Nigerian Medical Journal
NIGERIA MEDICAL ASSOCIATION
Print ISSN 0300-1652, E-ISSN 2229-774X

Original Research

Prevalence and Pattern of Obstructive Sleep Apnea among Undergraduate Students in Tertiary Institutions, Kwara State, Nigeria.

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Abstract

Background: Sleep is a very important physiologic process which is necessary to maintain a state of well-being. Obstructive Sleep Apnea (OSA) is prevalent among all age groups with variations in presentation and severity. It is often underreported, especially among young people in the Low- and Middle-Income Countries LMICs. This study assessed the prevalence and pattern of OSA among undergraduates enrolled at tertiary Institutions in Kwara State, Nigeria using both Epworth and Stop Bang tools.

Methodology: A campus-based study conducted among undergraduate students in Kwara state. Respondents were selected from three tertiary institutions. A total of 1,048 eligible students were selected using a multistage sampling technique. Epworth Sleepiness Scale (ESS) and Stop Bang Questionnaire (SBQ) were adapted and administered. Both descriptive and inferential analyses were conducted. The level of significance was set at a p-value of <0.05 at 95% confidence interval. Ethical approval was obtained.

Results: The mean age of respondents was 21± 2.69. More than half 634 (60.5%) of the 1048 respondents were females, with 20 (1.9%) were married. Abnormal sleepiness was reported in 151 (14.41%) while 897 (85.59%) had normal sleepiness using ESS. With the SBQ, 998 (95.2%) had a low risk while 46 (4.3%) had a moderate to high risk of OSA. Religion, increasing levels of study, and presence of chronic disease, were significantly associated with abnormal sleepiness using ESS, whereas female gender, religion, presence of chronic disease, smoking, use of sedatives and caffeine were significantly associated with OSA using SBQ.

Conclusion: The prevalence and pattern of sleep disorder among the undergraduates showed a moderate prevalence of sleep disorder and associated risks of OSA using the sleep disorder tools. There is a tendency to become a big burden with an increase in age, therefore health promotion interventions are recommended early to students to create awareness of OSA risks.

Key words: *Sleep Apnea; Undergraduate Students; Epworth Sleepiness Scale; Stop Bang Tool.*

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How to cite: Alatishe-Muhammad BW, Ige ET, Fatoye J, Shittu, Adefila BC, Oyekunle O, et al. Prevalence and Pattern of Obstructive Sleep Apnea among Undergraduate Students in Tertiary Institutions, Kwara State, Nigeria. Niger Med J 2024;65(6):1089-1100. https://doi.org/10.60787/nmj.v65i6.590.

Quick Response Code:

Introduction:

Sleep is a physiologic process required to maintain a state of well-being.[1] Obstructive sleep apnea (OSA) is a prevalent illness that can occur regardless of the symptoms and is associated with significant neurocognitive and cardiac consequences. A study among business studies students revealed 66.65 with sleep deprivation.[1] Sleep pattern varies with age, physiological, and psychosocial characteristics. It is also not only affected by psychiatric and physical illnesses but by occupational demands too.[1] Currently, the treatment of patients experiencing obstructive sleep apnoea differs by nation and is determined by the individual's symptoms. Generally, it has been observed that a sizeable proportion of students experience poor-quality sleep, and this may be related to academic stress.[2]. Irregular sleep schedules, fatigue,[3] and co-morbid physical or psychological conditions[4] are associated with poor sleep quality. Consequently, poor sleep also predisposes to the use of stimulants, alcohol, and sedatives with attendant consequences.
Numerous attempts have been made in well-equipped areas to identify and treat persons experiencing obstructive sleep apnea, but existing data suggest that the majority of individuals suffering from obstructive sleep apnea stay misdiagnosed and untreated, even in advanced nations[5]. There is often limited knowledge of obstructive sleep apnea in developing nations, and testing therapy techniques are frequently unavailable or haven't been tailored for areas with limited resources. Obstructive sleep apnea is related to a large financial and societal consequence due to its multifaceted and social repercussions. The cost of identifying and treating obstructive sleep apnea in the United States in 2015 was roughly $124 billion.[7]

