

Prevalence and correlates of snoring among adults in Nigeria

Olanisun Olufemi Adewole ¹, Ho Adeyemo ², F Ayeni ², Emmanuel .A Anteyi ³, Zaccheus .O Ajuwon ³, Greg E Erhabor ⁴, Temitayo.T Adewole ⁴

1. Department of Medicine, National Hospital, Abuja and Obafemi Awolowo University, Ile- Ife. Nigeria.
2. Gwagwalada Specialist Hospital Abuja, Nigeria.
3. Department of Medicine, National Hospital, Abuja
4. Department of Medicine, Obafemi Awolowo University Teaching Hospital, Ile Ife. Nigeria.

Abstract

Introduction: Snoring is a common sleep problem with significant public health concerns. Studies have characterized this in most developed countries. Hitherto there have been no published studies on this subject in Nigeria.

Objectives: To determine the prevalence and correlates of snoring in addition to morbidity in an adult population in Nigeria.

Design: A cross – sectional survey of 370 young adult and adult living in Abuja, Nigeria.. Data were collected on socio- demographic characteristics, sleep pattern as well as occurrence of snoring, apneas and excessive day time sleepiness was determined using Epworth Sleepiness Scale (ESS). Body Mass Index (BMI) and blood pressure were measured.

Results: Of the 370 respondents, 218 (59%) were females. The overall prevalence of snoring was 31.6%; habitual snoring (14%) and moderate snoring (17%). Apnea was reported in about 2% of the respondents while the prevalence of Clinically Suspected Obstructive Sleep Apneas (CSOSA) was 1%, (1.9% in males, 0.5% in females). Snoring was significantly associated with male sex, old age, increased BMI and cigarette consumption . The severity of snoring was also associated with a higher ESS score, day time symptoms and other morbidities.

Conclusions: Snoring among Nigerians is associated with multiple factors. There is a need for more awareness about this condition in order to control measures of factors associated with snoring.

Key words: snoring adult Nigerians.

African Health Sciences 2008; 8(2): 108-113

Introduction

Snoring is increasingly being recognized as of public health concern. It is a common complaint in adults and a hallmark of Obstructive sleep apnea syndrome (OSAS)¹. Habitual snoring is also associated with hypertension, cerebrovascular disease, heart disease and daytime somnolence^{2, 3,4,5,6}. Although most people with OSAS are habitual or heavy snorers, most snorers do not have the full blown syndrome.

The prevalence of snoring in children ranges from 3.2 and 12% in various studies^{7,8,9} and between 5 and 44% in adults^{6,10,11,12}. Most of these studies were done in Western or Asian countries. Few of such studies have been done in developing countries and none in Nigeria. The goals of this preliminary study, was to determine the prevalence and pattern of snoring, its association with socio- demographic characteristics and sleep related factors among Nigerian adults.

Methodology

A cross sectional study was carried on a sample of young adults and adults in Abuja, the Federal Capital City (FCT) of Nigeria. Two communities in the FCT were selected. The subjects used were workers in the two major health centers located in these communities .These were federal institutions whose employees are from different parts or region of the country.

A questionnaire was developed to asses for sleep problems among the participants. This was first pre tested and corrected. The corrected final version of the questionnaire included items on socio- demographic characteristics as well as height, weight, Body Mass Index (BMI) and sleep related problems like snoring, witnessed apneas by a spouse or bed partner and excessive day time somnolence. Participants were selected from the hospitals' register. Every 5th person on the lists was selected. The sample size was equally divided between the two centers.

For the purpose of this study and to determine the role of different working pattern, subjects were categorized into two main work groups:

Group 1 consisted of nurses, ward assistants and security officers, who mainly do shifts: while Group 2 included doctors, account staff, secretaries, laboratory scientists, pharmacists and cleaners.

Correspondence author:

Adewole O.O

Department of Medicine,

Obafemi Awolowo University , Ile Ife. Nigeria.

E mail: adewolef@yahoo.co.uk.

Informed consents was obtained from each participant and full explanation of the questionnaire. Each participant answered the questionnaire on site and was asked to discuss or confirm events like snoring and apneas. Participants were phoned to remind them of the study and to submit questionnaires.

