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Profile and Correlates of Sleep Quality and Obstructive Sleep Apnoea among Young Persons in Ibadan, Southwestern Nigeria

Profil et Corrélatés de la Qualité du Sommeil et de l'Apnée Obstructive du Sommeil chez les Sujets Jeunes à Ibadan, Sud-Ouest du Nigeria

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ABSTRACT

BACKGROUND: Sleep breathing disorders (SDB), especially obstructive sleep apnoea (OSA), are poorly studied in the young population. This study aimed to determine the prevalence of OSA and its associated risk factors among young persons.

METHODS: A cross-sectional study design was used, and participants aged 16-35 years were recruited from five tertiary institutions in Ibadan, South Western, Nigeria. The study used a structured questionnaire, stadiometer, weighing scale, tape measure, and digital blood pressure machine to collect data. Patient Health Questionnaire (PHQ-9), Generalized Anxiety Disorder-7 (GAD-7), and Pittsburgh sleep quality index (PSQI) were used to assess depression, anxiety, and sleep quality respectively. To assess the risk of OSA, we used both the STOP-Bang questionnaire and the NOSAS score. The Statistical Package for the Social Sciences version 23 was used to analyse the data, and statistical significance was set at <0.05 .

RESULTS: A total of 354 participants were included in this report with a mean age of 21.2 ± 3.5 years. The female: male ratio was 1.9:1. The mean $\pm$ standard deviation of PSQI, GAD-7 score and PHQ-9 were 2.2 ± 1.1 , 12.4 ± 5.1 and 15.0 ± 5.4 respectively. The following percentages of participants were found to be at low, intermediate, and high risk for OSA: 94.1%, 5.6%, and 0.3%, respectively. This study showed that age and GAD-7 score were independently associated with the PSQI score while age, body mass index, neck cuff size and PHQ-9 score for OSA score.

CONCLUSION: There is a burden of OSA among this population of young people; and modifying anthropometric and psychosocial factors can help mitigate the risk of OSA outcomes.

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KEYWORDS: Obstructive Sleep Apnea; Sleep-disordered Breathing; Epidemiology; Sleep Disorder

RÉSUMÉ

CONTEXTE: Les troubles respiratoires du sommeil (TRS), en particulier l'apnée obstructive du sommeil (AOS), sont peu étudiés chez la population jeune. Cette étude visait à déterminer la prévalence de l'ASO et ses facteurs de risque associés chez les jeunes.

MÉTHODES: Un schéma d'étude transversale a été utilisé, et les participants âgés de 16 à 35 ans ont été recrutés dans cinq institutions tertiaires à Ibadan, au sud-ouest du Nigeria. L'étude a utilisé un questionnaire structuré, une toise, une balance, un ruban à mesurer et un tensiomètre numérique pour collecter les données. Le questionnaire Patient Health Questionnaire (PHQ-9), le Generalized Anxiety Disorder-7 (GAD-7) et l'index de qualité du sommeil de Pittsburgh (PSQI) ont été utilisés pour évaluer la dépression, l'anxiété et la qualité du sommeil respectivement. Pour évaluer le risque d'AOS, nous avons utilisé à la fois le questionnaire STOP-Bang et le score NOSAS. Le logiciel Statistical Package for the Social Sciences version 23 a été utilisé pour analyser les données, et la signification statistique a été fixée à $<0,05$.

RÉSULTATS: Un total de 354 participants ont été inclus dans cette étude avec un âge moyen de $21,2 \pm 3,5$ ans. Le ratio femmes : hommes était de 1,9:1. Les moyennes $\pm$ écart-type du PSQI, du score GAD-7 et du PHQ-9 étaient respectivement de $2,2 \pm 1,1$, $12,4 \pm 5,1$ et $15,0 \pm 5,4$. Les pourcentages suivants de participants étaient classés à faible, intermédiaire et haut risque d'AOS: 94,1 %, 5,6 % et 0,3 %, respectivement. Cette étude a montré que l'âge et le score GAD-7 étaient associés de manière indépendante au score PSQI, tandis que l'âge, l'indice de masse corporelle, la circonférence du cou et le score PHQ-9 étaient associés au score ASO.