Recognizing OSA among students promotes awareness about sleep problems. This awareness pushes patients to seek diagnosis and treatment, potentially enhancing their general health and well-being. Because of poor sleep quality, undiagnosed OSA can have a severe influence on cognitive function and academic performance. Addressing this issue has the potential to improve students' educational outcomes. Understanding the prevalence of OSA in this group aids in identifying the lifestyle variables that contribute to it, such as irregular sleep schedules, stress, or lifestyle behaviors, allowing interventions for healthy living. Early detection of OSA helps prevent future consequences, enhancing long-term health and lowering healthcare expenses associated with untreated sleep disorders. A study on OSA prevalence among tertiary students gives significant data to public health research, assisting policymakers and healthcare practitioners in implementing preventive measures and developing targeted therapies.

This study will help to raise awareness of the burden of obstructive sleep apnea in this part of the globe by contributing to the existing scarcity of local data on the prevalence of obstructive sleep apnea, and by providing data to assist in guiding plans and health policies to address this significant health and societal problem among the undergraduates and youths in Nigeria. The objective of this study is therefore to determine the prevalence and pattern of obstructive sleep apnea among tertiary institution students in North Central Nigeria and the associated factors. This is necessary as research on sleep quality among student populations in our environment is scanty and a better understanding of the etiology and risk factors of sleep problems among students is essential to improve the quality of students' lives. Also, there have been numerous cross-sectional studies, but to the best of our knowledge, there's been no school-based study specifically for North Central Nigeria.

Methodology

A descriptive, cross-sectional, and analytical campus-based study was carried out over a month among undergraduate students of tertiary institutions in Ilorin, Kwara State. One from each of the categories of tertiary institutions (College of Education/Polytechnics/Universities) in Kwara state was selected by simple random balloting. Respondents were selected from the State College of Education, Kwara State Polytechnic, and University of Ilorin in North Central Nigeria. The respondents were students in the various faculties in the institutions, the total number of students from each faculty was obtained and proportionate allocation was done to determine respondents to interview from each faculty, department,

and level of study in the three schools. The respondents were given a brief description of the study and its objectives and informed that their participation in the study is voluntary, and they may decline without negative consequences. Subsequently, all consecutive consenting subjects were recruited for the study.

Ethical approval was obtained from the Ministry of Health Ethical Research Committee, Kwara State ERC/MOH/2023/3/0128, and confidentiality was maintained. Informed consents were obtained. Sample size (1048) was calculated using Fischer's formula $n = z^2pq/d^2$ and adjusting for a 10% non-response rate. Eligible students were selected using a multistage sampling technique. The instruments were interviewer administered to the students during the session, and participation was voluntary, anonymous, and unpaid. Blood pressure, height, and weight were recorded at baseline with standard instruments. Epworth Sleepiness Scale (ESS) and Stop Bang Questionnaire (SBQ) were adapted validated and administered. Previous studies as shown concurrent use of the ESS and SBQ too to determine OSA. The ESS measures the severity of excessive daytime sleepiness while the SBQ looks at the symptoms, comorbidities, and physical examination. The IBM SPSS was used to analyse collected data. Both descriptive and inferential analyses were conducted. Descriptive data was reported using frequency and percentage while Chi-square was used for the inferential. The prevalence and factors associated with OSA were reported. The level of significance was set at a p-value of <0.05 at a 95% confidence interval.

Instruments used in the study

The ESS & SBQ are effective tools for detecting a wide range of sleep disorders in the general population. The Epworth Sleepiness Scale (ESS) 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 respondent 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 0-11 is considered normal, while scores of 12-24 indicate that expert medical advice should be sought. The STOP-BANG questionnaire (SBQ) is another tool to assess the risk of sleep disorder using a set of questions on a scale of 0 to 1. The respondent is asked to respond to STOPBANG variables graded as 0 - being "NO" and 1 "YES". A summed score of 0-2 is considered Low risk, 3-4 is considered Intermediate risk, while scores of 5-8 are considered high risk for sleep disorder.[5.8]

Results

A total number of 1048 respondents were recruited for the study. The mean age of respondents was 21± 2.69 with 999 (95.3%) more than 18 years old. More than half 634 (60.5%) of the respondents were females, 968 (92.4%) were Yorubas while only 20(1.9%) were married. (Table 1)