Operational Definitions

Snoring was classified as (1) **never/non snorers** for those who had no such event, (2) **moderate or occasional snorers** for those who snore for 1-3times/ week , (3) **habitual snorers** for those with history of snoring of more than 3 times/ week.

Apneas. Witnessed pauses in respiration during sleep. It is classified as **never** in those without the event and **present** in those with the event.

The **Epworth Sleepiness Scale** (ESS) was used to determine excessive day time sleepiness. It is an eight item self administered questionnaire. Possible score ranges were from 0 to 24. For this study, an ESS score of more than **11** was taken to mean Excessive day time sleepiness EDS.

Clinically Suspected Obstructive Sleep Apneas (CSOSA) was defined in accordance with the 2001 International Classification of Sleep Disorders ¹; habitual and loud snoring, witnessed apneas and EDS.

Body Mass Index (BMI) was calculated using weight in Kilograms over height in meters squared.

Statistical analysis

Data were presented using discrete statistics, while chi square test was used to test for association between different categories snoring and other parameters like socio-demographic characters. Multiple linear regressions were used to test of independent association between snoring and various parameters **like sex (male v female), Body Mass Index $\leq 30\text{kg}/\text{m}^2$** . P values <0.05 were considered to indicate statistical significance.

Results

400 questionnaires were given out in all. Of these 5 % (20 respondents) were not returned. Insufficient information was provided by another 10 respondents. Information was complete in the remaining 370 respondents was included in this analysis. This yields an overall response rate of 92%.

The general characteristics of the study sample. 218(59%) of the respondents were female while 152(41%) were male with their ages ranging from 20 – 59. 40% of the respondents were from the southern parts of the country while 60% were from the various groups in the northern Nigeria. The overall mean age of respondents was 36.5 ± 6.51 years, it was 36.0 African Health Sciences Vol 8 No 2 June 2008

± 5.06 years in males and 37.2 ± 7.4 years in females. In male respondents the mean BMI was $28.9 \pm 3.55 \text{ kg}/\text{m}^2$, and in female respondents it was $27.9 \pm 5.1 \text{ kg}/\text{m}^2$. 58% of the respondents were in the group 1 work category. In 31 % of all the respondents, there was reported history of snoring; 36% in males and 27% in females.

The prevalence of disordered sleep breathing by age and sex .

As shown, the prevalence of snoring increases with age in both sexes. For females, the highest prevalence rate of snoring occur at age 40-49 years (34% for moderate, 14% for habitual snoring), whereas in males, the highest prevalence rate of snoring was obtained in the age group 50-59 years (25% each for moderate and habitual snoring). 25% of the males in the age group 50 -59 years had Clinically Suspected Obstructive Sleep Apneas. The overall rate of Clinically Suspected Obstructive Sleep Apneas among the respondents was 1.0 % (female was 0.5%, 1.9% in males). Statistically significant associations were found by univariate analysis between occurrence of snoring, CSOSA and sex and age. As shown, a higher proportion of males had moderate snoring and CSOSA. Though the association between sex and habitual snoring did not reach a statistically significant level, age groups 40-49 and 50 years and above for males were associated with habitual snoring, $P < 0.001$.

Table III shows the prevalence of snoring based on the occupational class and region of origin of participants in this study. As shown, 31% and 30% of respondents in occupational group I and 2 reported episodes of snoring respectively. This difference was not statistically significant. In contrast, more respondents from the southern part of the country compared with those from the northern part reported episodes of snoring, 34% v 29%. This was found to be statistically significant, p value 0.04. This difference persisted after controlling for age, p value =0.02, but after controlling for BMI, the observed relationship between snoring and region of origin of participants was not sustained, p value=0.05.

