

# Risk of Obstructive Sleep Apnoea and its Association with Perceived Quality of Life among Hospital Workers in Southern Nigeria

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ABSTRACT

**Background:** Obstructive sleep apnoea (OSA) is a prevalent yet underdiagnosed sleep breathing disorder associated with fatigue, poor quality of life and cardiometabolic complications. Despite growing awareness, data on the risk of OSA, health workers notwithstanding, remains sparse even in light of the knowledge of its health significance. This study aimed to assess the risk of OSA and its relationship with perceived health-related quality of life among hospital workers in Benin City, Nigeria, while also exploring potential sociodemographic and environmental influences.

**Methods:** A cross-sectional study was conducted among 93 non-clinical staff at the University of Benin Teaching Hospital. Participants were recruited through direct engagement and screened using a structured questionnaire incorporating the STOP BANG and WHOQOL BREF instruments. Data on stove type, cooking location and fuel source were collected to assess indoor exposure risks. Descriptive statistics, Chi-square tests and t-tests were used to analyze associations between OSA risk, sociodemographic variables and perceived quality of life.

**Results:** Most participants were at low risk for OSA (87.1%), while 5.4% and 7.5% were at intermediate and high risk respectively. All high-risk individuals were male and had significantly higher mean age ( $43.6 \pm 10.0$  years vs.  $31.8 \pm 7.4$  years;  $p < 0.001$ ). A significant inverse relationship was found between education level and OSA risk (Chi-square for trend = 6.831;  $p = 0.009$ ). Classic symptoms such as loud snoring (85.7%) and daytime fatigue (100%) were prevalent in the high-risk group. BMI was higher among high-risk individuals but not statistically significant. Most respondents rated their quality of life as good or very good (88.2%), although symptom burden among those at high OSA risk suggests possible impaired well-being. Nearly 41 percent of participants used open fire stoves without chimneys, indicating possible exposure to indoor air pollution.

**Conclusion:** A measurable proportion of hospital workers in this study were at increased risk of OSA, especially among older males and those with lower educational attainment. Despite overall positive self-reported quality of life, high-risk individuals exhibited a cluster of classic OSA symptoms that may compromise daily functioning and productivity. Routine workplace screening using validated tools like STOP-BANG, coupled with awareness campaigns and clean cooking interventions, is recommended to reduce the burden of undiagnosed OSA among workers in healthcare settings.

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## INTRODUCTION

Obstructive sleep apnoea (OSA) is a common and under-recognized sleep-related disorder characterized by recurrent episodes of upper airway obstruction during sleep, leading to intermittent hypoxia, interrupted sleep and poor sleep quality, with a substantial decline in physical, cognitive, and emotional health (Sforza & Roche, 2016; Slowik et al., 2025). OSA has been identified as a growing public health concern, with an estimated 936 million adults aged 30–69 years being affected globally, including 425 million with moderate to severe OSA (Benjafield et al., 2019).

In sub-Saharan Africa, the incidence and prevalence of OSA is poorly documented, with data limited by low awareness, poor utilization of sleep studies and limited access to specialist care. However, hospital-based studies suggest that OSA symptoms such as loud snoring, excessive daytime sleepiness, and witnessed apnoeic episodes are not uncommon, even among apparently healthy populations (Desalu et al., 2016; Simpamba et al., 2023). Among health workers, the risk may be elevated by occupational stress, unpredictable work schedules, and lifestyle-related factors such as weight gain, sedentary behaviour and poor sleep hygiene, which all contribute to OSA pathogenesis (Güçlü et al., 2019).

OSA is progressively identified as a contributor to reduced health-related quality of life (HRQoL), with affected individuals experiencing fatigue, intellectual impairment, mood disorders and reduced productivity (Kerner et al., 2016). The impact of OSA on HRQoL is especially important in healthcare workers, whose well-being directly affect patient safety and institutional functioning. Untreated OSA is associated with increased risks of cardiovascular diseases, insulin resistance, stroke, hypertension and increased all-cause mortality (Jean-Louis et al., 2008; Kerner et al., 2016).

