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Sleep Disorder and its Effect on Academic Performance of Medical Students in Jos, North Central Nigeria

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Abstract

Sleep disorder is common among clinical students due to the amount of information they must assimilate in order to pass prescribed examinations. This study examined the prevalence of sleep disorder in medical students in Jos, north-central Nigeria, and its impact on academic performance.

Methods: This was a descriptive cross-sectional study conducted on final-year medical students at Jos University Teaching Hospital in Plateau State, north central Nigeria. The SLEEP-50, Epworth Daytime Sleepiness Scale and Emotional Stability Test - Big Five Version were used to identify sleep disorder, daytime sleepiness as well as emotional stability respectively. Logistic regression was used to assess the relationship between sleep disorder and academic performance as well as other factors that affects academic performance.

Results: A total of 141 students responded to the 158 questionnaires that were distributed. Their ages ranged from 23 to 46 years, with a mean of 27.0 ± 2.9 years. There was a female: male ratio of 1:2 with female respondents being 25.9 ±1.4 years old on average and male respondents being 27.5 ±3.3 years old on average. About half of the respondents had sleep disorder; narcolepsy being the most common type of sleep disorder, while sleep-walking was the least common. Circadian rhythm sleep disorder was associated with poor academic performance (OR 0.050, 95% CI 0.009 – 0.293, P= 0.001)

Conclusion: Sleep disorder is common among medical students in north-central Nigeria and circadian rhythm sleep disorder is associated with poor academic performance. Their academic performance will improve if sleep disorder is recognized and treated.

Keyword: Sleep disorder, academic performance, medical students

Introduction

Sleep is an unconscious state from which one can be awoken by a variety of stimuli. It is an easily reversible behavioral quiescence that differs from seizures, comas, hibernation and anesthesia. It is distinguished from quiet wakefulness by its reduced responsiveness to environmental stimuli. Sleep has a daily set point that must be compensated for at a

later time.[1] An average adult needs 7-9 hours of sleep each night.[2] Satisfactory sleep is necessary for normal mental and physical health, and chronic sleep deprivation is linked to impaired neurocognitive states.[3] Sleep deprivation has been linked with immune dysregulation and this may be the pathogenetic link to psychological and metabolic problems as well as increased risk of atherosclerosis and cardiovascular events associated with sleep disorder, resulting in increased morbidity and mortality.[4,5] The prevalence of sleep disorder varies with populations approximately affecting 22-65% of the general population;[6-8] a third reporting insomnia,[9,10] and 16% -36% reporting obstructive sleep apnea coexisting with insomnia or hypersomnolence.[11, 12] There is growing evidence that sleep disorder also occurs among university students.[13]

Sleep is necessary for the enhancement of working memory as well as the consolidation of memory.[14] Studies have also shown that acute sleep deprivation affects different cognitive domains; attention, working memory as well as short-term memory.[15 16] Medical students are subjected to a high level of psychological stress, and there is a link between psychological stress and both sleep quality and academic performance.[17] Furthermore delayed circadian rhythm that occurs in these students, especially during examinations leads to poor sleep quality which in turn negatively affects academic performance.[18] It was observed from different studies that the academic performance of medical students as well as their health status were affected by sleep deprivation.[13 19] However, no such data is available in north central Nigeria. Therefore, this study was aimed at finding out the magnitude of sleep disturbance and its effect on the academic performance of medical students in north central Nigeria.

Methodology

This study was conducted on final year medical students at the Jos University Teaching Hospital in Plateau State, north central Nigeria. All final year medical students at Jos University Teaching Hospital were included in the study. Students with a prior diagnosis of sleep disorders, as well as those currently taking sedatives or narcotics for any acute or chronic medical condition were not permitted to participate in the study. This was a descriptive cross-sectional study of all medical students in their final year.