Associated features and morbidity

The frequency of snoring was significantly associated with mean BMI, smoking and ESS score. The mean BMI for habitual snorers ($33.4 \pm 4.88 \text{ kg}/\text{m}^2$) was highest compared with those of moderate snorers ($29.7 \pm 3.19 \text{ kg}/\text{m}^2$) and non snorers ($26 \pm 3.83 \text{ kg}/\text{m}^2$). There is also a significant association between the mean age of respondents and snoring severity. In addition, smoking,

Table I. General characteristics of study sample

Characters	Females N=218 (%)	Males N=152 (%)	Total N=370 (%)
Age group			
20-29	29 (13)	13 (8.5)	42 (11.3)
30-39	127 (58)	89 (58.5)	216 (58.4)
40-49	50 (23)	42 (27.6)	92 (25)
50-59	12 (5.5)	8 (5.5)	20 (5.4)
Mean(SD)			
Marital Status			
Married	155 (71)	101 (66)	256(69)
Single	63 (29)	51 (34)	114(31)
Region of origin			
Northern	122 (56)	109 (71)	231(60)
Southern	96 (44)	43 (29)	139(40)
BMI			
20-25	75 (34)	25 (16)	100 (27)
26-30	57 (26)	55 (36)	112 (30)
31-35	78 (35.8)	59 (38.8)	137(37)
36-40	4 (1.8)	5 (3.2)	9 (2.4)
>40	4 (1.8)	8 (5.2)	12 (3.2)
Snoring	59(27)	55(36)	114(31)

Table II. Prevalence of sleep disordered breathing based on age and sex

Age(yrs)	Females (N=218)				Males (N=152)			
	NS (%)	MS (%)	HS (%)	CSOSA (%)	NS (%)	MS*(%)	HS** (%)	CSOSA* (%)
20-29	29(100)	-	-	-	13(100)	-	-	-
30-39	93(73)	17(13.5)	17(13.5)	-	60(67)	19(21)	10(11)	-
40-49	25(50)	17(34)	7 (14)	1(2)	22(52)	10(23.8)	9(21.4)#2	1(2)
50-59	12(100)	-	-	-	2(25)	2(25)	(25)#	2(25)
Total	159(73)	34(15.6)	24(11)	1(0.5)	97(63.8)	31(20.4)	21(13.8)	3(1.9)

NS Non snorers, MS Moderate snorers, HS Habitual snorers, CSOSA Clinically suspected obstructive sleep apnea. Univariate analysis between males and females.*P value <0.05, **P value >0.05, #P value(for comparing habitual snoring between age groups 40-49 ,50-59 yrs between males and female) ,<0.001 .

frequent night wake ups, and hypertension were significantly associated with snoring severity. A higher proportion of respondents with habitual snoring (10%) compared with moderate snorers (6%) and non snorers (8%) had problems with concentration, p value 0.05. Other associated features and morbidity are shown in table III.

Discussion

To the best of our knowledge, this is the first study to examine the prevalence, correlates and morbidity associated with snoring in an adult population in Nigeria. It comprised of a total sample of 370 respondents with a high response rate. Though the population studied was atypical in terms of occupation, but the lack of significant association between the occupations of the respondents as seen in this study, suggest a possible wider application of these findings to the general population. This finding will be a useful guide and foundation for further study on a similar subject.

The overall prevalence of snoring obtained in this study was 31.6%. In men it was 34% and 26% in women. 17.5% and 12.1% of all the respondents were moderate and habitual snorers respectively. The prevalence of CSOSA in this study was 1.1%.

Both the overall prevalence of snoring and sex specific prevalence of snoring in this study was lower than 40% obtained among population sample in the UK and polish estimates of 25% in females and 46% in males ^{6,12}. However, our findings were similar to that obtained by Teculescu et al among French men ¹³. This could be due to definitions of snoring used. There is still some uncertainty about the definition of snoring, the most frequently used method for estimating the prevalence of snoring is based on the results of questionnaires in epidemiologic surveys. Since there is no standard and uniformly accepted technique for the objective measurement of snoring, the validation of these questionnaires remains a problem.

Table. III. Prevalence of snoring based on occupational group and region of origin.

Characteristics	Snoring (n=114)	Non –snoring (n=256)	Total (n=370)	P value
Occupation				
Group1	64(31%)	141(69)	205	0.7
Group2	50(30%)	115(70)	165	
Region of origin				
South	47(34%)	92(56%)	139	0.04
North	67(29%)	164(71%)	231	

The logistic regression model for snoring: Variables included and the baselines used for comparison were Sex (female), age (15-29years), Body Mass Index ($\leq 30\text{kg/m}^2$), and marital status (being single). Other variables included and baselines used for comparison were as shown in the foot note.