A number of risk factors for OSA have been identified, including male sex, age over 40 years, obesity, increased neck fat, craniofacial abnormalities, alcohol use, and smoking (Mitra et al., 2021). In recent years, environmental exposures to indoor air pollution from biomass fuels, have also been implicated in upper airway inflammation and night-time respiratory symptoms (Okwor et al., 2017; Radbel et al., 2024). In many low- and middle-income countries, including Nigeria, traditional cooking practices using open fires or kerosene stoves in poorly ventilated kitchens remain common. Health workers are not excluded from these exposures in their environments, potentially intensifying their respiratory risks.

Despite the known impact of OSA on quality of life and long-term health, routine screening for OSA risk in workplace wellness programs, particularly in Africa, remains rare. Tools such as the STOP-BANG questionnaire offer real-world alternatives for risk stratification in resource-limited settings and can guide the need for further assessment or intervention.

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This study aimed to assess the risk of obstructive sleep apnoea and its association with perceived health-related quality of life among hospital workers in Benin City, Nigeria. It also investigates the influence of sociodemographic factors and cooking-related environmental exposures to highlight potential intervention points for occupational and community health programs.

## MATERIALS AND METHODS

### Study Area and Design

This study was conducted at the University of Benin Teaching Hospital (UBTH), a tertiary health facility located in Benin City, Nigeria. The design was cross-sectional, designed to assess the risk of OSA and its relationship with health-related quality of life among hospital workers.

### Study Participants

The study population included full-time employees of UBTH working in non-clinical departments. Participants were selected through direct, in-person recruitment during working hours. Eligible staff members who expressed interest were interviewed after the close of work and had pertinent anthropometric measurements taken. The study excluded medical doctors, nurses, individuals with a known diagnosis of chronic respiratory disorders, and those who declined to provide informed consent.

### Data Collection and Management

Data collection was conducted using a structured, interviewer-administered questionnaire incorporating the validated STOP-BANG and WHOQOL-BREF instruments. The STOP-BANG questionnaire consists of eight items and is designed to categorize individuals into low, intermediate or high risk of OSA. The WHOQOL-BREF tool was used to assess participants perceived overall quality of life and satisfaction with health.

The data were analyzed using R statistical software. Categorical variables were described using frequencies and percentages, while

continuous variables were summarized using means and standard deviations. Associations between categorical variables were examined using the Chi-square test. Mean differences in continuous outcomes were analyzed using Student's *t*-test. A *p*-value of less than 0.05 was considered statistically significant, and findings were presented in tables and summary text.

#### **Ethical Considerations**

Ethical approval was obtained from the Ethics Committee of the University of Benin Teaching Hospital. The study adhered to ethical principles of autonomy, confidentiality, and informed consent. Questionnaires excluded names or personal identifiers, and participants were informed of their right to decline participation at any point in the study without negative consequences, such as effects on their treatment. Individuals identified as having a high risk of OSA were advised to seek further evaluation at the Respiratory Clinic of UBTH.

#### **Limitations**

The study relied on a screening instrument to assess the risk of obstructive sleep apnea. As diagnostic polysomnography was not available, the findings reflect estimated risk rather than confirmed diagnoses. This limitation restricts the ability to draw definitive clinical conclusions regarding the presence of OSA.

## **RESULTS**

### **Household cooking characteristics of respondents (Table 1)**

Thirty-eight (40.9%) respondents reported cooking on an open fire or stove without a chimney or hood, while 12 (12.9%) relied on closed stoves fitted with chimneys and 7 (7.5%) used open fires or stoves with a chimney or hood; only 2 (2.2%) cooked with electric stoves and 34 (36.6%) gave no answer on stove design. Cooking most often took place in a separate room set aside as a kitchen, reported by 71 (76.3%) participants, whereas 12 (12.9%) cooked outdoors and 8 (8.6%) used a separate building; a single respondent (1.1%) prepared meals in a room also used for living or sleeping and one (1.1%) did not specify a location. Gas was the principal cooking fuel used by 63 (67.7%) respondents, with kerosene used by 20 (21.5%), firewood by 8 (8.6%) and electricity by 2 (2.2%).