CONCLUSION: Il existe un fardeau de l'ASO parmi cette population de jeunes; et la modification des facteurs anthropométriques et psychosociaux peut aider à atténuer le risque de résultats d'ASO.

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MOTS-CLÉS: Apnée obstructive du sommeil; Troubles Respiratoires du Sommeil ; Épidémiologie ; Trouble du sommeil

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Abbreviations: CNM: College of Nursing and Midwifery; CSA: Central sleep apnoea; FSS: Federal School of Statistics; GAD-7: Generalized Anxiety Disorder-7; KU: Kola Daisi University; NoSAS: Neck circumference; Obesity, Snoring, Age, Sex; OSA: Obstructive sleep apnoea; OYCHST: Oyo State College of Health Science and Technology; PHQ-9: Patient Health Questionnaire; PSQI: Pittsburgh Sleep Quality Index, SDB: Sleep-disordered breathing; TERRACE: The Effects of anthropometry and psychosocial issues on campus; TP: The Polytechnic

INTRODUCTION

Sleep is an indisputable part of healthy living as it has been shown to account for over 30% of the early periods of life.^{1,2} Sleep breathing disorders on the other hand can negatively impact on persons' quality of life, general health, academic and professional performance.² Sleep - disordered breathing (SDB) can be obstructive sleep apnoea (OSA), central sleep apnoea (CSA), or a combination of both.³

One billion people (30-69 years old), nearly one-seventh of the adult population, are thought to have OSA, although prevalence is 2-4% in the general population.⁴ Furthermore, according to Benjafield et al., and Lyon et al., 425 million have moderate to severe OSA out of the global one billion individuals affected by OSA.^{4,5} This global estimate revealed almost tenfold increase when compared to the previous estimate made years earlier (100 million in 2007 vs. 936 million in 2019).^{4,5}

The disorder is linked to several health conditions such as heart arrhythmias, diabetes mellitus, coronary artery disease, stroke, and a reduction in quality of life.^{6,7} Obesity and overweight are the most prevalent risk for SDB, particularly OSA.⁸

OSA results from a partial closure of the airways or a reduction in their diameter during inspiration and very common in Stage 1, Stage 2 and rapid eye movement (REM) sleep.¹⁰ This disease has been defined by the presence of obstructive respiratory episodes (apnoeas, hypopnoeas, and respiratory effort-related awakenings) per hour of sleep.¹⁰ Other indicators of the condition include daytime fatigue, loud snoring, observed breathing interruptions, or awakening due to gasping or choking. OSA has slowly acquired attention over the past thirty years as research on undiagnosed OSA has grown.^{2,5,6}

OSA prevalence increase with age and most of the studies in the literature focus on middle age and elderly population leaving out the younger age group. Very few studies are done among racial homogenous young black population. Those with OSA are also faced with many psychosocial issues, especially the young persons who may have to combine the risk of being overweight, obesity, anxiety, depression, and possibly stigmatization with the energy and productivity needed for this very critical age bracket.^{6,7,9} Thus, there is a compelling need to assess OSA prevalence and its risk factors in this young age group.

This study aimed to determine the prevalence of OSA and its associated risks among young persons (16-35 years) in tertiary institutions in Ibadan, South West Nigeria.

SUBJECTS, MATERIALS AND METHODS

Study design

The study adopted a cross-sectional study design. The protocol of the study has been previously published.¹²

Study Setting

The study included five tertiary institutions in Ibadan, the capital of Oyo State in southwest Nigeria which were part of The Effects of anthropometRy And psychosocial issues on campus (TERRACE) study.¹²

Study Participants/Population

The participants aged 16-35 years were recruited from College of Nursing and Midwifery (CNM), Federal School of Statistics (FSS), Kola Daisi University (KU), Oyo State College of Health Science and Technology (OYCHST) and The Polytechnic (TP) between February 2021 and November 2021.

Sample size and sampling technique

Applying the formula for cross-sectional studies for populations less than 10,000 ($n = (Z^2pq)/d^2$) while using a prevalence of 31.6% of those at high risk of developing OSA, a sample size of 331 was obtained with a margin error of 5% and confidence interval of 95%.^{13,14} A total of 375 participants were recruited which included anticipated non-response of 10% by participants.