Male sex was associated with 1.9 risk (CI: 1.7 to 2.2). In contrast, a BMI of $\geq 30\text{kg/m}^2$ was associated

with a 2.3-fold excess in the risk of habitual snoring compared to a BMI of $< 30\text{kg/m}^2$. There was a > 10 -fold risk of habitual snoring in subjects with witnessed apneic events on 3 days per week vs subjects with no apneic events. Other factors that continued to have relationships with habitual snoring included smoking, being married and day time sleepiness. This is as shown in table IV.

Table IV. Associated features and morbidity among study sample by snoring severity.

Characteristics	HS N=50 (%)	MS N=60 (%)	NS N=257 (%)	P value
#Mean Age yrs(SD)#	37.5(4.8)	37.3(6.01)	35.4(6.9)	0.05
Mean BMI kg/m ² (SD)	33.4(5.5)	27(3.2)	25.7(3.83)	0.001
Smoking Yes%	40.6	34.8	21	0.001
Excessive fatigue Yes (%)	13(26)	8(13)	13(5)	0.002
3Wake ups/night Yes (%)	13(26)	8(13)	18(7)	0.001
Difficulty in concentration Yes (%)	5(10)	4(6)	20(8)	0.05
Hypertension Yes (%)	13(26)	8(13)	30(11.4)	0.04
Early Morning Headache Yes (%)	19(38)	14(23)	7(3)	0.001
#Mean overnight sleep duration hrs(SD)	7.4(2.1)	8(1.07)	6.8(1.1)	0.001
#Mean ESS(SD)	6.5(2.3)	6.2(3.3)	4.5(2.5)	

#ANOVA test Significance level <0.05 , while Chi square and Phi tests were used to test for association in others with significance level <0.05

Table V. Logistic regression model of snoring

Variable	Odds ratio (95% confidence interval)	P value
Sex: Men	1.9 (1.8 to 2.0)	0.0000
Age (years):		
30-39	1.8 (1.5 to 2.1)	0.0001
40-49	2.1(1.8 to 2.4)	0.0000
50-59	2.3(2.0 to2.6)	0.0000
>5	1.5 (1.2 to 1.8)	0.0104
Body mass index (kg/m³) 30	2.6 (2.1 to 3.3)	0.0000
Marital status:		
Married	1.9 (1.7 to 2.1)	0.0000
Sleep duration:		
Too short	1.5 (1.1 to 1.9)	0.0320
Appropriate	1.6 (1.2 to 1.9)	0.0197
Daytime sleepiness; Yes	1.2 (1.0 to 1.3)	0.0387
Breathing pauses: yes	2.3(1.8 to 2.4)	0.000
Cigarette consumption:		
Current smokers	1.3 (1.2 to 1.5)	0.0003

Reference Categories: SEX , Female; Age 15-29 Years; Body Mass Index 30; Marital Status: Single; Sleep Duration: Too Long Sleep Duration; Day Time Sleepiness: No Daytime Sleepiness; Breathing Pauses; None, Cigarette Consumption: Never.

With regards to gender, a higher prevalence of snoring in male adults has been consistently observed in many studies.^{6, 14, 15} Our results also showed that male adolescents were more likely than female adolescents to be habitual snorers (odds ratio [OR], 1.5; 95% CI, 1.2 to 1.9). This significance even persisted after controlling for other confounding information. Since biological development in adolescents is not fully complete, habitual snoring in the current study may not have had a chance of being significantly affected by gender after adjustment for other factors.

In both male and female, as found in this study, the frequency of snoring increases with age. This observation continues for female until the age 50-59 years when there were no reported cases of snoring, whereas the highest prevalence of snoring among males was observed in the 50 -59 age group. Additionally, by the age of 50 and above, 50% of the males were snoring while none of the females were. However more females (34%) snore at the age group 40-49 years compared to males (24%). As shown there is about two half risk of snoring for those within the age group 50 -59 compared to the two fold risk for those in the age group 40- 49. The import of these findings is that the prevalence of snoring increases with age for both sexes, while it may reduce at older age(50 -59 years) in females, in males it may be associated with clinically suspected obstructive sleep apnea. However, further studies may need to be done with a larger sample size in order to make a valid statement concerning this .