Recruitment and data collection took place over a twelve-week period from September to November 2017. Data was collected through self-administered questionnaire which was adapted from the SLEEP-50, Emotional Stability Test -Big Five Version, and Epworth daytime sleepiness scales. This adapted questionnaire was pre-tested on a subsample of 20 students who were not part of the target population for the study and modified where necessary. The author oversaw the respondents' recruitment and data collection process which was done by five pre-trained resident doctors. Demographic data (such as age and gender), body mass index, waist-hip ratio, neck circumference, and drug addiction were collected.

These questionnaires were distributed to students during their mid-semester break. They were allowed to seek out any information they needed while filling the questionnaires. Academic performance was evaluated using students' actual grades obtained from the office of the Dean, Faculty of Medical Sciences at the end of their final examinations (Part A and Part B), which were graded as Excellent, Pass, Bare Pass, bare Failure, and Failed, with Part A consisting of Community Medicine,

Obstetrics and Gynecology, and Pediatrics, and Part B consisting of Medicine and Surgery. Excellent, Pass and Bare pass were all considered passes, whereas bare failure and failed were both considered failed. Students that passed ≥ 4 courses were regarded as having good academic performance while those who passed < 4 courses were regarded as having performed poorly. Fasting blood was obtained with an aseptic thumb prick with a lancet, and fasting blood glucose level was estimated with an ACCUCHECK glucometer, with results obtained in 12 seconds.

Instrumental tools used in the study

The SLEEP-50 is an effective tool for detecting a wide range of sleep disorders in the general population.[20] The scale is divided into nine subscales. Some of the most common sleep disorders and complaints, as well as the factors required for diagnosis, are sleep apnea, insomnia, narcolepsy, restless leg movement disorder, circadian rhythm sleep disorder, sleep walking, nightmares, factors influencing sleep, and the impact of sleep complaints on daily functioning.[20]

Epworth Daytime Sleepiness Scale (EDSS)[21]

This is a scale designed to assess daytime sleepiness using a brief questionnaire. This can aid in the diagnosis of sleep disorders. On a scale of 0 to 3, the subject is asked to rate his or her likelihood of falling asleep in eight different situations with responses graded as 0 - being no chance of dozing and 3 a high chance of dozing. The summed score of 0-9 is considered normal, while scores of 10 and 11 are borderline, and scores of 12-24 indicate that expert medical advice should be sought.

Emotional Stability Test - Big Five Version

This is a useful scale for assessing emotional stability because it asks 20 different questions to assess various aspects of emotion to differentiate those who are emotionally stable from those who are not. Following the administration of the questionnaire, the scores for each of the twenty questions are added together to yield a single number. The possible score range is 20 to 100, with a mean score of 60. A score above the mean indicates an emotional stability tendency, while a score below the mean indicates an emotional instability tendency.

Statistical analysis

All data were coded and entered into an MS Excel spreadsheet; analysis was carried out using the Statistical Product and Service Solutions (SPSS, Chicago, Illinois, USA), version 17.0. Continuous variables were expressed as means ± standard deviation and categorical variables as proportions. For categorical data, we used the chi-square test while for continuous variables, we employed the use of student's t-test. To explore the relationship between sleep disorder, habits, and academic performance, a univariate logistic regression was used first and then the independent significant variables were entered into a multiple logistic regression model to determine the variables that could predict poor academic performance. Statistical significance was set at $p \leq 0.05$.

Ethical consideration

Jos University Teaching Hospital Ethics Committee granted ethical approval. The confidentiality of information given by all students who volunteered to participate in the study was maintained, and no compensation was provided. Students were fully informed about the study, and each provided written informed consent.

Results

A total of 158 questionnaires were distributed, with 141 eventually returned completed, representing an 89% response

rate. The students' ages ranged from 23 to 46 years, with a mean of 27.0 ± 2.9 years. They were made up of 47 (33.3%) females and 94 (66.7%) males in a 1:2 ratio. The female respondents' mean age was 25.9 ± 1.4 years, while the males' mean age was 27.5 ± 3.3 years, (P =0.001). Males were significantly more likely to be hypertensive (P=0.017). Regular alcohol consumption was observed in 16/141 (11.3%) of students, 14/94 (14.9%) of whom were males and 2/47 (4.3%) of whom were females, (P = 0.060). Students who were married were in the minority (3.5%). Similarly, while only one student (0.7%) had diabetes, 49 (34.8%) were hypertensive. Table 1.