The sampling technique adopted was a three-stage, multistage sampling technique.¹² These three stages are described below:

First stage - Two universities, out of the five universities in Ibadan, were randomly selected through a raffle draw. However, only one could be done due to the non-availability of institutional approval from the second university during the study period. Two polytechnics, out of the four polytechnics in Ibadan, were randomly selected through a raffle draw. However, only one could be done due to the non-availability of institutional approval from the second polytechnic during the study period. Three monotechnics, out of the ten monotechnics in Ibadan, were selected through a raffle draw. Hence, a total of five tertiary institutions were included in this study.

Second stage - In this stage of sampling, the selection of academic departments from the included tertiary institutions was done. Through a raffle draw, two academic departments were randomly selected from each of the included universities, while three and two academic departments, units, or divisions were selected from the polytechnics and monotechnics, respectively.

Third stage - Twenty-five students per selected academic department were randomly recruited for the study using a table of random numbers. The list contained the name, sex, age, academic

level/year, and contact address of all students in such a department.

Data Collection

A structured questionnaire, stadiometer, weighing scale, tape measure, and digital blood pressure machine were the tools used in this study.

Questionnaire: Students from one of the institutions participated in a pilot study of the structured questionnaire. Grammatical spellings were corrected afterward in addition to improved questionnaire formatting and layout. The current survey is divided into several sections, including biodata (age, date of birth, gender, level of education, course of study, marital status, number of children, academic status [full-time vs. part-time], and employment status), a habit of smoking or drinking, physical activity, and body measurements (weight, height, neck cuff size, waist circumference, and hip circumference). Patient Health Questionnaire (PHQ 9), Generalized Anxiety Disorder-7 (GAD-7), and Pittsburgh sleep quality index (PSQI) were objectively used to assess depression, anxiety and sleep quality, respectively.

The PHQ-9 tool is a multipurpose instrument for screening, diagnosing, monitoring and measuring the severity of depression, with a total score range of 0 to 27 and 5, 10, 15, and 20 representing cut-points for mild, moderate, moderately severe and severe depression, respectively. The GAD-7 is a screening tool for anxiety disorder with a total score range of 0 to 21 and 5, 10, and 15 represent cut points for mild, moderate, and severe anxiety, respectively. The PSQI tool is a self-reported questionnaire that measures sleep quality during the previous month with a total score of 21.^{17,18}

The STOP-Bang questionnaire which include variables on snoring, tiredness, observed apnoea, high blood (BP), body

mass index (BMI), age, neck circumference, and male gender.⁽¹⁵⁾ The STOP-Bang questionnaire, which is used to assess OSA consists of eight dichotomous (yes/no) items related to the clinical features of sleep apnoea. The total score ranges from 0 to 8. Patients can be classified for OSA risk based on their respective score: low risk (0-2), intermediate risk (3-4) and high risk (5-8).¹⁵

Neck circumference, Obesity, Snoring, Age, Sex (NoSAS) tool was used to assess OSA. The tool has a score ranges from 0 to 17, and consists of 5 items with: neck circumference >40 cm: 4 points; BMI <30 kg/m²: 3 points and ≥ 30 kg/m²: 5 points; presence of snoring: 2 points; age ≥ 55 years: 4 points; male sex: 2 points. A ≥ 8 indicates a higher risk of OSA.¹⁶ The correlation between the STOP-Bang questionnaire and NoSAS questionnaire score was ($r^2=0.451, p<0.0001$).

Data Management and Analysis

The administered questionnaires were checked for accuracy and completeness after each participant provided their responses. Data were electronically entered into the study database and cleaned. The data were analysed using the Statistical Package for the Social Sciences (SPSS) version 23. For descriptive data, frequency tables, charts, and graphs were used. Where continuous variables were regularly distributed, means and standard deviations were employed. The median and interquartile ranges were used to report the skewed data. The relationship between qualitative variables were determined using Chi-square or Fisher's exact test. Independent t-test and ANOVA were employed to compare normally distributed continuous variable. Pearson's correlation coefficient was used to test for the association between of PSQI, age,

weight, height, waist circumference, hip circumference, cuff size, BMI, blood pressure, pulse pressure (PP), mean arterial pressure (MAP), GAD-7, PHQ, and STOP-Bang score in all, male and female participants. Multiple linear regressions were used to predict which variables significantly explained the variation in the PSQI in order to rule out confounders.