There was a strong association between BMI and snoring in this report. This has also been noted in previous studies.^{12, 16, 17} .The reason for this may be related to the reduction in pharyngeal airway diameter and resistance produced by deposits of adipose tissue in obese individuals¹⁷. Pharyngeal resistance correlates with increasing weight/height ratio or

obesity. Obese adults had a 2.6-fold excess risk of habitual snoring when compared with those with a BMI < 30kg/m². This association was left unexplained by other confounding factors that were examined in this report.

Active smoking has been shown to be associated with snoring and sleep –disordered breathing^{17, 18, 19, and 20}. Smoking may provoke mucosal edema and inflammation of the pharynx, resulting in the narrowing and collapsibility of pharyngeal airway, and leading to an increased risk of snoring.¹⁷ Although the amount and exposure period of smoking were low and short in our respondents compared to other studies, current smokers had a significantly increased risk of habitual snoring, compared with nonsmokers (OR, 1.3; 95% CI, 1.2 to 1.5). Thus, our data confirm that smoking is an independent risk factor for habitual snoring in adults.

Our findings showed that snoring was correlated with increasing degrees of daytime sleepiness, as measured by the ESS score and a tendency to fall asleep was five to seven times as common in subjects with snoring as a problem. This finding has been reported also by other workers⁶. This increase tendency to fall asleep could partly be due to insufficient refreshing sleep probably due to repeated awakenings, despite the increased total sleep time. It could also reflect possible hypoxemia. The possible resultant effect of this is the difficulty in concentration observed in this category of patients. Sleepiness and difficulty in concentration could be major source of accidents and in this group of respondents; it could be associated with reduced productivity.

Breathing pauses or apneas were reported in 7% of our study population. Daytime sleepiness was independently related to both snoring and occurrence of apneas. Respondents with apneas have an increased tendency to snore compared to those without. The occurrence of snoring, apneic episodes and

excessive day time sleepiness in these individuals could suggest probable OSAS. Polysomnography data would have been helpful to detect OSAS in these individuals. However, using the clinical prediction rule model by the International Classification of Sleep Disorder, 1% of our study population has CSOSA. This figure is low when compared with the findings of Kamil et al in Malaysia²¹. In that study, the prevalence of habitual snoring was close to 50%. This may be responsible for the wide margin in our finding and theirs.

A significant association was found between occurrence of snoring and region of origin of the respondents. A higher proportion of the respondents from the southern part of the country reported episodes of snoring. This observation persisted even after controlling for the effects of smoking and age. However, it was not sustained after controlling for the effect of Body Mass Index. Carmelli et al studied the influence of genetic factors on snoring and EDS among twins²². The findings showed that snoring have a genetic basis that is largely independent of genes associated with obesity. In that study, 23% of those with self reported snoring were estimated to have a genetic basis.

Studies have reported associations between snoring and cardiovascular diseases^{2, 3, 4, 5, 6}. As found in this study, snoring was associated with hypertension. This could be due to metabolic syndrome as some of the respondents were also obese. However as revealed in our study, snoring was associated with hypertension and Excessive Daytime Sleepiness. This finding was corroborated by other works that shows that snoring and EDS themselves were risk factors for hypertension^{3, 4}. This implies that even simple snoring may not just be benign. Hence snoring should not be dismissed as benign until proven otherwise as respondents who snore have significant occurrence of other problems like difficulty in concentrating and high Epworth Sleepiness Score as found in this study.

In conclusion, our results show that snoring is a common problem among adults in Nigeria with real impact on day time functioning. The risk and severity of snoring is significantly increased with age, sex, a BMI of > 30, in current smokers, and in those with higher Epworth Sleepiness Scores. There may be geographic or ethnic variation in frequency and severity of snoring in Nigeria probably due to genetic or environmental factors. More controlled studies are needed also in this area.