Eighty-eight (62.4%) students (males n=55) had emotional relationships with the opposite gender, with no statistically significant difference across gender, while 40 (28.4%) subjects (males n=28) took afternoon naps, P=0.597. Fifty-four (38.3%) thought their sleep duration was normal (males n =38), and 25 (17.3%) reported using stimulants (male, n=13). Forty-two (29.8%) reported snoring (31 males), P=0.241. Furthermore, anthropometric measures differed between genders and were mostly statistically significant, except for BMI, where the mean BMI was 24.4 ± 4kg/m2 and there was no statistically significant difference between genders. There was no statistically significant difference in the mean fasting plasma glucose between gender; 5.14 ± 0.8mmol/L versus 5.2 ± 0.5mmol/L. Males, on the other hand, had significantly higher systolic and diastolic blood pressures (Table 2).

Sixty-eight (48.2%) students had a sleep disorder. Narcolepsy was the most common sleep disorder in this study population (Table 3). Ten students (7.1%) had circadian rhythm sleep disorder, which was significantly associated with poor academic performance (P= 0.001). There was no significant association between other sleep disorder subtypes and academic performance (Table 4).

A total of 97 (68.8%) students passed ≥ 4 courses comprising 50 males (35.5) and 47 females (33.3%), p =0.0001. Sixty (82.2%) of students without sleep disorder passed ≥ 4 courses as compared to 37 (54.4%) students with a sleep disorder (p =0.001). Furthermore, 38 (88.3%) Students who were ≤ 25 years passed ≥ 4 courses as compared to 59 (60.2%) students who were aged > 25 years (P = 0.001). Seventy-eight (78.8%) students who belonged to study groups also passed ≥ 4 courses as against 19 (45.0%) of those without study groups with a statistically significant difference (p = 0.001), (Table 5).

Age ≤ 25 years (odds = 6.987, 95% confidence interval = 1.988 – 23.550, p = 0.002), being emotionally stable, (odds = 4.750, 95% confidence interval = 1.559 - 14.471, p = 0.006), being in a study group (odds = 4.711, 95% confidence interval = 1.859 – 11.939, p = 0.001), and circadian rhythm sleep disorder (odds = 0.050, 95% CI = 0.009 – 0.293, p = 0.001) emerged as independent predictors of good academic performance on multiple logistic regression analysis (Table 6).

Table 1: Characteristics of students by gender

		Gender		
Characteristics	**Total(n=141)**	**Males (n = 94)**	**Females (n= 47)**	**P value**
Age: mean (SD) years	26.98 (2.9)	27.54 (3.3)	25.85 (1.4)	0.001[α]
Age range in years	23 - 46	23 - 46	24 - 32	
Age = 25years	43 (30.5)	19 (20.2)	24 (51.1)	
> 25years	98 (69.5)	75 (79.8)	23 (48.9)	<0.001[α]
Marital status				
Single	136 (96.5)	91 (96.8)	45 (95.7)	
Married	5 (3.5)	3 (3.2)	2 (4.3)	0.999
Emotionally stable				
Yes	88 (62.4)	55 (58.5)	33 (70.2)	0.176
No	53 (37.6)	39 (41.5)	14 (29.8)	
Drinking of alcohol				
Yes	16 (11.3)	14 (14.9)	2 (4.3)	
No	125 (88.7)	80 (85.1)	45 (95.7)	0.060
Afternoon nap				
Yes	40 (28.4)	28 (29.8)	12 (25.5)	
No	101 (71.7)	66 (70.2)	35 (74.5)	0.597
Hypertension				
Yes	49 (34.8)	39 (41.5)	10 (21.3)	
No	92 (65.2)	55 (58.5)	37 (78.7)	0.017[α]
Diabetes				
Yes	1 (0.7)	1 (1.1)	0 (0)	
No	140 (99.3)	93 (98.9)	47 (100)	0.999

