JMedSci

Journal of the Medical Sciences
(Berkala Ilmu Kedokteran)

Volume 55, Number 1, 2023; 44-52
https://doi.org/10.19106/JMedSci005501202306

Evaluation of patients with suspected obstructive sleep apnea in a low-middle income country: Lagos experience

Oluwafemi Tunde Ojo[1,2]*, Adeola Olubunmi Ajibare[1,2], Akinola Olusola Dada[1,2], Ramon Moronkola[1], Ayoola Odeyemi[1], Temitope Fapohunda[1], Ikechukwu Adolphus Aganweze[1], Tracy Udoka Ossai[1], Ifeoluwa Owoeye[1], Olufunke Olayinka Adeyeye[1,2]

[1]Department of Medicine, Lagos State University Teaching Hospital, Ikeja, Lagos. [2]Department of Medicine, College of Medicine, Lagos State University Teaching Hospital, Nigeria

Submitted: 2022-11-10
Accepted : 2023-01-09

Keywords:
Obstructive sleep apnea;
polysomnography;
sleep study;
apnea;
sleep-disordered breathing

ABSTRACT

Obstructive sleep apnea (OSA) is a common chronic disorder that decreases the quality of life of patients. It is an underdiagnosed medical condition in Nigeria. This study aimed to describe the clinical presentations and validate the sleep apnea screening questionnaires with a home sleep study for the diagnosis of patients with suspected OSA seen in Lagos. This was a descriptive cross sectional study carried out on adult patients with suspicion of OSA referred to the Respiratory Clinic of Lagos State University Teaching Hospital. A proforma was used to obtain information and also data from home polysomnography was obtained for each patient. We selected 22 patients. The commonest presentations include snoring (20 or 90.9%), daytime somnolence (16 or 72.7%) and choking while sleeping (12 or 54.5%). The commonest comorbidities were hypertension (16 or 72.7%) and obesity (6 or 27.3%). The STOP-Bang score identified more patients with a high clinical probability for OSA than the Epworth score (20 and 12 patients respectively). Polysomnography showed evidence of sleep apnea in most suspected patients with severity ranging from mild, to moderate to severe disease (3 or 13.6%, 3 or 13.6%, and 10 or 45.5% respectively). The use of combined Epworth and STOP-Bang questionnaires combination is a great tool in identifying patients with suspected cases of OSA based on clinical presentations that will eventually benefit in a resource-limited environment like Lagos. There should be increased awareness of the use of this readily available and cheap questionnaire among physicians in Lagos for ease of OSAS diagnosis for many patients.

INTRODUCTION

Obstructive sleep apnea (OSA) is a respiratory sleep disorder characterized by intermittent upper-airway collapse during sleep.[1] The diagnosis of OSA requires the objective demonstration of abnormal breathing during sleep.[2] The apnea-hypopnea index (AHI) is widely used to define OSA in clinical and epidemiological studies.[3] The general prevalence of OSA defined by ≥5 apnea and hypopnea events per hour of sleep associated with excessive sleepiness is approximately 3-7% in men and 2-5% in women.[4] The risk factors for OSA include obesity, upper airway abnormalities, male gender, menopause, and increased age which peaks at approximately 55 years.[5]

Obstructive sleep apnea is associated with symptoms during sleep including

*corresponding author: ojofemi911@yahoo.com

snoring, choking and nocturia and wakefulness, excessive sleepiness, fatigue, lack of energy, and with sequelae such as psychological changes, and alterations in the quality of life.[4] The identification of OSA is low in Nigeria and this may be due to poor awareness among doctors about the disease presentations as well poor referral systems for sleep abnormalities evaluation and diagnosis. We hypothesized that sleep breathing disorders are common but rarely reported and referred to respiratory physicians in Nigeria.

This study aimed to evaluate the common presentations of OSA and also evaluate the use of common screening assessment tools as well as home polysomnography in the diagnosis of patients with suspected obstructive sleep apnea. The outcome of this study helps to highlight the importance of clinicians using the readily available and cheap sleep apnea screening questionnaire for early diagnosis of patients with OSA for timely treatment in a resource-limited setting like Lagos, Nigeria.