Unconditional multivariate logistic regression model was used to determine the adjusted and associated factors for OSA. Adjustment were made for selected factors identified from literature review and empirical evidence based on significant correlations found in our initial bivariate analyses. The odds ratio (OR) and 95% confidence intervals (CIs) in our models were estimated and statistical significance was put at <0.05.

Ethical considerations

The study protocol was reviewed and approved by the Oyo State Health Research Ethics Committee (AD 13/479/1776B) before commencement of the study. The leadership of the selected institutions gave their written consent, and the student participants gave both verbal and written consent. Every respondent in the study participated voluntarily.

RESULTS

A total of 375 participants were recruited in the five centres. However, 21 participants were removed because they did not complete the STOP Bang questionnaire. A total of three hundred and fifty-four (354) participants were included in this report with a mean age of 21.2 ± 3.5 years. The female: male ratio was 1.9:1. They were mostly full-time students (99.1%), single (94.3%), and self-employed (75.7%) who mostly earned less than 10,000 naira/month. Less than a twentieth of participants'

Table 1: Baseline characteristics of participants

Variables	
Centre n (%)	
CNN	75 (21.2)
FSS	72 (20.3)
KU	66 (18.6)
OYSCHST	74 (20.9)
TP	67 (18.9)
Age, mean $\pm$ SD years	21.2 $\pm$ 3.5
Gender n (%)	
Male	122 (34.5)
Female	232 (65.5)
Level or year of study, n (%)	
100	191 (54.0)
200	131 (37.0)
300	21 (5.9)
400	11 (3.1)
Marital status, n (%)	
Never married	334 (94.4)
Currently married	19 (5.4)
Not stated	1 (0.3)
Current academic status n (%)	
Student (full-time)	351 (99.2)
Part time student	3 (0.8)
Currently smoke tobacco products n (%)	
Yes	7 (2.0)
No	346 (98.0)
Currently use smokeless tobacco products daily (n=353) n (%)	
Yes	5 (1.1)
No	349 (98.9)
Ever ingest alcohol n (%)	
Yes	85 (24.0)
No	269 (76.0)
At least one standard alcohol drink in last 12months (n=354) n (%)	
5 - 6 days per week	11 (3.1)
1 - 2 days per week	5 (1.4)
1 - 3 days per week	11 (3.1)
Less than once a month	46 (13.0)
Never	281 (79.4)
Weight mean $\pm$ SD kg	57.8 $\pm$ 11.0
Height mean $\pm$ SD cm	165.9 $\pm$ 8.3
Waist circumference mean $\pm$ SD cm	75.1 $\pm$ 8.3
Hip circumference mean $\pm$ SD cm	89.0 $\pm$ 9.0
Systolic blood pressure mean $\pm$ SD mmHg	108.8 $\pm$ 10.9
Diastolic blood pressure mean $\pm$ SD mmHg	67.6 $\pm$ 8.9
Pulse pressure mean $\pm$ SD mmHg	43.5 $\pm$ 11.7
Body mass index mean $\pm$ SD kg/m ²	21.0 $\pm$ 3.7
Neck cuff size mean $\pm$ SD cm	33.0 $\pm$ 2.6

CNN-College of Nursing and Midwifery, FSSFederal School of Statistics, KU- Kola Daisi University, OYSCHST -Oyo State College of Health Science and Technology, TP-The Polytechnic, OSA-obstructive sleep apnoea, PQSI -Pittsburg sleep quality index, GAD 7 - Generalized Anxiety Disorder 7-item, PHQ 9 - Patient Health Questionnaire-9

Table 2: Table showing the profile of risk of OSA and sleep quality among participants