Table 1: Socio-demographic Characteristics of Respondents

Variables	Frequency (N=1048)	Percentage (100%)
Age		
< 18	49	4.67
>18	999	95.3
Mean age	21± 2.69	
Sex		
Female	634	60.5
Male	414	39.5

Religion		
Christianity	324	30.92
Islam	722	68.89
Others	2	0.19
Tribe		
Fulani/Hausa	14	1.34
Igbo	14	1.34
Yoruba	968	92.37
NUPE	7	0.67
Others	45	4.29
Marital status		
Married	20	1.91
Single	1028	98.09
Campus		
Education and Mini campus	352	33.59
Kwara State Polytechnic	399	38.07
University of Ilorin	297	28.34

Epworth Sleepiness Scale (ESS) Result showing the level of dosing off was shown in Table 2.

Table 2: Epworth Sleepiness Scale (ESS) Result among study participants

ESS VARIABLES	**Level of dosing off (N=1048)**			
	Would never	**Slight chance**	**Moderate chance**	**High chance**
	Freq. (%)	**Freq. (%)**	**Freq. (%)**	**Freq. (%)**
Sitting and reading/ picking grain/counting rosery	494(47.14)	264(25.19)	178(16.99)	112(10.69)
Watching TV /radio/children play/folklore	542(51.71)	205(19.56)	171(16.31)	130(12.40)
Sitting, active in a public place	680(64.89)	187(17.85)	118(11.26)	63(6.01)
As a passenger in a car for ≥ hour	566(54.01)	147(14.03)	162(15.46)	173(16.51)

Lying down to rest	368(35.12)	228(21.75)	229(21.85)	223(21.28)
Sitting and talking to someone	970(92.56)	57(5.44)	14(1.34)	7(0.67)
Sitting quietly after a meal without alcohol	642(61.16)	192(18.32)	144(13.74)	70(6.68)
In a car, while stopped for a few minutes in traffic	956(91.22)	54(5.15)	32(3.06)	6(0.57)

The prevalence and risk of OSA using SBQ was shown in Table 3.

Table 3: Prevalence and risk of OSA using the STOPBANG questionnaire among participants

VARIABLES	**Stop bang (N=1048)**	
	YES (%)	**NO (%)**
STOP		
SNORE loudly (louder Than talking or loud enough to be heard through	145 (13.84)	903 (86.16)
often feel TIRED, fatigued or sleepy during the daytime	499 (47.61)	549 (52.39)
OBSERVED breath stop by others	26 (2.48)	1022 (97.52)
Being treated for high blood PRESSURE	6 (0.57)	1042 (99.43)
BANG		
BMI more than 35kg/m2	7 (0.67)	1041 (99.33)
AGE over 50 years old	1 (0.10)	1047 (99.9)
NECK circumference > 16 inches (40cm)	6 (0.57)	1042 (99.43)
GENDER – Male	410 (39.12)	638 (60.88)

Abnormal sleepiness was reported in 151(14.41%) while 897 (85.59%) had normal sleepiness using ESS. (Table IV)

Table 4: Prevalence of OSA using ESS & SBQ

Sleep Disorder Risk	**Frequency (N=1048)**	**Percentage (100%)**
ESS		
Normal sleepiness	897	85.59
Abnormal sleepiness	151	14.41
STOP BANG		

Low risk (0-2)	998	95.23
Intermediate risk (3-4)	46	4.39
High risk (5-8)	4	0.38

ESS-Epworth Sleepiness Scale
OSA-Obstructive Sleep Apnea
SBQ-Stop Bang Questionnaire

Table 5: Pattern of Substance use among respondents

VARIABLES	**SUBSTANCE USE (N=1048)**	
	Yes / %	**No/&**
Do you smoke	28 (2.67)	1020 (97.33)
Do you take alcohol	87 (8.30)	961 (91.7)
Do you take any substance to help you sleep	15 (1.43)	1033 (98.57)
Do you take caffeine	360 (34.35)	688 (65.65)
Do you take cannabis	20 (1.91)	1028 (98.09)
Do you take marijuana	22 (2.10)	1026 (97.9)
Do you take tobacco	29 (2.77)	1019 (97.23)
Do you take any form of sedatives	13 (1.24)	1035 (98.76)

With the SBQ, 998 (95.2%) had a low risk while 50 (4.8%) had a moderate to high risk of OSA. (Table 4). Almost 1020 (97.3%) of all the students reported not to have smoked before. (Table 5). Only a few 55(5.25%) had sleeping problems prior and 46(4.39%) sought help (Table 6).

