DOI: https://doi.org/10.53350/pjmhs2115102823

ORIGINAL ARTICLE

Diagnostic Accuracy of Stop-Bang Questionnaire in Diagnosing High Risk Patients of Obstructive Sleep Apnea Considering Polysomnography as a Gold Standard

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ABSTRACT

Objective: To determine the diagnostic accuracy of stop-bang questionnaire to diagnose high risk patients of obstructive sleep apnea taking polysomnography as gold standard.

Methodology: This cross-sectional descriptive study was conducted at Isra University Hospital Hyderabad and help taken from Sleep Disorder Laboratory, The Aga Khan Hospital, Karachi. Patients with age of 18 to 70 years, presenting with symptoms of OSA of either gender were included. History was taken from patients. STOP- BANG Questionnaire was filled out for each patient consenting to participate in the study. All information was noted and entered in the Proforma.

Results: Mean age of patients was 40.1 with standard deviation 17.6, mean AHI score was 20 with standard deviation 6 and stop bang score showed average 6.8 with standard deviation 2.7. Distribution of gender showed that most of the patients were male. Diagnostic accuracy calculated for stop bang questionnaire, sensitivity 77.2%, Specificity 65.5%, Positive Predictive Value 75.4%, Negative Predictive Value 67.8%, Diagnostic Accuracy 72.3% of stop bang questionnaire as follows.

Conclusion: This study confirms the STOP-Bang questionnaire's high performance in screening for Obstructive sleep apnea (OSA) in the surgical population and sleep clinic. The likelihood of OSA severity increases from moderate to severe with the increasing STOP-Bang score.

Keywords: Obstructive sleep apnea, stop-bang questionnaire, apnea-hypopnea index, polysomnogram.

INTRODUCTION

Obstructive sleep apnea (OSA) is a condition marked by upper airway flow obstructions, which can be partial or complete (American Academy of Sleep Medicine, 2005), resulting in frequent interruptions of breathing during sleep. During sleep, when the dorsal muscles of throat relax, the soft tissue collapses and blocks the upper airway, causing OSA. This causes partial and complete interruptions in breathing (hypopneas and apneas) that persist for minimum 10 seconds when sleeping. Hypercarbia and hypoxemia, fluctuations in intrathoracic pressure, peripheral vasoconstriction[3], and elevated sympathetic activity are all common symptoms associated with apneic episodes. OSA raises the likelihoods of hypertension[5] Coronary artery disorder[6], and stroke[7].

Obstructive sleep apnea (OSA) is a prevalent disease that affects 2-26 percent of the general population[8]. Though, 80% of males and 93% of females are believed to go undiagnosed[9]. The benchmark diagnostic test polysomnography is among the most significant obstacles in OSA diagnosis, as it is expensive and takes too much time, and also sleep laboratories have long wait periods along with shortage of sleep specialists.

The STOP-BANG is more uncomplicated and shorter instrument than previous screening questionnaires like the widely recognized "Berlin Questionnaire" or "Sleep Disorders Questionnaire". It has already been validated in assessing surgical patients before surgery, with 92.9% sensitivity in a validation cohort. It comprises a 4-item subjective questionnaire

(STOP) and a 4-item part supported with measures and demographics (BANG),[10-11] however previous studies show a specificity of 47%.[13] In our country OSA remains under diagnosed disease and most of the patients present with complications particularly cardiovascular. Also as stated above the diagnosis of OSA is done with the help of polysomnography but since there is a paucity of sleep laboratories in our country, it also contributes to OSA being undiagnosed, hence a screening tool is required which is easily available, less time consuming, and cost effective. The present study aimed at assessing the specificity, sensitivity, positive predictive values and negative predictive values of the STOP-BANG in the sleep laboratory setting, where screening for severe OSA can possibly help in prioritizing laboratory studies.

METHODOLOGY

This cross-sectional descriptive study was conducted at Isra University Hospital Hyderabad and sleep Disorder Laboratory, The Aga Khan Hospital, Karachi during six months from March 2019 to Sep 2019. Cases of age between 18 to 70 years, presenting with symptoms of OSA and either of gender were included. All the cases those were previously diagnosed by polysomnography or treated for OSA, incomplete or absent questionnaire and if patient breathing supplemental oxygen while tested were excluded. After obtaining informed consent, consecutive patients were referred for diagnostic

polysomnography at Sleep Disorder Laboratory of The Aga Khan Hospital Karachi, who fulfilled the inclusion criteria. STOP-BANG Questionnaire was filled out for each patient. Patient demographics including height, weight, age, gender, BMI, neck circumference and medical record number were recorded using Performa. SPSS version 20 was used for the data analysis.