[α]Statistically significant

Table 2: Clinical Characteristics of students by gender

Characteristics	Total (n =141)	Male (n =94)	Female (n =47)	P value
Duration of sleep during examination period (hours)	5.46 (1.3)	5.56 (1.4)	5.26 (1.1)	0.203
Emotional relationship years: median ± IR	1 (2)	0.75 (2)	1 (2)	
Duration of sleep off examination period (hours)	6.39 (1.2)	6.39 (1.3)	6.37 (1)	0.923
Weight: mean (±SD)	68.8 (11.7)	70.72 (9.3)	64.85 (14.9)	0.05
Height: mean (±SD)	1.68 (0.1)	1.70 (0.1)	1.6 (0.1)	<0.001[α]
BMI: mean (±SD)	24.4 (4)	24.4 (3.2)	24.4 (5.4)	0.929
Waist circumference: mean (±SD)	78.1 (8.5)	79.29 (6.9)	75.57 (10.8)	0.014[α]
Hip circumference (cm): mean (±SD)	95.62 (8.6)	94.41 (6.6)	98.0 (11.3)	0.019[α]
Waist hip ratio: mean (±SD)	0.82 (0.1)	0.84 (0.1)	0.77 (0.1)	<0.001[α]
Neck circumference: mean (±SD)	36.0 (3.2)	37.4 (2.6)	33.1 (2.4)	<0.001[α]
Fasting plasma: glucose mmol/L mean (±SD)	5.16 (0.7)	5.14 (0.8)	5.2 (0.5)	0.575
Systolic BP (mmHg): mean (±SD)	124 (15.8)	127 (16.4)	117 (12.4)	0.001[α]
Diastolic BP (mmHg): mean (±SD)	82.9 (9.9)	84.29 (10.6)	80.0 (7.8)	0.016[α]

[α]Statistically significant

Table 3: Sleep disorder type stratified by gender

Sleep disorder n (%)	Male n=94	Female n=47	Chi-square	P value
Hypersomnia	13 (72.2)	5 (27.8)	0.287	0.592
Nightmare	21 (70)	9 (30)	0.191	0.662
Sleep walking	1 (100)	0 (0)	-	1*
CRSD	10 (100)	0 (0)	-	0.031[β]
RLS/PLMD	1 (20)	4 (80)	-	0.042[β]
Narcolepsy	28 (77.8)	8 (22.2)	2.686	0.101
Insomnia	11 (78.8)	3 (21.4)	-	0.386*
OSA	3 (75)	1 (25)	-	1*

*Fisher exact test

[β]Fisher exact test and statistically significant

CRSD: circadian rhythm sleep disorder; RLS/PLMD: restless leg syndrome/periodic limb movement disorder; OSA: Obstructive sleep apnea;

Table 4: Association between sleep disorders and academic performance among medical students

Sleep disorder n (%)	Good Performance	Poor performance	Chi- square test	P value
Hypersomnia				
Yes	9 (50)	9 (50)	3.395	0.065
No	88 (71.5)	35 (28.5)		
Nightmare				
Yes	17 (56.7)	13 (43.3)	2.611	0.106
No	80 (72.1)	31 (27.9)		
Sleep walking				
Yes	0 (0)	1 (100)	-	0.312*
No	97 (69.3)	43 (30.7)		
CRSD				
Yes	2 (20)	8 (80)	-	0.001$^{\beta}$
No	95 (72.5)	36 (27.5)		
RLS/PLMD				
Yes	4 (80)	1 (20)	-	1*
No	93 (68.4)	43 (31.6)		
Narcolepsy				
Yes	21 (58.3)	15 (41.7)	2.464	0.116
No	76 (72.4)	29 (27.6)		
Insomnia				
Yes	8 (57.1)	6 (42.9)	0.983	0.321
No	89 (70.1)	38 (29.9)		
OSA				
Yes	2 (50)	2 (50)	-	0.589*
No	95 (69.3)	42(30.7)		