MATERIALS AND METHODS

Design and site of study

This was a cross-sectional descriptive study conducted at the Respiratory Clinic of Lagos State University Teaching Hospital, Nigeria. The study was carried out in Lagos State University Teaching Hospital (LASUTH) Ikeja, which is one of three tertiary centers that receive referrals from all parts of the Lagos metropolis and its environs. It has a bed capacity of about 774. Participants were recruited from the respiratory clinic of the hospital.

Participants of study

Participants aged > 18 yr who referred to the respiratory clinic on account of suspicion of obstructive sleep apnea were included in this study. Patients with low clinical probability for OSA with Epworth and stop bang scores of less than 10 and 3, respectively, and patients who were unable to do a sleep study were excluded. A convenient sampling method was used in this study. All the eligible patients were recruited after taking their inform consent. A proforma was used to obtained information from the case notes of the participants. This involves the socio-demographics, initial clinical presentations, Epworth score, Stopbang score, and the AHI result from the sleep study previously conducted for the patients.

Stopbang questionnaire

It is a reliable, concise, and easy-to-use screening tool for OSA.[6] It consists of eight dichotomous (yes/no) items related to the clinical features of sleep apnea. The total score ranges from 0 to 8. Patients can be classified for OSA risk based on their respective scores. The sensitivity of Stopbang score ≥ 3 to detect moderate to severe OSA (apnea-hypopnea index >15) and severe OSA (AHI > 30) is 93% and 100%, respectively.[6] Patients with a Stopbang score of 0 to 2 can be classified as low risk for moderate to severe OSA whereas those with a score of 5 to 8 can be classified as high risk for moderate to severe OSA.[6]

Epworth sleepiness scale (ESS)

It is a subjective measure of a patient's sleepiness with 8 items.[7] The test is a list of eight situations in which the tendency to become sleepy is rated on a scale of 0, no chance of dozing, to 3, high chance of dozing. The values of all the responses were added up. The total score is based on a scale of 0 to 24. Epworth score of > 10 indicates a high probability of OSA.[7]

Sleep study

Patients underwent a level 3 validated home sleep study with the polygraph system, ApneaLink device which is a pocket-sized, digital, multi-channel recording device that measures airflow through a nasal cannula connected to a pressure transducer, providing an AHI based on recording time.[8,9] It also can differentiate between obstructive and central events. Patients were instructed by nurses or physicians on how to operate the device for sleep recording. Respiratory events were scored when desaturations of at least 4% occurred in the absence of moving artifacts and irrespective of co-existing changes in snoring or heart rate. The ApneaLink default settings for apneas and hypopneas were used in this study. An apnea was defined as a decrease in the airflow by 80% of baseline for at least 10 s. Hypopnea was defined as a decrease in the airflow by 50% of baseline for at least 10 s. The AHI used for analysis was automatically analyzed by the ApneaLink software which was available for reviewing and rescoring by the clinician.[8,9]

Data analysis

The data were entered into excel and this was exported into SPSS version 26 for descriptive data analysis. The numerical demographic and clinical data e.g age was summarized with mean and standard deviation. Categorical variable e.g gender was summarized as frequencies and percentages. The Epworth score and Stopbang score were summarized on bar charts. The overall accuracy of Epworth and STOP-Bang was assessed by dividing summation of true positive and true negative by overall sample size.

Ethical approval

Ethical approval was obtained from the Ethics and Research Committee of LASUTH.

RESULTS

We selected 22 patients, including 15 (68.2%) males and 7 (31.8%) females, aged between 18 and 75 yr, with a mean age of 51.82±12.8 yr. The commonest presentations include snoring (20 or 90.9%), daytime somnolence (16 or 72.7%) and choking while sleeping (12 or 54.5%). The commonest co-morbidities were hypertension (16 or 72.7%) and obesity (6 or 27.3%) as shown in TABLE 1. STOP-Bang score (20 patients) indicated more patients with high clinical probability for OSA than Epworth score (12 patients) as shown in FIGURE1. Polysomnography showed evidence of sleep apnea in most of the patients with clinical suspicion ranging from mild to severe disease (3 or 13.6%, 3 or 13.6%, and 10 or 45.5%, respectively) as shown in FIGURE 2. The sensitivity of Epworth score and STOP-Bang score were 68.8% and 100%, respectively. While the specificity of Epworth score and STOP-Bang score were 83.3% and 33.3%, respectively. The overall accuracy of Epworth and STOP-Bang were 72.7% and 81.8% respectively as shown in TABLE 2. About 50% of the participants commenced weight loss while only nine people were able to commence CPAP treatment. Only four patients had sleep hygiene and mandibular advance device respectively.