### **Self-reported quality of life and health satisfaction (Table 2)**

More than half of the respondents 56 (60.2%), rated their quality of life as good, while 26 (28.0%) described it as very good. Ten participants (10.8%) were neutral in their rating and only one

respondent (1.1%) rated their quality of life as poor. In terms of satisfaction with their health, 49 (52.7%) reported being satisfied and 28 (30.1%) were very satisfied. Ten respondents (10.8%) expressed neutrality, while five (5.4%) were dissatisfied and one (1.1%) reported being very dissatisfied with their health.

### **OSA risk classification (Figure 1)**

Based on the STOP-BANG instrument, most respondents, 81 (87.1%) were categorized as being at low risk for obstructive sleep apnea (OSA), while 5 (5.4%) were classified as intermediate risk and 7 (7.5%) as high risk.

### **Education and OSA Risk (Figure 2)**

When education levels were dichotomized into primary, secondary, and tertiary categories, a clear inverse relationship with OSA risk was observed. Among those with primary education, 2 of 3 participants (66.7%) were classified as intermediate or high risk, compared to 2 of 13 (15.4%) of those with secondary education and 8 of 77 (10.4%) of those with tertiary education. The association was statistically significant (Chi-square for linear trend = 6.831, *p* = 0.009).

### **Distribution of characteristics across OSA risk categories (Table 3)**

Among the 93 respondents, 81 (87.1%) were classified as low-risk for obstructive sleep apnea (OSA), 5 (5.4%) as intermediate-risk and 7 (7.5%) as high-risk. Males made up the majority of the high-risk group, with all 7 (100.0%) being male, while females accounted for only 1 (20.0%) in the intermediate-risk group and none in the high-risk category.

Regarding educational attainment, 69 respondents in the low-risk group (85.2%) had tertiary education, 11 (13.6%) had secondary education, and 1 (1.2%) had primary education. In the intermediate-risk group, 4 (80.0%) had tertiary education and 1 (20.0%) had secondary education. Among the high-risk group, 4 (57.1%) had tertiary education, 1 (14.3%) had secondary education, and 2 (28.6%) had primary education.

Symptoms and indicators associated with OSA risk showed clear trends. Loud snoring was reported by 6 (85.7%) of those at high risk and only 4 (4.9%) of those at low risk. Similarly, daytime tiredness or sleepiness was reported by all individuals in the high-risk group (100.0%), 4 (80.0%) in the intermediate-risk group, and 31 (38.3%) in the low-risk group.

Only 1 respondent (1.1%) reported being observed to stop breathing during sleep, and this individual was in the low-risk category. A history of hypertension was more common in the intermediate-risk group (40.0%) compared to the

high-risk group (14.3%) and the low-risk group (2.5%).

**Table 4: Comparison of age and BMI by OSA risk category**

Participants classified as high risk for obstructive sleep apnoea (OSA) had a significantly higher mean age ( $43.6 \pm 10.0$  years) compared to those in the low or intermediate risk groups ( $31.8 \pm 7.4$

years), with the difference being statistically significant ( $p < 0.001$ ). Although the mean body mass index (BMI) was also higher among those at high risk ( $25.3 \pm 3.4$  kg/m<sup>2</sup>) relative to the low/intermediate group ( $23.5 \pm 3.8$  kg/m<sup>2</sup>), this difference was not statistically significant ( $p = 0.119$ ).