Table 6: Sleep disorder among respondents

Variables	**Frequency (N=1048)**	**Percentage (100%)**
Have you sought help of any kind for sleeping		
No	1002	95.61
Yes	46	4.39
Do you think you have Problems sleeping		
No	993	94.75
Yes	**55**	5.25
Where did you seek for help (n=46)		
Hospital	15	27.27

Patent medicine store	15	27.27
Pharmacy store	17	30.91
Traditional	0	0
Others	8	14.55
Do you take any drug to help you sleep (n=1048)		
No	1007	96.09
Yes	41	3.91
Where do you get the drug (n=41)		
Hospital	4	9.76
Patent Medicine	9	21.95
Pharmacy	27	65.85
Others	1	2.44

Abnormal sleep pattern across the different class levels was shown with the highest prevalence reported among 600 level students (Fig. 1)

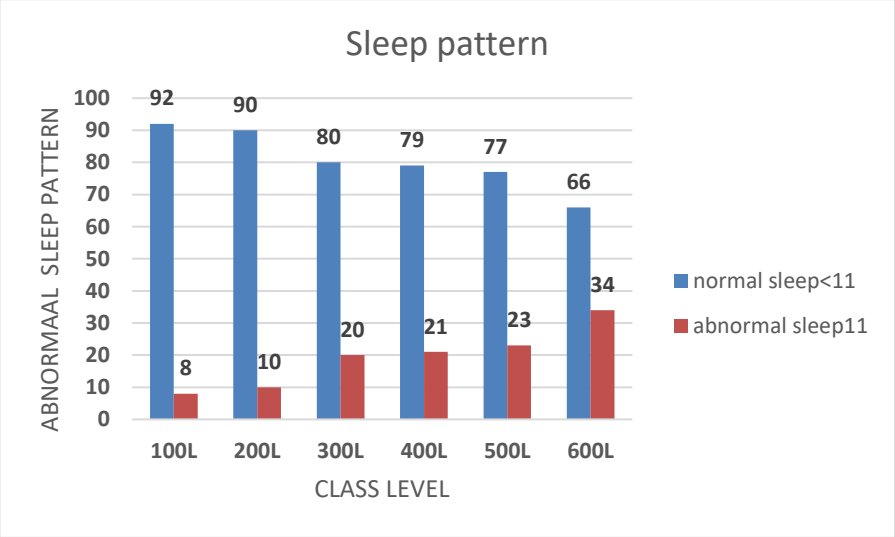

Figure 1: Prevalence of abnormal sleep pattern

Religion, increasing levels of study, presence of chronic disease, smoking, and caffeine were significantly associated with average and abnormal sleepiness using ESS, (Table 7)