TABLE 1. Socio-demographic and clinical characteristics of participants

Variable	Male	Female	Overall
Age (mean ± SD yr)	53.60 ± 13.4	48.00 ± 11.3	51.82 ± 12.8
BMI (mean ± SD kg/m^2)	34.58 ± 5.9	34.93 ± 5.9	33.33 ± 5.9
Symptoms [n (%)]			
• Snoring	14 (93.3)	6 (85.7)	20 (90.9)
• Daytime somnolence	11 (73.3)	5 (71.4)	16 (72.7)
• Choking while sleeping	8 (53.3)	4 (57.1)	12 (54.5)
• Tiredness	4 (26.7)	2 (28.6)	6 (27.3)
• Early morning headache	4 (26.7)	2 (28.6)	6 (27.3)
• Poor sleep	3 (20.0)	2 (28.6)	5 (22.7)
• Apnea	2 (13.3)	1 (14.3)	3 (13.6)
• Restlessness while sleeping	1 (6.7)	0 (0.0)	1 (4.5)
• Leg movement while sleeping	1 (6.7)	0 (0.0)	1 (4.5)
Comorbidity [n (%)]			
• Hypertension	11 (73.3)	5 (71.4)	16 (72.7)
• Diabetes	4 (26.7)	0 (0.0)	4 (18.2)
• Obesity	5 (33.3)	1 (14.3)	6 (27.3)

TABLE 2. Accuracy of Epworth score and Stopbang score in assessing OSA

Method	OSA status using AHI		Overall
	Absent	Present	
Epworth score			
• Low risk	5 (50.0)	5 (50.0)	72.7%
• High risk	1 (8.3)	11 (91.7)	
STOP-Bang score			
• Low risk	2 (100.0)	0 (0.0)	81.8%
• High risk	4 (20.0)	16 (80.0)	

*The accuracy of polysomnography for diagnosis of OSA was higher compared to Epworth and STOP-Bang questionnaires.