Variables	
Stop Bang score mean $\pm$ SD	1.1 $\pm$ 0.9
Snoring n(%)	19(5.4)
OSA classification(STOP Bang score) n(%)	
Low risk	333(94.1)
Intermediate risk	20(5.6)
High risk	1(0.3)
OSA classification(using NoSAS score) n(%)	
Low risk	351(99.2)
High risk	3(0.8)
PSQI score mean $\pm$ SD	2.2 $\pm$ 1.1
Quality of sleep	
Good sleep	354(100.0)
Poor sleep	0(0)
GAD-7 score mean $\pm$ SD	12.4 $\pm$ 5.1
PHQ-9 mean $\pm$ SD	15.0 $\pm$ 5.4

GAD 7- Generalized Anxiety Disorder 7-item, PHQ 9- Patient Health Questionnaire-9

smoke (past or present) while about a fifth take alcohol (24%); 13% of those who drink alcohol take less than a drink per month. The following percentages of participants were found to be at low, intermediate, and high risk for OSA: 94.1%, 5.6%, and 0.3%, respectively using STOP Bang Score (Table 2). The mean $\pm$ standard deviation of PSQI, GAD-7 score and PHQ-9 were 2.2 $\pm$ 1.1, 12.4 $\pm$ 5.1 and 15.0 $\pm$ 5.4 respectively. The mean from PSQI demonstrated good sleep quality while GAD-7 and PHQ-9 showed high level of anxiety and depression respectively.

Bivariate analysis of Pittsburgh sleep quality index with various variables showed among all the participants, age, GAD-7 score and PHQ-9 score are positively correlated with statistical significance, however, this was only seen only with age among males while among females only GAD-7 and PHQ 9 scores (Table 3).

Bivariate analysis of STOP Bang score with various variables showed among all the participants, body mass index, systolic blood pressure, heart rate, cuff size, pulse pressure, mean arterial pressure, GAD-7 score and PHQ 9 score are positively correlated with statistical significance, although age was statistically significant, it was negatively correlated (Table 4). Among males only age and PHQ 9 are positively correlated and statistically significant while among females it differs with GAD-7 and PHQ 9 scores positively correlated and statistically significant (Table 4). Furthermore, age is also statistically significant among female but negatively correlated. NoSAS score was similar to STOP Bang score except for slight variations as shown in Table 4.

Table 5 showed that age and GAD-7 score were independently associated with the PSQI score while age, weight, height, BMI, neck cuff size and PHQ-9 score were associated with STOP Bang

Table 3: Bivariate analysis of Pittsburgh sleep quality index with various variables

Variables	Bivariate analysis of Pittsburgh sleep index with various variables					
	All		Male		Female	
	r ²	p-value	r ²	p-value	r ²	p-value
Age(years)	0.148	0.005	0.224	0.013	0.109	0.096
Weight (kg)	0.004	0.939	-0.119	0.193	0.084	0.202
Height(cm)	-0.079	0.139	-0.018	0.842	-0.065	0.321
Waist circumference (cm)	0.023	0.673	-0.037	0.684	0.046	0.490
Hip circumference (cm)	0.031	0.563	-0.119	0.191	0.080	0.227
Systolic blood pressure (mmHg)	0.002	0.965	0.024	0.793	0.021	0.753
Diastolic blood pressure (mmHg)	0.074	0.165	0.082	0.369	0.061	0.357
Heart rate (beat/min)	0.031	0.558	0.000	0.999	0.017	0.797
Cuff Size(cm)	-0.013	0.814	0.020	0.827	0.043	0.515
BMI(kg/m ²)	0.059	0.265	-0.114	0.210	0.121	0.066
Pulse pressure(mmHg)	-0.067	0.210	-0.049	0.589	-0.038	0.564
Mean arterial pressure(mmHg)	-0.045	0.398	-0.027	0.769	-0.016	0.813
GAD 7 score	0.185	0.001	0.043	0.646	0.259	<0.0001
PHQ 9 Score	0.150	0.005	0.027	0.773	0.221	0.001

GAD 7- Generalized Anxiety Disorder 7 -item,PHQ 9- Patient Health Questionnaire-9