References

1. Obstructive sleep apnea syndrome. In: American Sleep Disorders Association, eds. The International Classification of Sleep Disorders, Revised: Diagnostics and Coding Manual. Rochester, MN, American Sleep Disorders Association, 2001.
2. Gilson T, Oberg H, Taube A. Snoring and systemic hypertension: an epidemiological study. *Act. Med. Scand.* 1987; 222:415-421.
3. Hal K, Young T, Birdwell T, et al Sleep apnea and hypertension: a population-based study. *Ann. Intern. Med.* 1994; 120:382-388.
4. Jenna P, Sol A. Snoring, sleep apnea and cardiovascular risk factors: the MONICA II Study. *Int. J. Epidemiology.* 1993;23: 439-444
5. Jenna P, Schultz-Larsen K, Davidson M, et al Snoring and risk of stroke and ischemic heart disease in a 70 year old population: a 6-year follow-up study. *Int. J. Epidemiology.* 1994;23:1159-1164
6. Zielinski J, Zgierska A, Podlodowski M, et al Snoring and excessive daytime somnolence among Polish middle-aged adults. *Eur. Respir. J.* 1999; 14:946-950.
7. Ali NJ, Piston PJ, Stradling JR. Snoring, sleep disturbance, and behavior in 4–5 year olds. *Arch Dis Child.* 1993; 68:360-366.
8. Brunetti L, Rana S, Lospallutti ML, et al Prevalence and obstructive sleep apnea syndrome in a cohort of 1,207 children of southern Italy. *Chest.* 2001; 120:1930-1935
9. Ferreira Am, Clemente V, Gozal D, et al Snoring in Portuguese primary school children. *Pediatrics.* 2000; 106:e64-e69.
10. Bearpark H, Elliott L, Grunstein R, et al. Snoring and sleep apnea: a population study in Australian men. *Am. J. Respir. Crit. Care Med.* 1995; 151:1459-1465.
11. Ng TP, Seow A, Tan WC. Prevalence of snoring and sleep breathing-related disorders in Chinese, Malay and Indian adults in Singapore. *Eur. Respir. J.* 1998;12 :198-203.
12. Ohayon, MM, Guilleminault, C, Priest, et al, Snoring and breathing pauses during sleep: telephone interview survey of a United Kingdom population sample. *BMJ.* 1997;314: 860-863.
13. DTeculescu, B Hannhart, A Cornette B, et al. Prevalence of Habitual Snoring in a Sample of French Males Role of 'Minor' Nose-Throat Abnormalities. *Respiration* 2001;68 :365-370.
14. Olson LG, King MT, Hensley MJ, et al A community study of snoring and sleep-disordered breathing: prevalence. *Am. J. Respir. Crit. Care Med.* 1995 ; 152:711-716.
15. Chol Shin, Soon Jae Joo, JinKwan Kim, et al. Prevalence and Correlates of Habitual Snoring in High School Students. *Chest.* 2003; 124: 1709-1715.
16. Young T, Palta M, Dempsey J, et al The occurrence of sleep-disordered breathing among middle-aged adults. *N. Engl. J. Med.* 1993;328:1230-1235.
17. Bloom JW, Kaltborn WT, Quan SF. Risk factors in a general population for snoring: importance of cigarette smoking and obesity. *Chest.* 1988; 93: 678-683.
18. Stradling JR, Crosby JH. Predictors and prevalence of obstructive sleep apnea and snoring in 1001 middle-aged men. *Thorax.* 1991; 46:85-90.
19. Lindberg E, Taube A, Janson C, et al A 10-year follow-up of snoring in men. *Chest.* 1998; 114:048-1055
20. Wetter DW, Young TB, Bidwell TR, et al Smoking as a risk factor for sleep-disordered breathing. *Arch. Intern. Med.* 1994; 154: 2219 -2224.
21. Kamil MA, Teng CL, Hassan SA. Snoring and breathing pauses during sleep in the Malaysian population. *Respirology.* 2007; 12:375-380.
22. Carmelli D, Bliwise DL, Gary ES, Terry R. Genetic factors for self-reported snoring and excessive daytime sleepiness. Twin Study. *Am. J. Resp. Crit. Care Med.* 2001; 164:949-952.