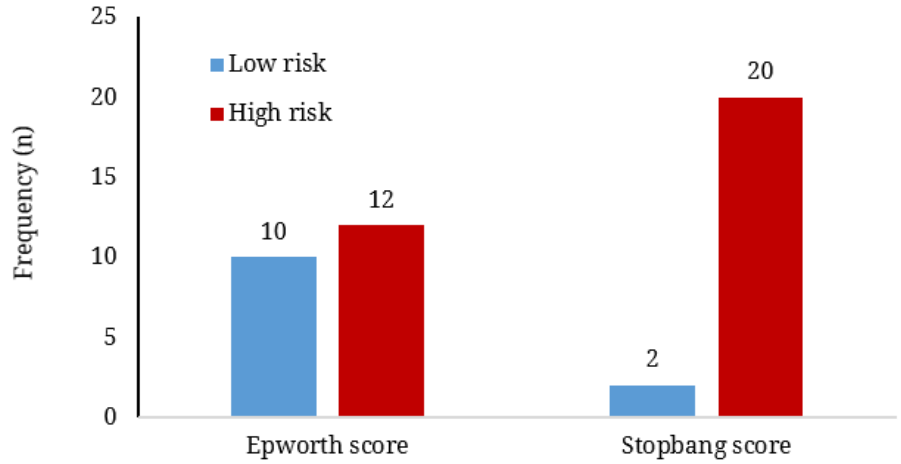

FIGURE 1. Sleep apnea assessment using Epworth and STOP-Bang questionnaires

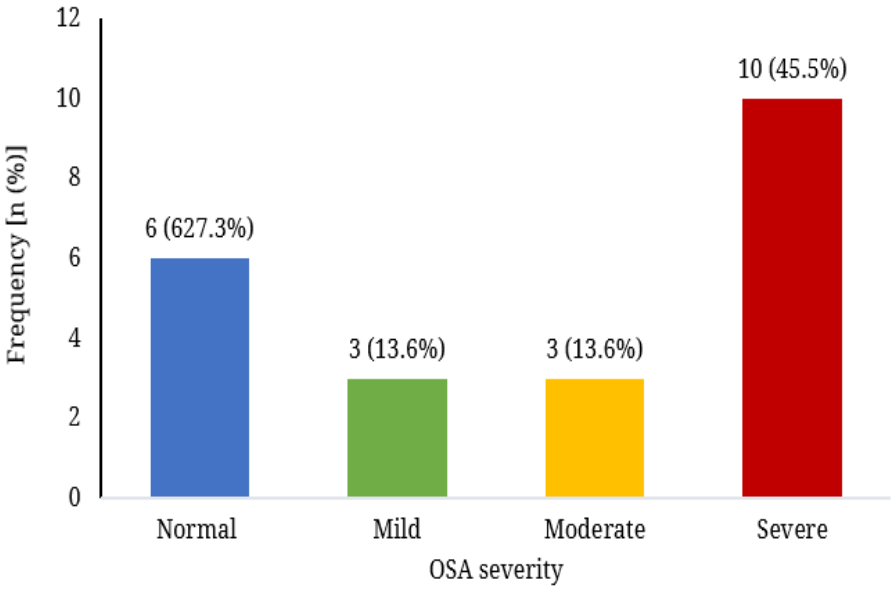

FIGURE 2. OSA classification among patients with suspected OSA

DISCUSSION

The objectives of this study were to describe the common presentations of OSA and to evaluate the usefulness of common screening assessment tools as well as home polysomnography in the diagnosis of patients with suspected OSA. The mean age of the participants was 51.82 ± 12.8 yr and majority were males. The commonest presentations include snoring, daytime somnolence, and choking while sleeping. The commonest comorbidities were hypertension and obesity. The STOP-Bang score identified more patients with a high clinical probability for OSA than the Epworth score. Polysomnography showed evidence of sleep apnea in most suspected patients. These findings imply that the use of combined Epworth and STOP-Bang questionnaires are a great tool in identifying patients with suspected cases of OSA, especially in a resource-limited environment like Lagos.

The high frequency of OSA among

middle-aged men in our study is similar to the report of Partinen *et al*.,[10] who noted that the prevalence of OSA is highest among men aged 40–65 yr. This is also corroborated by Al Lawati *et al*.,[11] who reported in a review that OSA is generally common, with moderate to severe disease present in approximately 9% of middle-aged men and 4% of women. Garvey *et al*.,[12] also reported that OSA is probably the most common respiratory disorder in the United States and Europe suggesting that between 14 and 49% of middle-aged men have clinically significant OSA. The prevalence of OSA in Nigeria was reported to be common among middle-aged people and ranges between 22% in men and 16% in women.[13] Desalu *et al*.,[14] reported that the frequency of high-risk for sleep apnoea increased with age and declined after 65 yr and also increased with the body mass index in a hospital-based study. This suggests that the epidemiology and prevalence of OSA are common in Nigeria and similar to what obtains in Europe and North America despite poor reporting.

Obstructive sleep apnea is associated with symptoms during sleep including snoring, choking, nocturia, wakefulness, excessive sleepiness, fatigue, and lack of energy.[15] Our findings suggest that the commonest presentations of patients with obstructive sleep apnea include snoring, daytime somnolence, and choking while sleeping. This is similar to the findings of Ohayon *et al*.,[16] who reported that snoring is very common in 35–45% of men and 15–28% of women with suspicion of OSA in a population-based study in the UK. Young *et al*.,[17] also reported that excessive daytime sleepiness is common and a poor discriminator in patients with OSAHS. The prevalence of snoring among patients assessed for OSA in Abuja was reported to be about 31% in a population-based study.[13] Akintunde *et al*.,[18] also reported a high prevalence of snoring in about 44.2% of university Community in South Western Nigeria. This suggests that common presentations of patients with OSA in Nigeria are not different from those reported elsewhere, and this should be appreciated by primary care clinicians to avoid underdiagnoses of this condition.