Table 7: Relationship between sociodemographic factors and sleep apnea using ESS

Variables	**ESS**				
	N. Sleepiness	**A.Sleepiness**	**Total**	χ^2	**p-value**
	897(85.59)	**151(14.41)**	**1048(100)**		
Age				2.862	0.09
<18	46 (93.88)	3 (**6.12**)	49 (4.68)		
>18	851 (85.19)	148 (**14.81**)	999 (95.32)		
Sex				0.700	0.40
Female	538 (84.86)	96 (15.14)	634 (60.5)		
Male	356 (86.71)	58 (13.29)	414 (39.5)		
Religion				13.21	0.00
Christianity	260 (80.25)	64 (**19.75**)	324 (30.9)		
Islam	636 (88.09)	86 (**11.91**)	722 (68.89)		
Others	1 (50.00)	1 (50.00)	2 (0.21)		
Tribe				3.598	0.46
Fulani	11 (78.57)	3 (21.43)	14 (1.34)		
Hausa	11 (78.57)	3 (21.43)	14 (1.34)		
Igbo	6 (85.71)	1 (14.29)	7 (0.67)		
Yoruba	834 (86.16)	134 (13.84)	968 (92.27)		
Others	35 (77.78)	10 (22.22)	45 (4.29)		
Marital status				1.855	0.17
Married	15 (75.00)	5 (25.00)	20 (1.91)		
Single	882 (85.80)	146 (14.41)	1028 (98.1)		
Level				46.25	0.00
100	320 (91.95)	**28 (8.05)**	348 (33.2)		
200	269 (89.67)	**31 (10.33)**	300 (28.62)		
300	113 (79.58)	**29 (20.42)**	142 (13.5)		
400	133 (78.70)	**36 (21.30)**	169 (16.13)		
500	23 (76.67)	**7 (23.33)**	30 (2.86)		
600	39 (66.10)	**20 (33.90)**	59 (5.63)		

ESS-Epworth Sleepiness Scale, N-normal, A-abnormal.

whereas female gender, religion, presence of chronic disease, smoking, use of sedatives and caffeine were significantly associated with OSA using SBQ at a p-value <0.005(Table 8)

Table 8: Relationship between sociodemographic factors and sleep apnea using SBQ

Variables	**Stop bang Risk**				χ^2	**p-value**
	Low	**Intermediate**	**High**	**Total**		
Age					1.9263	0.38
<18	45 (91.84)	4 (8.16)	0 (0.00)	49 (4.68)		
>18	953 (95.40)	42 (4.20)	4 (0.40)	999 (95.32)		
Sex					30.494	<0.001
Female	622 (98.11)	10 (**1.58**)	2 (**0.32**)	634 (60.5)		
Male	376 (90.82)	36 (**8.70**)	2 (**0.48**)	414 (39.5)		
Religion					10.617	0.03
Christianity	305 (95.06)	14 (**4.32**)	2 (**0.62**)	324 (30.9)		
Islam	689 (95.43)	31 (**4.29**)	2 (**0.28**)	722 (21.29)		
Others	1 (50.00)	1 (50.00)	0.00	2 (0.19)		
Tribe					9.3405	0.31
Fulani	14 (100.00)	0 (0)	0 (0)	14 (1.34)		
Hausa	14 (100.00)	0 (0)	0 (0)	14 (1.34)		
Igbo	6 (85.71)	1 (14.29)	0	7 (0.67)		
Yoruba	920 (95.04)	45 (4.65)	3 (0.31)	968 (92.37)		
Others	44 (97.78)	0	1 (2.22)	45 (4.29)		
Marital status					1.5987	0.45
Married	18 (90.00)	2 (10.00)	0 (0.00)	20 (1.91)		
Single	980 (95.33)	44 (4.28)	4 (0.39)	1028 (98.1)		
Class level					16.806	0.08
100	333 (95.69)	14 (4.02)	1 (0.29)	348 (33.2)		
200	282 (94.00)	18 (6.00)	0 (0)	300 (28.6)		
300	135 (95.07)	7 (4.93)	0 (0)	142 (13.5)		
400	161 (95.27)	6 (3.55)	2 (1.18)	169 (16.1)		

500	28 (93.33)	1 (3.33)	1 (3.33)	30 (2.9)
600	59 (100.00)	0 (0.00)	0 (0.00)	59 (5.6)

SBQ-Stop Bang Questionnaire, $\chi 2$ - Chi^2 test.

Discussion

The findings showed that respondents were mostly young with a mean age of 21± 2.69 years and slight female predominance. The majority of the participants were single, and almost all had never smoked before. While there was variation in the participants' sleep patterns, most of them reported normal sleep and when evaluated for obstructive sleep apnea (OSA) risk using the SBQ assessment tool, most participants were classified as low risk.

These demographics are consistent with earlier research findings, by Osaigbovo, Ogbolu, and Okeahialam[9] which emphasize the young age of university attendees. Another study[10] reported a similar tribe and marital distribution in Western Nigeria[11]. The data showed that most of the respondents had normal sleep patterns, in contrast to earlier studies which reveal that students experienced shorter sleep durations, inconsistent bedtimes, nocturnal snacking, and sleep patterns characterized by snoring[11]. This disparity could be attributed to useful coping strategies or lesser exposure to stressors. From these findings, the measures responsible for this improvement should be sustained and encouraged among undergraduates.