Table 1: Household cooking characteristics of respondents

Variable	Frequency (n=93)	Percentage (%)
<b>Design of cooking stove used</b>		
Open fire or stove without chimney or hood	38	40.9
Closed stove with chimney	12	12.9
Open fire or stove with chimney/hood	7	7.5
Electric	2	2.2
No response	34	36.6
<b>Location of cooking</b>		
In a separate room used as kitchen	71	76.3
Outdoors	12	12.9
In a separate building used as kitchen	8	8.6
In a room used for living/sleeping	1	1.1
No response	1	1.1
<b>Fuel used for cooking</b>		
Gas	63	67.7
Kerosene	20	21.5
Firewood	8	8.6
Electricity	2	2.2

Table 2: Self-reported quality of life and health satisfaction

Variable	Frequency (n=93)	Percentage (%)
<b>Self-rating of quality of life</b>		
Poor	1	1.1
Neutral	10	10.8
Good	56	60.2
Very good	26	28.0
<b>How satisfied are you with your health?</b>		
Very dissatisfied	1	1.1
Dissatisfied	5	5.4
Neutral	10	10.8
Satisfied	49	52.7
Very satisfied	28	30.1

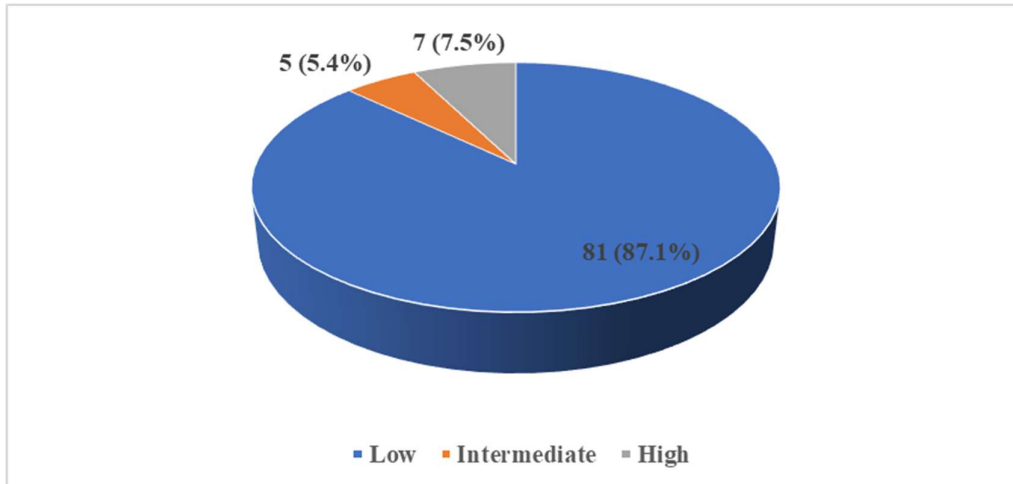


Figure 1: OSA risk category among respondents

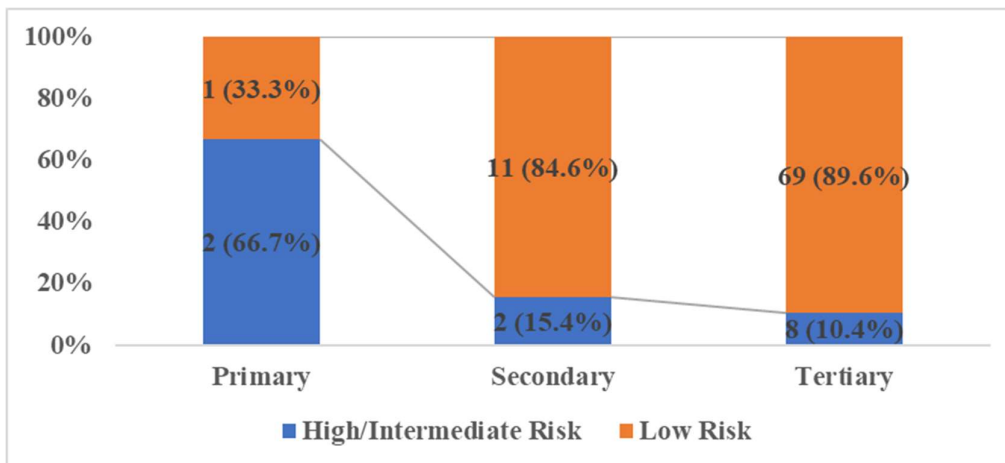


Figure 2: Risk of Obstructive Sleep Apnoea at different levels of Education

Table 3: Distribution of characteristics across OSA risk categories

Variable	OSA Risk Category			Total n=93 (100.0%)
	Low Risk n=81 (87.1%)	Intermediate Risk n=5 (5.4%)	High Risk n=7 (7.5%)	
<b>Gender</b>				
Male	51 (63.0)	4 (80.0)	7 (100.0)	62 (66.7)
Female	30 (37.0)	1 (20.0)	0 (0.0)	31 (33.3)
<b>Highest Level of Education</b>				
Primary school	1 (1.2)	0 (0.0)	2 (28.6)	3 (3.2)
Secondary school	11 (13.6)	1 (20.0)	1 (14.3)	13 (14.0)
Tertiary	69 (85.2)	4 (80.0)	4 (57.1)	77 (82.8)
<b>Indicators of OSA risk</b>				
Do you snore loudly (louder than talking or loud enough to be heard through closed doors)?	4 (4.9)	1 (20.0)	6 (85.7)	11 (11.8)
Do you often feel tired, fatigued, or sleepy during daytime?	31 (38.3)	4 (80.0)	7 (100.0)	42 (45.2)
Has anyone observed you stop breathing during your sleep?	1 (1.2)	0 (0.0)	0 (0.0)	1 (1.1)
Do you have or are you being treated for high blood pressure?	2 (2.5)	2 (40.0)	1 (14.3)	5 (5.4)

Table 4: Comparison of age and BMI by OSA risk category

Variable	OSA Risk		P-value
	High (Mean $\pm$ S.D)	Low/Intermediate (Mean $\pm$ S.D)	
Age (years)	43.6 $\pm$ 10.0	31.8 $\pm$ 7.4	<0.001
Body Mass Index (kg/m <sup>2</sup> )	25.3 $\pm$ 3.4	23.5 $\pm$ 3.8	0.119