Our findings suggest that the commonest comorbidities were hypertension and obesity. This is similar to the report of Lacedonia *et al*.,[19] who reported that the prevalence of comorbidities was higher in patients affected by OSA, with arterial hypertension being the highest. Fusetti *et al*.,[20] in a descriptive study confirmed the existence of a statistically significant correlation between the severity of OSAS and BMI, ESS, average SO2, hypertension, diabetes mellitus, dyslipidemia, and metabolic syndrome. Desalu *et al*.,[14] in a multicenter observational hospital study showed that patients with systemic hypertension, obesity, excessive daytime sleepiness, history of smoking, snoring in a first-degree relative, and use of sedatives are at high risk of OSA. Other risk factors for OSA include heart failure among Africans.[18] Akanbi *et al*.,[21] reported that obesity and OSA may be more prevalent in Nigeria than previously predicted and obesity was found to independently increase OSA risk in a population-based study. The implication of this to practice in Nigeria is that patients seen in clinics with the comorbidities mentioned should be screened for OSA for early diagnosis and management. This may help to optimize the treatment of other background clinical conditions of such patients and improve their quality of life.

Our findings suggest that STOP-Bang score identified more patients with high clinical probability for OSA than the Epworth score. This is similar to the previous report that compared with the ESS, the SBQ is a more accurate tool for detecting mild, moderate, and severe

OSA.[22] Amra *et al*.,[23] in a cross-sectional study in Iran suggested that Berlin and STOP-Bang are more sensitive and accurate than ESS for OSA screening. A comparative study of the predictive values of OSA screening tools reported that the SB correctly identified more patients with OSA and SDB than the ESS alone.[24] The use of only ESS may not suffice for screening especially in patients who are not symptomatic for OSA that may have low clinical probability score. The use of STOP-Bang and ESS should be made readily available in the clinics for routine screening of patients with suspected risk factors.

Our findings revealed that polysomnography showed evidence of sleep apnea in most suspected patients. A study in France noted that Home-PSG is not feasible for about 33% of patients.[25] This figure most likely is much higher in our environment because of poor access and high cost of the device and test. Zou *et al*.,[26] reported that home sleep device is reasonably accurate for unattended home diagnosis of OSA. Su *et al*.,[27] also noted that home sleep monitoring device has good sensitivity, specificity, positive and negative predictive values for obstructive sleep apnea. Bilgin *et al*.[28] showed that the portable home sleep device can be used as an alternative diagnostic tool either at home or in sleep clinic for the diagnosis of OSA. The availability and affordability of sleep test is still a huge challenge in Nigeria. Currently, there are about 8 sleep centers in Lagos serving the population of about 20,000,000 Lagosians, of which 3 can perform level 1 (full polysomnography) sleep study. Only about 50% of patients with suspected OSA seen in the clinic are able to conduct sleep study due to the cost. It costs about 150-300 dollars depending on the center. There is a need for government and private health centers to invest in sleep medicine infrastructure to increase access and affordability for more Nigerians.

Our findings showed that only about nine patients with confirmed OSA were able to procure CPAP due to the high cost which ranges between 1000-1500 dollars. Majority of patients are not covered by insurance to cater for the treatment as in the case with other hospital services and would have to make out-of-pocket payments to use the device. This suggests that the treatment of diagnosed patients with OSA in Nigeria is still challenging dues to high cost of treatment. This calls for the attention of policy makers to capture the coverage of CPAP therapy under insurance for most Nigerians.

Limitations of this study

The study was performed using a small sample size and convenient sampling technique due to the limited number of patients available, hence the possibility of selection bias. Despite these limitations, this study highlights the importance of using the screening tools and polysomnography for evaluating patients with obstructive sleep apnea even in the absence of polysomnography especially in a resource limited setting like ours. This calls for more enlightenments of physicians in making use of the screening tools routinely in the clinics for assessing patients with risk factors for OSA.

