ORIGINAL RESEARCH ARTICLE

Self-Reported Sleepiness, Fatigue and Risk of Obstructive Sleep Apnea Using the STOP BANG Components: Women's Perspective

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DOI: 10.55489/njcm.141120233284

ABSTRACT

Introduction: About 2-4% of adults have obstructive sleep apnoea (OSA), a frequent chronic condition. The disorder is characterised by recurrent bouts of whole or partial collapse of the upper airway, primarily the oropharyngeal tract, while sleeping, which results in a decrease or stoppage of airflow. The aim of the study is to assess the relationship between the self-reported sleepiness, fatigue and the risk of Obstructive Sleep Apnea among the midlife women aged 40 to 65 years

Methodology: This was a cross sectional study conducted in the field practice area of rural and urban health and training centre of a tertiary care teaching hospital, Chengalpattu district, Tamilnadu among 380 women aged 40 to 65 years.

Results: Mean age of the study population was 49.69 (± 11.2). On risk categorization by STOP-BANG Questionnaire, it was found that 72.9% (277), 26.1% (99) and 1.1% (4) had low, intermediate and high risk for sleep apnea. 16.9% of the study participants had excessive daytime sleepiness. Fatigue severity scale of more than or equal to 36 was seen among 34.5% of the study participants.

Conclusion: The STOP-Bang questionnaire has been shown in studies to be a quick, efficient, and accurate OSA screening tool. It can make it easier to allocate resources effectively for detecting and treating OSA that had not yet been recognised.

Keywords: Obstructive sleep apnea, hypoxia, screening, STOP BANG questionnaire

ARTICLE INFO

Financial Support: None declared

Conflict of Interest: None declared

Received: 01-08-2023, **Accepted**: 16-10-2023, **Published**: 01-11-2023

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How to cite this article: Jasmine M, Suganthi S, Manoj P, Ilanchoorian D, Vijayalakshmi. Self-Reported Sleepiness, Fatigue and Risk of Obstructive Sleep Apnea Using the STOP BANG Components: Women's Perspective. Natl J Community Med 2023;14(11):717-722. DOI: 10.55489/njcm.141120233284

www.njcmindia.com | pISSN09763325 | eISSN22296816 | Published by Medsci Publications

INTRODUCTION

Apnea is defined as "complete cessation of airflow for at least 10 seconds"[1]. Obstructive sleep apnea (OSA), a sleep-related breathing disorder is characterized by cessation of breathing during sleep leading to tissue hypoperfusion there occurs sleep arousal.[2] Its prevalence has been in steadily increasing over the decades. [3] OSA is associated with sympathetic overactivity, intermittent hypoxia, oxidative stress and increased cardiovascular morbidity and mortality.[4] It has been proven to be a risk factor for the development of CVDs like left ventricular hypertrophy, atrial fibrillation and heart failure.[5] Apart from somatic complications, OSA also has an impact on the mental health of the patients [6] According to Apnea/ Hypopnea index (AHI), the sleep apnea can be classified into mild, moderate and severe.[7] Studies have shown that the male to female ratio for the prevalence of OSA is 3:1. However the literature has shown that this disparity is not reflected in clinical populations leading to potential under-diagnosis in women.[3,8]

Obesity in the post-menopausal women have also been found to have an independent risk factor for the development of OSA. Women are under the impact of hormonal changes during menopause, which in turn causes higher risk of sleep disturbances. The progesterone has both anxiolytic and sedative effect. Estrogen is associated with norepinephrine, serotonin metabolism affecting the sleep pattern.[9] Apart from these hormonal changes, the menopausal women have known to have low levels of melatonin. Melatonin has a major role in maintaining the circadian rhythm. [10] In addition to all this, mood disorders and vasomotor symptoms due to menopause have also found to be associated with the sleep disorders.