Table 4: Bivariate analysis of STOP Bang and NoSAS scores with various variables

Variables	STOP Bang score						NoSAS score					
	All		Male		Female		All		Male		Female	
	r ²	p-value	r ²	p-value	r ²	p-value	r ²	p-value	r ²	p-value	r ²	p-value
Age(years)	-0.165**	0.002	-0.076	0.406	-0.176	0.007	0.102	0.054	-0.077	0.396	0.262	<0.0001
Weight (kg)	0.119*	0.025	0.026	0.775	-0.027	0.682	0.239	<0.0001	0.247	0.006	0.271	<0.0001
Height (cm)	0.283**	<0.0001	0.005	0.954	-0.064	0.330	0.001	0.984	0.170	0.061	0.006	0.932
Waist circumference (cm)	0.006	0.915	0.126	0.168	-0.053	0.420	0.267	<0.0001	0.243	0.007	0.276	<0.0001
Hip circumference(cm)	-0.012	0.817	-0.019	0.835	-0.010	0.881	0.202	<0.0001	0.148	0.104	0.218	0.001
Waist: Hip ratio	0.045	0.400	0.023	0.798	-0.12	0.860	0.607	<0.0001	0.446	<0.0001	0.752	<0.0001
Systolic blood pressure (mmHg)	0.115*	0.031	-0.072	0.430	-0.115	0.088	0.023	0.678	0.128	0.163	0.008	0.901
Diastolic blood pressure mmHg)	-0.077	0.148	-0.188	0.039	-0.087	0.200	0.168	0.002	0.169	0.064	0.165	0.014
Heart rate (beat/min)	-0.155**	0.003	-0.029	0.752	0.045	0.499	0.048	0.372	-0.106	0.245	0.073	0.266
Neck cuff size(cm)	0.351**	<0.0001	0.068	0.457	-0.015	0.818	0.087	0.101	0.157	0.085	0.175	0.008
Body mass index(kg/m ²)	-0.036	0.504	0.019	0.839	0.006	0.925	0.263	<0.0001	0.179	0.049	0.283	<0.0001
Pulse pressure(mmHg)	0.208**	<0.0001	-0.077	0.401	0.003	0.964	-0.101	0.058	-0.032	0.730	-0.097	0.140
Mean arterial pressure(mmHg)	0.190**	<0.0001	-0.060	0.514	-0.033	0.618	-0.076	0.152	0.007	0.937	-0.074	0.262
GAD 7 score	0.199**	<0.0001	0.166	0.073	0.283	<0.0001	-0.110	0.042	-0.096	0.301	-0.115	0.086
PSQI score	-0.012	0.828	0.024	0.793	0.049	0.459	0.148	0.005	0.224	0.013	0.109	0.096
PHQ 9 Score	0.278**	<0.0001	0.316	0.001	0.309	<0.0001	-0.105	0.054	0.003	0.977	-0.143	0.031

GAD 7- Generalized Anxiety Disorder 7 -item,PHQ 9 - Patient Health Questionnaire-9

Table 5: Factors associated with PSQI score using multiple regression analysis

	Unstandardized Coefficients		Standardized Coefficients	95.0% Confidence Interval for B		p-value
	B	Std. Error		Beta	Lower Bound	
(Constant)	.515	.398		-.267	1.298	0.196
Age(years)	.051	.016	.171	.019	.083	0.002
GAD-7 score	.041	.015	.196	.011	.071	0.007
PHQ-9 Score	.005	.014	.028	-.023	.034	0.703
GAD 7- Generalized Anxiety Disorder 7 -item, PHQ 9- Patient Health Questionnaire-9						

score (Table 6).

DISCUSSION

Quality of sleep

We assessed the quality of sleep using the PSQI, which is validated for

screening insomnia at cut-off scores of 5.0.^{17,18} All our participants had good quality of sleep. A study in this environment has also found very low prevalence of poor quality of sleep and similar low mean score of PSQI score.¹⁹

A study among medical students showed higher prevalence which highlight course of study which predispose to high likelihood of poor sleep quality.²⁰ This is connected with the fact that medical trainees undergo more strenuous schedules in medical school, and this is worse as they progress in their training.²⁰ Usually, we expect nursing students who constitute one out of five of our participants to engage in shifting duty during their training, this did not reflect in our result. Shift work and in particular night work is a known disrupter of the sleep–wake cycle and its synchrony with the diurnal rhythm and other

Table 6: Factors associated with STOP Bang score using multiple regression analysis