The majority had normal blood pressure and body mass index (BMI) values, and they were of typical height and weight. This health profile indicates a relatively healthy population, which is consistent with findings from other research involving similar age groups[12 –13].

Regarding substance use, results indicated that the majority of the respondents did not engage in smoking, alcohol, and substances to aid sleep. While a sizable percentage of respondents reported using caffeine, a smaller percentage reported using sedatives or other substances like cannabis. This contrasts with other studies that reveal higher rates of cannabis and tobacco use among university students, suggesting a possible gap in substance use education and prevention efforts[3]. The high percentage of caffeine use is however supported by the results of other studies that prove that caffeine consumption is frequent among university students, and it is used to handle their academic stress and to stay awake[14]. These findings highlight the effectiveness of current preventive measures in reducing substance use among students but suggest a need for increased focus on caffeine use to prevent overuse. Further health campaigns and understanding the reasons behind substance use can inform prevention programs.

The results have further shown that most of the respondents mainly depend on over-the-counter medications from patent medicine dealers (PMDs) rather than seeking professional medical attention. Relative to other similar studies, these findings depict the general trend in which students prefer purchasing over-the-counter drugs owing to their affordability and accessibility[15], but it also runs the risk of resulting in incorrect diagnosis and treatment. More public health education is required to raise awareness of the dangers of self-medication and the value of expert medical consultations.

Results on the Epworth Sleepiness Scale (ESS) demonstrate a high proportion of respondents answered no or very little in the likelihood of dozing during everyday situations. That is, the majority would not fall asleep talking to a person or sitting in a public place. However, a moderate fraction indicated a slight to moderate chance of dozing when lying down during the day or sitting as a passenger for a long period. This aligns with other studies that show university students had low levels of daytime sleepiness, but a greater tendency to fall asleep in bed or as a passenger which may result from sleep deficits accumulated by their busy schedules and the demands of their studies[11]. There is also a possible cultural factor, as

some students are more familiar with taking naps when they have smaller amounts of free time throughout the day- particularly in less structured environments[16].

The STOPBANG questionnaire showed only a small number of respondents had characteristics associated with increased risk for Obstructive Sleep Apnea (OSA) on the initial results. A minority reported loud snoring, and daytime tiredness or witnessed apnoeic events. Fewer still had risk factors like obesity (BMI), treatment for hypertension, or large neck circumference. It is noteworthy that most respondents were female and were at higher risk of OSA.

However, previous studies have reported a high prevalence of OSA among respondents who snorted, 16.3% who demonstrated extreme sleepiness, 10.0% who experienced weariness, and 8.0% who encountered drowsy driving [8].

In addition, studies noted that drug use, internet use, and psychological distress are associated with OSA[16]. There is a strong correlation between smoking and several sleep disorders and a quantitative relationship between the amount of smoking and the likelihood of developing these sleep difficulties[17]. There is also a strong correlation between caffeine use whose intake rises during stressful academic periods and restful sleep[18].

Many students at the Nigerian university exhibited suboptimal knowledge of obstructive sleep apnoea [14], highlighting the necessity of integrating the assessment of sleep disorders into the undergraduate curriculum that primarily aims to facilitate the identification of clinical characteristics associated with prevalent sleep disorders, such as sleep apnoea.[19]

Conclusion

The sleep disorder tools show a moderate prevalence of sleep disorder and some important associated risks of OSA among undergraduate students. There is a tendency for this to become a big burden with an increase in age, therefore health promotion and prevention interventions are recommended early to students to create awareness of OSA risks and prevent OSA at an older age. Such education should be in the early years and should include the importance of improved sleep to physical and mental health. Optimizing sleep quality will ultimately improve the wellness of the future workforce and subsequently improve the quality of life of the general population in Nigeria and beyond.

Limitations of the study

The study was done among only three tertiary institutions, and it did not consider the youths who were out of school.

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