Though the gold standard method for diagnosing Obstructive sleep Apnea is polysomnography, it is expensive. STOP BANG questionnaire and Epworth Sleepiness Scale are established as a simple, economical and rapid screening tool for Obstructive Sleep Apnea. The studies concentrating on the prevalence of OSA among women is lower in Tamil Nadu. With this background the present study was conducted to assess the risk for obstructive sleep apnea among the midlife women.

The study was conducted to assess the risk of developing Obstructive Sleep Apnea in midlife women aged 40 to 65 years, and also to assess the relationship between the self-reported sleepiness, fatigue and the risk of Obstructive Sleep Apnea among them.

METHODOLOGY

This cross-sectional study was conducted in the field practice area of the Rural and Urban Health and Training Centre affiliated with a tertiary care teaching hospital in Chengalpattu district, Tamil Nadu. The study focused on women aged 40 to 65 years and excluded those with previously diagnosed sleep disorders or those unwilling to provide consent. The sample size of 380 was determined based on a prevalence rate of 39% from a prior study, with an absolute error of 5%, using the formula 4pq/l^2.

Sampling method: Sampling was done by a multistage random sampling method. In the first stage of this study, village selection was a critical step in ensuring a representative sample from the service area of the Rural and Urban Health and Training Centre in Chengalpattu district. Out of the 12 villages within this area, a pragmatic approach was taken, selecting 4 villages to ensure probability proportional to size. As the total population of these 4 villages represents the 48% of the total population of 12 villages maintaining the generalisability of the results. In addition, this decision was influenced by resource constraints, time limitations, and budget considerations, all while striving to maintain a representative sample and mitigate logistical challenges.

Moving on to the second stage, household selection, a systematic process was adopted to ensure fairness and impartiality. From each of the 4 selected villages, households were chosen using computer-generated random numbers. This approach guaranteed the randomness of household selection, contributing to the overall sample's representativeness.

In the third and final stage, participant selection, a systematic random sampling method with probability proportional to size was employed to identify eligible women from the selected households. This method was based on inclusion criteria focused on women aged 18 to 65 years, a group susceptible to sleep-related issues and obstructive sleep apnea (OSA) risk. With each eligible woman assigned a unique sequential number using computer-generated random numbers, a sampling interval of 2.11 was calculated. The systematic sampling process ensured that the sample was drawn proportionally from each of the 4 selected villages, aligning with their respective population sizes and enhancing the study's representativeness and validity.

Study tool: The study instrument is a semi structured questionnaire in English with 4 sections

Section 1: This section of the study focuses on gathering sociodemographic information and anthropometric measurements of the participants. Sociodemographic details include data such as age, gender, ethnicity, education level, and marital status, which provide a comprehensive view of the study population. Anthropometric measurements encompass variables like height, weight, body mass index (BMI), and neck circumference, which are essential for understanding the physical characteristics of the participants. These details serve as a foundation for the subsequent analyses related to sleep disorders and fatigue.

Section 2: The STOP BANG questionnaire is a crucial

tool in this research, used for assessing the risk of Obstructive Sleep Apnea (OSA). Comprising eight components (Snoring, Tiredness, observed apnea, High blood pressure, BMI, Age over 50, and Neck circumference), this structured questionnaire assigns a score of 0 or 1 to each component based on specific risk factors' presence or absence. The total score ranges from 0 to 8, with higher scores indicating a higher risk of OSA. Participants can be categorized as having a low risk (0-2), intermediate risk (3-4), or high risk (5-8) of OSA, providing valuable insights into the prevalence and severity of this sleep disorder within the study population.

Section 3: The Epworth Sleepiness Scale (ESS) is employed to assess daytime sleepiness in the study participants. This scale consists of eight questions, each rated on a scale from 0 to 3, indicating the likelihood of dozing off in specific situations. The total ESS score can range from 0 to 24, with higher scores signifying greater daytime sleepiness. Participants can be classified into categories such as normal daytime sleepiness (0-5), mild excessive daytime sleepiness (6-10), moderate excessive daytime sleepiness (11-15), or severe excessive daytime sleepiness (16-24). This section provides valuable insights into the prevalence and severity of daytime sleepiness among the participants.

