relation between sleeping room and study level of students.

Conclusion

In this study, we aimed to assess the relation between sleep pattern and academic performance, and factors affecting sleep pattern. We found that sleep pattern and GPA had no relation, however, male students showed they have deeper sleep than females. The percentage of female students sleeping in a shared room was higher than males, and finally, medicine students had a higher percentage in sharing a room than pharm D students. The number of students who answered the questionnaire and who are majoring in medicine were almost three times more than those majoring in pharm D. Also female respondents were triple the amount of male respondents, which may have affected the results.

Recommendations

1. More hours of sleep should be obtained for optimum health and well-being.
2. The habit of sleeping early should be sustained as it is optimal for the maintenance of the circadian rhythm, sleeping during the night helps in improving mental health and development.
3. Further studies are still needed to link sleep pattern and academic performance among medical and pharmacy students

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