## DISCUSSION

This study explored the risk of obstructive sleep apnoea (OSA) and its relationship with perceived health-related quality of life (HRQoL) among hospital workers in Benin City, Nigeria. Using the validated STOP-BANG and WHOQOL-BREF instruments, the study provides important insight into the under-recognized burden of sleep-related breathing disorders among a working adult population in a low-resource setting. Although only 7.5% of respondents were categorized as high risk for OSA and 5.4% as intermediate risk, these proportions are noteworthy given the relatively young and lean demographic profile of the participants. The predominance of low-risk classification (87.1%) may suggest an overall healthy sample, yet the presence of high-risk individuals within this cohort highlights the potential for undiagnosed OSA even among hospital staff. These findings are comparable to those of Adewole et al. (2009) who reported OSA symptoms in Nigerian urban workers using screening tools, despite low obesity rates. Similarly, Ozoh et al. (2014) in Lagos found substantial proportions of undiagnosed OSA risk in patients presenting to respiratory clinics, further confirming that traditional risk assumptions based solely on body mass index may underestimate the problem in African populations.

All respondents classified as high risk were male, affirming the well-documented association between male sex and OSA prevalence. This finding is consistent with established physiological and anatomical differences in airway collapsibility and fat distribution patterns between sexes, as seen in a study carried out by Fietze et al. (2019) which showed that men are at two to three times higher risk of developing OSA than women. The finding is also in line with studies conducted in both high-income and low-income settings, including investigations by Appleton et al. (2018) which demonstrated an age-adjusted male predominance in OSA prevalence. In the present study, the mean age of participants at high risk was significantly higher (43.6 years) than those at low or intermediate risk (31.8 years), and this difference was statistically significant. Age-related increases

in OSA risk have been attributed to physiological changes in upper airway tone, fat deposition around the pharynx, and alterations in ventilatory control mechanisms, particularly during rapid eye movement (REM) sleep (Labarca et al., 2023; Messineo et al., 2024)