Section 4: The Fatigue Severity Scale (FSS) is utilized to evaluate fatigue among the study participants. Comprising nine Likert scale statements, individuals rate their agreement with each statement on a scale from 1 to 7. The total FSS score is calculated by averaging the scores across all statements, with a range from 1 to 7. A higher score (>=36) indicates a greater severity of fatigue. This section aims to assess the prevalence and intensity of fatigue within the study population, providing valuable data for understanding the impact of fatigue on participants' daily lives and overall well-being.

Data collection/Procedures involved: After obtaining written informed consent in regional language, the study participants were interviewed with the pretested semi-structured questionnaire and the data was collected.

Ethical considerations: After getting ethical approval from Institutional Human Ethics Committee (IHEC No-11/0440/23; dt: 05.01.2023), study was conducted. The purpose of the study was explained to the participants in their local language. The informed Consent from the participants was obtained before initiating the study. The confidentiality of the participants was maintained throughout all the phases of the study.

Data analysis: Data was analyzed using SPSS version 21. Results was presented as frequency and proportions, mean, and standard deviation (SD) or median and percentiles as appropriate. Mann Whitney U and Kruskal Wallis test was applied and the p value less than 0.05 is considered as significant.

RESULTS

Mean age of the study population was 49.69 (± 11.2). Out of 380 study participants about 188 (49.4%) were over 50 years of age.

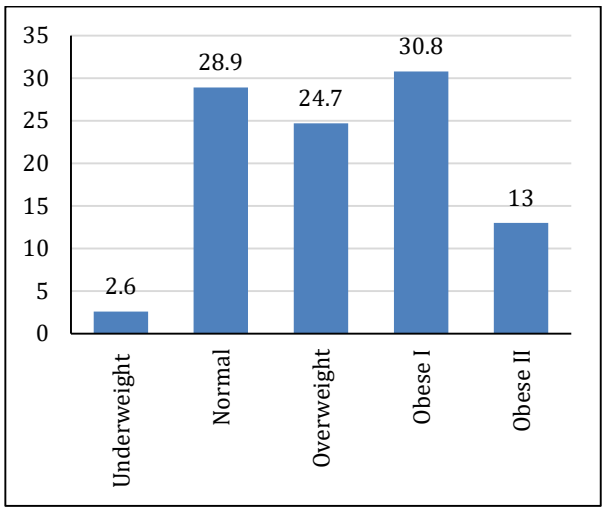

Figure 1: Distribution of BMI among the study participants

The overall mean score of STOP BANG questionnaire was 1.73 ± 1.25. About 55.3% (N=166) of the study participants reported tiredness, fatigue and felt sleepy in the day time. 47.3% (N=142) of them were over 50 years of age and 30.3% (N=91) reported snoring loudly out of which 7 (2.3%) of them experienced apneic episodes. Moreover 35.3% of the study participants were hypertensive. (Table 1) On risk categorization by STOP-BANG Questionnaire, it was found that 72.9% (277), 26.1% (99) and 1.1% (4) had low, intermediate and high risk for sleep apnea.

Table 1: Results of STOP- BANG Questionnaire, ESS score and Fatigue severity scale (n=380)

Complements of Scales	Participants (%)
STOP- BANG Questionnaire	
Loud snoring	91 (23.9)
Fatigue, tiredness in day time	166 (43.7)
Observation of pause in breathing during sleep	7 (1.8)
Treated for High Blood Pressure	106 (27.9)
BMI >35 kg/m^2	8 (2.1)
Age >50 years	142 (37.4)
Neck Circumference >16 inch	1 (0.3)
Male	0 (0.0)-
ESS score*	
Lower Normal Daytime Sleepiness	188 (49.5)
Higher Normal Daytime Sleepiness	128 (33.7)
Mild Excessive Daytime Sleepiness	61 (16.1)
Moderate Excessive Daytime Sleepiness	2 (0.5)
Severe Excessive Daytime Sleepiness	1 (0.3)
FSS score#	
<36	249 (65.5)
>=36	131 (34.5)