CONCLUSION

These findings imply that the use of Epworth and STOP-Bang questionnaires combination is a great tool in identifying patients with suspected cases of OSA based on clinical presentations that will eventually benefit in a resource-limited environment from home sleep study like Lagos. There should be increased awareness on the use of this readily available and cheap questionnaire among physicians in Lagos for ease of OSAS diagnosis for many patients.

ACKNOWLEDGEMENT

Authors would like thank all participants were involved in this study.

REFERENCES

1. Kapur VK. Obstructive sleep apnea: diagnosis, epidemiology, and economics. Respir Care 2010; 55(9):1155-67.
2. McNicholas WT. Diagnosis of obstructive sleep apnea in adults. Proc Am Thorac Soc 2008; 5(2):154-60. https://doi.org/10.1513/pats.200708-118MG
3. Pevernagie DA, Gnidovec-Strazisar B, Grote L, Heinzer R, McNicholas WT, Penzel T, *et al*. On the rise and fall of the apnea− hypopnea index: A historical review and critical appraisal. J Sleep Res 2020; 29(4):e13066. https://doi.org/10.1111/jsr.13066
4. Anonym. Obstructive sleep apnea in adults: epidemiology, clinical presentation, and treatment options. Adv Cardiol 2011; 46:1-42. https://doi.org/10.1159/000327660
5. Punjabi NM. The epidemiology of adult obstructive sleep apnea. Proc Am Thorac Soc 2008; 5(2):136-43. https://doi.org/10.1513/pats.200709-155MG
6. Chung F, Abdullah HR, Liao P. STOP-Bang questionnaire: a practical approach to screen for obstructive sleep apnea. Chest 2016; 149(3):631-8. https://doi.org/10.1378/chest.15-0903
7. Johns MW. Sleepiness in different situations measured by the Epworth Sleepiness Scale. Sleep 1994; 17(8):703-10. https://doi.org/10.1093/sleep/17.8.703
8. Nigro CA, Dibur E, Malnis S, Grandval S, Nogueira F. Validation of ApneaLink Ox™ for the diagnosis of obstructive sleep apnea. Sleep Breath 2013; 17(1):259-66. https://doi.org/10.1007/s11325-012-0684-4
9. Nigro CA, Dibur E, Aimaretti S, González S, Rhodius E. Comparison of the automatic analysis versus the manual scoring from ApneaLink™ device for the diagnosis of obstructive sleep apnoea syndrome. Sleep Breath 2011; 15(4):679-86. https://doi.org/10.1007/s11325-010-0421-9
10. Partinen M, Telakivi T. Epidemiology of obstructive sleep apnea syndrome. Sleep 1992; 15(6 Suppl):S1-4. https://doi.org/10.1093/sleep/15.suppl_6.s1
11. Al Lawati NM, Patel SR, Ayas NT. Epidemiology, risk factors, and consequences of obstructive sleep apnea and short sleep duration. Prog Cardiovasc Dis 2009; 51(4):285-93. https://doi.org/10.1016/j.pcad.2008.08.001
12. Garvey JF, Pengo MF, Drakatos P, Kent BD. Epidemiological aspects of obstructive sleep apnea. J Thorac Dis 2015; 7(5):920-9. https://doi.org/10.3978/j.issn.2072-1439.2015.04.52
13. Adewole OO, Hakeem A, Fola A, Anteyi E, Ajuwon Z, Erhabor G. Obstructive sleep apnea among adults in Nigeria. J Natl Med Assoc 2009; 101(7):720-5. https://doi.org/10.1016/s0027-9684(15)30983-4
14. Desalu O, Onyedum C, Sanya E, Fadare J, Adeoti A, Salawu F, *et al*. Prevalence, awareness and reporting of symptoms of obstructive sleep apnoea among hospitalized adult patients in Nigeria: a multicenter study. Ethiop J Health Sci 2016; 26(4):321-30. https://doi.org/10.4314/ejhs.v26i4.4
15. Obstructive sleep apnea in adults: epidemiology, clinical presentation, and treatment options. Adv Cardiol 2011; 46:1-42. https://doi.org/10.1159/000327660
16. Ohayon MM, Guilleminault C, Priest RG, Caulet M. Snoring and breathing pauses during sleep: telephone interview survey of a United