*Fisher exact test,

$^{\beta}$ Fisher exact and statistically significant

CRSD: circadian rhythm sleep disorder; RLS/PLMD: restless leg syndrome/periodic limb movement disorder; OSA: Obstructive sleep apnea

Table 5: Academic performance with various parameters

Variable	Total	Good performance (n %)	Poor performance (n %)	Chi-square test	P value	Odds ratio	95% confidence interval
Gender							
Male	94	50(51.5)	44(100)	-	<0.001[β]	-	1.555 – 2.273
Female	47	47(48.5)	0(0)				
Age Group							
= 25	43	38(39.2)	5(11.4)	11.046	0.001[α]	0.199	0.072 - 0.550
>25	98	59(60.8)	39(88.6)				
Marital status							
Single	136	94 (96.9)	42 (95.5)	-	0.647*	-	0.108 – 4.161
Married	5	3 (3.1)	2 (4.5)				
Study Group							
Yes	99	78(80.4)	21(47.7)	15.462	<0.001[α]	4.496	2.070 - 9.764
No	42	19(19.6)	23(52.3)				
Upkeep/week							
High	70	49(50.5)	23(52.3)				
Low	71	48(49.5)	23 (52.3)	0.094	0.759	1.118	0.548 – 2.281
Duration of sleep during							
Exams	20	13(13.4)	7(15.9)	0.156	0.693	1.222	0.451 - 3.313
Normal	121	84(86.6)	37(84.1)				
Abnormal							
Use of Stimulant							
Yes (1)							
No (0)	25	19(19.6)	6(13.6)	0.735	0.391	1.543	0.570 - 4.178
	116	78(80.4)	38(86.4)				
Sleep Disorder							
Present	68	37 (38.1)	31(70.5)	12.656	<0.001[α]	0.259	0.120-0.556
Absent	73	60 (61.9)	13(29.5)				
Sleep duration off exam period							
Normal	54	38(39.2)	16(36.4)	0.101	0.750	0.887	0.424-1.854
Abnormal	87	59(60.8)	28(63.6)				
Emotional Stability							
Yes	88	66(68)	22(50)	4.200	0.040	2.129	1.027 - 4.413
No	53	31(32)	22(50)				
Marital status of parents							
Married	111	77(79.4)	34(77.3)	0.080	0.777	0.883	0.374 - 2.086
Unmarried	30	20(20.6)	10(22.7)				

*Fisher exact test,
[α] Statistically significant
[β] Fisher exact test and statistically significant

Table 6: Predictors of academic performance among medical students

covariates	Odds ratio	95% confidence interval	P value
Age = 25years	6.987	1.988 – 24.550	0.002
Age >25years	1	-	-
Emotional stability	4.750	1.559 – 14.471	0.006
Emotionally unstable	1	-	-
Study group	4.711	1.859 – 11.939	0.001
No study group	1	-	-
Circadian rhythm sleep disorder	0.050	0.009 – 0.293	0.001
No circadian rhythm sleep disorder	1	-	-

Discussion

Approximately half of our study participants had at least one sleep disorder and the sleep disorders identified included hypersomnia, nightmares, sleep walking, circadian rhythm sleep disorder, restless leg syndrome/periodic limb movement disorder, narcolepsy, insomnia and obstructive sleep apnea. The presence of circadian rhythm sleep disorder predicted poor academic performance among the students. A quarter of our study participants had narcolepsy, a third had nightmares, more than a tenth had hypersomnia, and less than a tenth had insomnia. Our findings contradict the findings of Yassin et al who found hypersomnia in about one in every five of their study participants.[22] However, our findings on insomnia were similar to reports from community-based research in the general adult population in the United States.[23, 24] In contrast to our findings that narcolepsy was the most common sleep disorder, insomnia was reported as the most common sleep disorder in the United States,[25] while restless leg syndrome was reported as the most common sleep disorder in Iraq, affecting approximately one-third of students, followed by insomnia in a quarter, circadian rhythm disorder in about a fifth, and sleep apnea in more than a tenth.[26]

In our research, although OSA was more common in men as previously reported,[27-29] there was no statistically significant difference in OSA prevalence across gender. However, we discovered that women were more susceptible to restless leg syndrome/periodic leg movement disorder (RLS/PLMD) similar to the report in Iraq[26] but there is no gender difference in the risk of other types of sleep disorders. The variation in the prevalence rate could be from differences in studied groups, variation in methodologies and designs as well as differences in tools used to assess the disorder.