* Epworth Sleepiness Scale - Self-reported sleepiness assessment; #Fatigue severity scale score

Table 2: Association between STOP-BANG risk assessment with ESS and FSS

Variables	STOP-BANG risk assessment			P value
	Low risk (%)	Intermediate risk (%)	High risk (%)	
ESS score				
Lower Normal Daytime Sleepiness	121 (43.7)	67 (67.7)	0	<0.001
Higher Normal Daytime Sleepiness	111 (40.1)	17 (17.2)	0	
Mild Excessive Daytime Sleepiness	45 (16.2)	15 (15.2)	1 (25)	
Moderate Excessive Daytime Sleepiness	0	0	2 (50)	
Severe Excessive Daytime Sleepiness	0	0	1 (25)	
FSS score				
<36	201 (72.6)	48 (48.5)	0	<0.001
>=36	76 (27.4)	51 (51.5)	4 (100)	

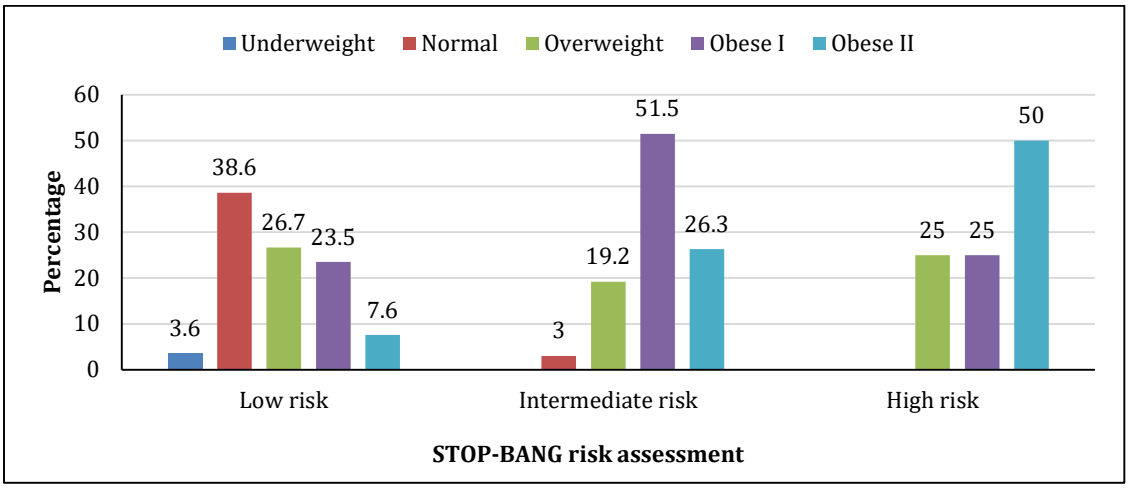

Figure 2: Association between BMI and STOP-BANG risk assessment

The total mean ESS score was 5.82 ± 3.96 and the total mean FSS score was 32.14 ± 4.38.

Correlation analysis showed that there is a significant positive correlation (r = 0.398; p = <0.001) between FSS and ESS. There is also significant positive correlation (r=0.226; p = <0.001) between FSS score and STOP BANG score. According to the analysis there was a very weak negative correlation (r= -0.02) between ESS score and STOP BANG score. However, this was not statistically significant.