Kingdom population sample. Bmj 1997; 314(7084):860-3. https://doi.org/10.1136/bmj.314.7084.860
17. Young T, Palta M, Dempsey J, Skatrud J, Weber S, Badr S. The occurrence of sleep-disordered breathing among middle-aged adults. N Engl J Med 1993; 328(17):1230-5. https://doi.org/10.1056/NEJM199304293281704
18. Akintunde AA, Salawu AA, Opadijo OG. Assessment of Snoring and obstructive sleep apnoea in a Nigerian university: Association with cardiovascular risk factors. Niger Med J 2014; 55(6):469-73. https://doi.org/10.4103/0300-1652.144698
19. Lacedonia D, Carpagnano GE, Patricelli G, Carone M, Gallo C, Caccavo I, *et al*. Prevalence of comorbidities in patients with obstructive sleep apnea syndrome, overlap syndrome and obesity hypoventilation syndrome. Clin Respir J 2018; 12(5):1905-11. https://doi.org/10.1111/crj.12754
20. Fusetti M, Fioretti AB, Valenti M, Masedu F, Lauriello M, Pagliarella M. Cardiovascular and metabolic comorbidities in patients with obstructive sleep apnoea syndrome. Acta Otorhinolaryngol Ital 2012; 32(5):320-5.
21. Akanbi MO, Agaba PA, Ozoh OB, Ocheke AN, Gimba ZM, Ukoli CO, *et al*. Obesity and obstructive sleep apnea risk among Nigerians. J Med Trop 2017; 19(2):110-5. https://doi.org/10.4103/jomt.jomt_17_17
22. Chiu HY, Chen PY, Chuang LP, Chen NH, Tu YK, Hsieh YJ, *et al*. Diagnostic accuracy of the Berlin questionnaire, STOP-BANG, STOP, and Epworth Sleepiness Scale in detecting obstructive sleep apnea: A bivariate meta-analysis. Sleep Med Rev 2017; 36:57-70. https://doi.org/10.1016/j.smrv.2016.10.004
23. Amra B, Javani M, Soltaninejad F, Penzel T, Fietze I, Schoebel C, *et al*. Comparison of Berlin Questionnaire, STOP-Bang, and Epworth sleepiness scale for diagnosing obstructive sleep apnea in Persian patients. Int J Prev Med 2018; 9:28. https://doi.org/10.4103/ijpvm.IJPVM_131_17
24. Vana KD, Silva GE, Goldberg R. Predictive abilities of the STOP-Bang and Epworth Sleepiness Scale in identifying sleep clinic patients at high risk for obstructive sleep apnea. Res Nurs Health 2013; 36(1):84-94. https://doi.org/10.1002/nur.21512
25. Portier F, Portmann A, Czernichow P, Vascaut L, Devin E, Benhamou D, *et al*. Evaluation of Home versus Laboratory Polysomnography in the Diagnosis of Sleep Apnea Syndrome. Am J Respir Crit Care Med 2000; 162(3 Pt 1):814-8. https://doi.org/10.1164/ajrccm.162.3.9908002
26. Zou D, Grote L, Peker Y, Lindblad U, Hedner J. Validation a portable monitoring device for sleep apnea diagnosis in a population based cohort using synchronized home polysomnography. Sleep 2006; 29(3):367-74. https://doi.org/10.1093/sleep/29.3.367
27. Su S, Baroody FM, Kohrman M, Suskind D. A comparison of polysomnography and a portable home sleep study in the diagnosis of obstructive sleep apnea syndrome. Otolaryngol Head Neck Surg 2004; 131(6):844-50. https://doi.org/10.1016/j.otohns.2004.07.014
28. Bilgin C, Erkorkmaz U, Ucar MK, Akin N, Nalbant A, Annakkaya AN. Use of a portable monitoring device (Somnocheck Micro) for the investigation and diagnosis of obstructive sleep apnoea in comparison with polysomnography. Pak J Med Sci 2016; 32(2):471-5. https://doi.org/10.12669/pjms.322.9561