Variables	Unstandardized Coefficients		Standardized Coefficients	95.0% Confidence Interval for B		P-value
	B	Std. Error		Lower Bound	Upper Bound	
(Constant)	-2.382	.742		-3.842	-.922	0.001
Age(years)	-.029	.013	-.112	-.055	-.003	0.031
Systolic blood pressure mmHg	.000	.003	-.007	-.007	.006	0.893
Heart rate beat/minutes	-.007	.004	-.097	-.015	.000	0.053
Neck cuff size(cm)	.145	.021	.399	.103	.186	<0.0001
Pulse pressure mmHg	.005	.006	.047	-.006	.016	0.406
Body Mass Index Kg/m ²	-.041	.014	-.158	-.068	-.013	0.004
GAD-7 score	.002	.012	.013	-.021	.025	0.850
PHQ-9 Score	.036	.011	.220	.015	.058	0.001

GAD 7- Generalized Anxiety Disorder 7-item, PHQ 9- Patient Health Questionnaire-9

endogenous biologic rhythms which affects physiologic sleep.²⁰ We therefore postulate that this disparity may be due to the timing of recruitment which may be when they are not on posting for clinical duty. We did not collect data on current posting of participants. Good sleep quality among other students was not surprising since shift related training are not present in these other categories.

Increasing age and worsening anxiety state were found to predict poorer sleep outcome in our participants. Many other studies among undergraduates have identified age and anxiety state as independent predictors of the quality of sleep.^{21,22} Depression appears to play a role among female and not males.

Obstructive sleep apnoea

This study assessed the risk for OSA and it found a low burden of 5.9% with intermediate- high risk for OSA using STOP Bang tool for screening.^{13,23} A study in this environment and in other population have reported higher prevalence compared to our study.¹¹ This is not surprising considering OSA is common in middle and old age, our study population were between 16-35 years. Another study which used STOP Bang tool among general adult population showed those to be high risk to be 4.9% compared to 0.3% in our study.²⁴ Also a similar study among University students in same geographical area and with higher mean

of BMI showed a higher burden.²⁸ Notwithstanding that the mean BMI was 28.5kg/m² compared to 21kg/m² from our study participants, BMI was independently associated with OSA.²⁵ This illustrates the well-established intertwining role of obesity with OSA.^{13,26-28}

There was similarity of high risk of OSA using the two screening tools we deployed. High risk of OSA was 0.3% and 0.8% using the STOP Bang and NoSAS tools respectively. To the best of our knowledge, this is the first study in this region that combined the tools for assessment of young person in same study.²⁹

The predictors of risk for OSA among all the participants were age, BMI and neck cuff size and depressive state which have been identified by other studies in other locations.^{32,33} These predictors are positively correlated to OSA. OSA tend to co-exist with depressive symptoms and also tend to share many symptoms such as daytime sleepiness, low energy, poor concentration, irritability psychomotor retardation, and weight gain.^{34,35} This interplay is not unconnected with intermittent hypoxia causing dose-dependent cell loss in brain areas rich in noradrenergic and dopaminergic pathways, both of which are important for regulating sleep/wakefulness as well as maintaining normal mood and mood regulation.³⁶ Furthermore, our previous

abstract using a model of blood pressure parameters alone identified pulse pressure as an independent predictor however this was not replicated in this study.³⁷ It was only significant during bivariate correlation in this full report and not the comprehensive model we created.

Limitation of study

This study is limited by being a cross sectional study hence cannot demonstrate causality. While the study included a rich variety of student population, it does not include medical students which have been found to have high burden of poor sleep quality to allow for comparism.²⁰ The only university included in this study does not have medical students. Also, a polysomnography was not used to assess OSA. However STOP Bang questionnaire is well validated and previously used in similar population.³⁸⁻⁴⁰

CONCLUSION

There is a burden of risk for OSA in young population in Ibadan, Nigeria. The factors independently associated with the conditions are positively correlated with age, body mass index, and psychosocial factors. Given the key role played by OSA in non-communicable diseases occurrence, more attention should be paid to OSA in the young age group to allow early

diagnosis and care to prevent its dramatic complications. In addition, the presence of modifiable anthropometric and psychosocial factors, which can be addressed, would play a significant role in mitigating OSA outcomes in this population.

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