Discussion

According to the current study, 43.8% of participants had a BMI of 25 kg/m2 or greater, which is similar to findings from a national survey by Venkatrao M et al., who estimated that 40.3% of Indians were obese. The greatest rate of obesity prevalence was seen in South India (46.5%), among women (41.9%) compared to males (38.7%), and among urban (44.2%) vs rural (36.1%) populations.[15] Data from the NFHS-4 and NFHS-5 show that the prevalence of obesity among women has grown from 20.6% to 24%.[16,17] Worldwide, 2.8 million people die from obesity and overweight each year.[18] More than 135 million Indians are fat. Sedentary lifestyle and high-energy diets are major contributing factors.[19]

Obstructive sleep apnea prevalence is steadily rising. There is a difference in the prevalence of OSA in men and women because women often have less severe illness and shorter apneas and hypopneas. Most of the time, people are unaware of the events that lead to despair and anxiety.[20] OSA was also found to coexist with other symptoms such fatigue, weight gain, poor psychosocial health, restlessness in addition to disrupted sleep, sadness, and anxiety.

Scientific data demonstrated that OSA suspects had minimal productivity.[21,22] Due to nocturnal oxygen desaturation, which is followed by pulmonary and systemic vasoconstriction, it is also an independent risk factor for cardiovascular illnesses, raising blood pressure. As a result, prevention of problems can be greatly increased by early identification and treatment.[23]

A systematic review and meta-analysis of 47 research from around the world showed that a validated measure called the STOP BANG questionnaire may reliably identify sleep apnea.[24] Due to the fact that OSA and NCD have a similar etiological cause, a significant proportion of NCD patients also had severe OSA. The STOP BANG questionnaire, which includes anthropometric results, was discovered to be a simple and trustworthy instrument that may be used for population screening.[25] 13.7% of the research participants over the age of 18 who were both male and female had moderate or severe OSA, ac-

cording to Pattanaik S et al.[26] The prevalence (26.1% with intermediate risk and 1.1% with high risk) is lower than the findings of the current investigation. This discrepancy can be caused by the variable inclusion of research participants.

Similar findings were obtained in research by Jyothi RK et al.[27] In contrast to a recent study by Prabhu G et al., which reported that just 2% of healthcare professionals in tertiary care centres had intermediate risk, our analysis identified intermediate risk in 26.3% of the general population, suggesting reduced OSA risk among healthcare professionals.[28] According to a different study, 42.9% of pregnant obese women were at high and moderate risk of developing sleep apnea, respectively.[29]

Daytime sleepiness could be an indication of OSA and be helpful for screening. According to the results of the current study, there is a strong correlation between self-reported drowsiness and OSA risk as measured by the STOP-BANG questionnaire. 17.2% and 15.2% of those with moderate OSA risk reported greater levels of normal daytime sleepiness and mild excessive daytime sleepiness, respectively. Similar to this, among individuals at increased risk for OSA, mild, moderate, and severe excessive daytime sleepiness were present in 25%, 50%, and 25% of cases, respectively. According to the results of the current study, there is a statistically significant correlation between OSA risk as measured by the STOP-BANG questionnaire and weariness as measured by the fatigue severity scale. 51.5% of those with intermediate OSA risk reported a prevalence of fatigue with an FSS score of greater than 36. All of the individuals at high risk for OSA reported experiencing weariness often. According to research by Jyothi RK et al,[30] the mean ESS score was 7.17. Sleep apnoea syndrome affected 21.5%. According to research by Martins EF et al[31], 39% of people have ESS greater than 10.

Although OSA and obesity each have an impact on quality of life and healthy living, we discovered a correlation between OSA risk and rising BMI.[32] Therefore, in addition to screening for diabetes, hypertension, or cardiovascular illnesses, straightforward interview-based screening tools can be used to identify sleep apnea.

Conclusion

Our findings revealed a substantial proportion of participants at risk for OSA, with 72.9% classified as low risk, 26.1% as intermediate risk, and 1.1% as high risk based on the STOP-BANG questionnaire. Additionally, a strong correlation was observed between self-reported daytime sleepiness and OSA risk, highlighting the potential utility of assessing daytime sleepiness for screening OSA in midlife women. Furthermore, fatigue severity was significantly associated with OSA risk, indicating the importance of considering fatigue assessment alongside OSA risk evaluation. These findings underscore the need for early OSA identification and tailored interventions for midlife women to enhance their overall health and well-being.

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