Educational attainment also demonstrated a significant inverse association with OSA risk. Participants with only primary education were disproportionately represented in the intermediate and high-risk groups. While only 3.2% of the total sample had primary education, two of these three respondents (66.7%) fell into higher OSA risk categories. In contrast, among those with tertiary education, which represented 82.8% of the total sample, only 10.4% were at intermediate or high risk. The possible reasons for this trend may relate to limited health literacy, delayed health-seeking behaviour or greater occupational exposure to environmental and lifestyle stressors in individuals with lower educational attainment. The significance of this association lies in its modifiability; while age and sex are non-modifiable, educational gaps can be addressed through targeted health promotion interventions and improved access to screening and treatment. Notably, classic OSA symptoms such as loud snoring and excessive daytime tiredness were reported almost universally among those at high risk. Six out of seven individuals at high risk (85.7%) reported loud snoring, and all seven (100.0%) experienced frequent daytime fatigue or sleepiness. In contrast, these symptoms were markedly less frequent among those at low risk. This symptom clustering is consistent with the construct validity of the STOP-BANG tool and aligns with clinical observations globally. As seen in a study by Zhang et al. (2021), daytime fatigue was one of the most commonly reported symptoms among OSA patients, and was strongly correlated with poor HRQoL scores. Interestingly, despite the presence of these hallmark symptoms, objective clinical diagnoses are rarely pursued in resource-constrained settings, largely due to the limited availability of sleep laboratories and under-appreciation of the burden of sleep disorders. The current study's findings support the use of

practical, non-invasive screening tools like STOP-BANG for early identification of at-risk individuals in institutional and occupational settings.

Body mass index (BMI) was not a strong differentiator of OSA risk in this study. Although the mean BMI was slightly higher among those at high risk (25.3 kg/m<sup>2</sup>) compared to their low/intermediate-risk counterparts (23.5 kg/m<sup>2</sup>), this difference was not statistically significant. Moreover, only one participant in the entire sample had a BMI above 35. These findings are similar to observations from Esmaeil et al. (2025), who also noted that patients with OSA may present without obesity, with less than one-third of respondents being obese, and that reliance on BMI alone could miss many cases. This stresses the need to consider phenotypic and anatomical variations in the manifestation of OSA. Given the leaner body habitus typical of many African populations, it becomes especially important to include symptom-based criteria in screening protocols.

In terms of perceived quality of life, the majority of respondents reported good (60.2%) or very good (28.0%) QoL, and most were satisfied (52.7%) or very satisfied (30.1%) with their health. These findings may reflect a generally healthy workforce, but the presence of OSA-related symptoms among those at high risk likely impacts their true functional health status. As noted in a study by Ashgari et al. (2013), individuals with untreated OSA report lower physical domain scores on the WHOQOL-BREF. While domain-level QOL scores were not analyzed in this study, the presence of fatigue, sleep disturbance and comorbid hypertension among high-risk respondents suggests a possible undercurrent of impaired well-being that may not be fully captured by general self-ratings.

Environmental and lifestyle exposures were also examined. A notable proportion of participants reported using open fires or stoves without chimneys (40.9%), and cooking predominantly took place indoors. The use of biomass fuels in enclosed spaces increases exposure to particulate matter, nitrogen dioxide and carbon monoxide, all of which may irritate upper airway tissues and contribute to airway narrowing during sleep. Although no direct association was demonstrated between stove design and OSA risk in this study, the potential role of indoor air pollution as a modifier of upper airway inflammation is increasingly recognized, as chronic exposure to household smoke may exacerbate nocturnal respiratory symptoms and increase susceptibility to conditions such as OSA (Krishnan et al., 2014; Pataka et al., 2022).

This highlights a relevant intersection between environmental health and sleep medicine that warrants further investigation in African settings.

## CONCLUSION

This study provides early evidence of OSA risk among hospital workers in Nigeria, with associations noted for male sex, increasing age, lower education, and classic symptoms such as snoring and fatigue. While most participants rated their quality of life positively, those at high risk may experience hidden deficits that affect both personal well-being and professional function. Institutional policies promoting early screening, symptom recognition and cleaner household energy practices could serve as important steps toward reducing the burden of sleep-disordered breathing in similar settings.

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## Conflicts of interest

The authors declare that they have no conflicts of interest.

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