Female students had better academic performance than their male counterparts. This finding is consistent with reports by other authors. [30, 31-34] It however, contradicts other studies conducted in Nigeria [35] and turkey.[36] Contrary to the report in south eastern Nigeria[35] monthly allowances did not affect academic performance in this study. Circadian rhythm disorder was found to be negatively associated with academic performance as poor academic performance was nine times higher in those with circadian rhythm sleep disorder. Our findings are in contrast to those from the United States, where obstructive sleep apnea, insomnia, and circadian rhythm sleep disorder have all been linked to lower academic performance.[25] In Iraq, however, insomnia, affective disorders, and having

multiple sleep disorders have also been linked to lower academic performance. [26] The reasons for these differences could be differences in the study populations; multiracial in the case of the United States [26] and Asian in the case of Iraq.[26]

Multiple logistic regression revealed that independent predictors of poor academic performances included age ≥ 25 years, not being in a study group, being emotionally unstable and the presence of circadian rhythm sleep disorder. The finding that younger students performed better academically is consistent with findings from Japan[37] and the United States.[38] Another study conducted in Nigeria found that being younger was not associated with good academic performance.[39] The reason for this difference with the Nigerian study was that the assessment of academic performance in surveyed students was a composite variable based on feedback from medical students that was not verified by viewing official results contrary to what we did in our study.

Furthermore, having a study group implies high motivation and study enjoyment, which can lead to improved grades. This finding is consistent with what has been reported in Nigeria, [39] Saudi Arabia,[40] Portugal,[41] Curacao,[42] and Japan.[43] This supports the notion that study groups encourage members to think creatively and develop strong communication skills, both of which aid in refining knowledge of the subject matter. It has been demonstrated that those who participate in study groups feel more confident and at ease in achieving their academic goals, and this should be encouraged in all academic settings, including medical schools.

Several studies have found a link between emotional stability and social support, and academic performance which is consistent with our findings.[44 - 46] It is a well-known fact that emotional stability allows individuals to develop a balanced perspective on life difficulties. This executive ability and structured perception aid in the development of real-life thinking, wisdom and good appraisal of situations all of which can influence academic performance. Environmental factors like relationships, physical health, self-awareness, and stress must all be considered and managed appropriately to maintain emotional stability.

Age ≥25 years, emotional instability, independent study and circadian rhythm sleep disorder were found to be predictors of poor academic performance. Our findings, highlight the importance of paying attention to sleep disorders among clinical students by school administrators as well as healthcare personnel in tertiary institutions in order to put structures in place that would assist students seek assistance from sleep physicians as quickly as the need arises.

We acknowledge that this study has some limitations. Our reliance on self-reported questionnaires gave our data some subjective connotation, but the fact that participants had the opportunity to ask questions when they had issues with any section of the questionnaire gave the study some objectivity. Our study had more male participants than females because there are fewer females in our medical schools. Similarly, the small sample size of our study may also be a limitation. To further investigate the predictors of poor academic performance in students with circadian rhythm sleep disorders, larger multicenter and longitudinal studies are required.

Conclusion

The study showed that sleep disturbances are common among clinical students and these disorders are linked with poor school performance. Circadian rhythm sleep disorder is a predictor of poor

performance. Consequently, we recommend measures aimed at improving knowledge of sleep in medical schools as this has the potential to improve the overall well-being of students and lead to improved output from medical schools.

Recommendation

Sleep pedagogy should be prioritized in educational institutions as should the effects of sleep disorders on the academic success. The role of age, emotional stability and being engaged in study groups should be emphasized.

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