RESULTS

Mean age of patients was 40.1±17.6 years, mean BMI was 27.8±6.9, while neck circumferences average was 39±6, mean AHI score was 20±6 and at last stop bang score showed average was 6.8±2.7. Out of all 71.4% were males and 28.6% were females. Table 1

Table 1: Descriptive statistics of demographic characteristics of the patients (n=213)

Variables	Statistics		
	Mean+SD	Minimum	Maximum
Age (years)	40.1+17.6	18	70
BMI	27.8+6.9	21.4	30.5
Neck circumferences	39±6	26	42
AHI	20+6	3	27
Stop bang score	6.8+2.7	2	8
Gender	Males	152(71.4%)	
	Females	61(28.6%)	

Table 2: Comparison of stop bang and PSG in diagnosis of OSA (n=213)

Stop bang	PSG		Total	P-value
	YES	NO		
YES	95	31	126	0.0001
NO	28	59	87	
TOTAL	123	90	213	

Sensitivity: 77.2%, Specificity: 65.5%, PPV: 75.4%
NPV: 67.8%, Diagnostic Accuracy: 72.3%

Table.3. Stratification of stop bang and PSG in diagnosis of OSA with respect to gender, age and BMI (n=213)

Variables				PSG		p-value
				Yes n=64	No n=38	
Gender	Female	Stop Bang	Yes	24	11	0.002
			No	8	18	
	Male	Stop Bang	Yes	71	20	0.004
			No	20	41	
		Total		91	61	
Age groups	<40 years	Stop Bang	Yes	50	11	0.001
			No	19	29	
	≥40 years	Stop Bang	Yes	39	20	0.008
			No	15	30	
BMI	<27 BMI	Stop Bang	Yes	40	17	0.0003
			No	19	35	
	≥27 BMI	Stop Bang	Yes	44	11	0.0002
			No	20	27	

of stop bang questionnaire was done with PSG taking as gold standard which was showed significant results with p-value=0.0001, diagnostic accuracy calculated for stop bang questionnaire, sensitivity 77.2% Specificity 65.5%, Positive Predictive Value 75.4%, Negative Predictive Value 67.8%, Diagnostic Accuracy 72.3% of stop bang questionnaire as follows. Table 2

Stratification has been done with regards to gender, age groups and BMI all results were showing significance withp-vales <0.05. Table.3

DISCUSSION

The study's findings revealed that when the STOP-Bang score increased, the specificity, OR, and predicted probability for having OSA, severe/moderate OSA, and severe OSA increased as well. Moreover, gradual reduction in sensitivity was also found. For score 5 of STOP-Bang, the odds ratio (OR) for severe/moderate OSA was 4.8 and OR for severe OSA was 10.4. For 7and 8 scores of STOP-Bang, the odds ratio for severe/moderate OSA was 6.9 and OR for severe Obstructive sleep apnea (OSA) was 14.9. The STOP- Bang survey was first offered as a scoring model for patient before surgery.[11] The findings of this study confirmed the STOP-Bang survey's effectiveness as a screening procedure for surgical patients. The relationship between the likelihood of OSA and STOP- Bang scores would be a valuable tool for perioperative medical team to stratify surgical patients for undiagnosed OSA and prioritize patients for diagnostic and treatment procedures.

Around 80% of males and 93% of females with moderate to severe OSA go undiagnosed,[17] causing various challenges for anesthesiologists. Patients with OSA are considered to have greater risk of challenging intubation, surgical complications, admissions to intensive treatment unit, and longer hospitalization period.[7,18-21] According to Memtsoudis et al, [9] OSA was linked to a significantly greater frequency of pulmonary problems. However in obese individuals receiving bariatric surgery, there was no correlation between OSA severity and postoperative complication.[22] This could be because the majority of OSA subjects (93%) had received preoperative PAP ventilation, and every patient was closely followed postoperatively using pulse oximetry on conventional nursing levels or in intermediate or intensive care units.[22] To minimize postoperative complications, lately a publication from Canada [23] and the American Society of Anesthesiologists (ASA) recommendations [24] both emphasized the need of diagnosis and management in OSA patients preoperatively.

According to Farney's research, the STOP-Bang survey can be employed to evaluate the chances of having no OSA, mild OSA, moderate OSA, or severe OSA. The STOP-Bang approach indicates that the likelihood of OSA severity increases with increasing cumulative scores of risk factors.[25] Any score more than 4 raises the chances of developing severe OSA. With an 8 score, the chances of severe OSA were 81.9%.[25] Although our findings revealed a comparable relationship between STOP-Bang scores and the likelihood of developing severe OSA, we did not find a significant increase in the risk of developing severe OSA with a greater STOP-Bangscores. This could be because of diversity in our study population. Our study subjects were preoperative cases. While, Farney's patients were those who were referred towards a sleep clinic because they had a high incidence of severe OSA.

The STOP survey was designed and validated in this study for surgical patients as a screening tool for OSA. The STOP survey is a four-question yes/no self-administered screening questionnaire. At AHI cutoffs of above 5, above15, and above 30, the STOP survey had reasonably good PPV and sensitivity. The PPV was significantly higher among patients who had certain clinical features, like age above 50 years, male gender, neck circumference above 40 cm, and BMI above 35 kg/m2. The NPV and sensitivity of STOP- Bang scoring grew significantly when age, BMI, gender and neck circumference were included. For moderate OSA cases and severe OSA cases, NPV and sensitivity were above 90%.

The limitations of this research study include high polysomnography refusal rate and also patients with sleep symptoms can possibly have given their assent to overnight polysomnography on the basis of self-selection. The high dropout and refusal rates (49% of study subjects did not come for their planned polysomnographic screening) is also a challenging situation that was encounter by this study. This could be attributed to concern about the procedure and the requirement to spend a night within sleep laboratory. Other factors as well influenced the patient's dropout and refusal, such as the fact that younger patients and smokers were less likely to return for their polysomnography overnight. This self-selection may be reflected in the increased incidence of OSA among the patient's undergoing polysomnography. This tool has exclusively been evaluated in surgical patients (noncancer) at this time. It should also be tested in other scenarios.

CONCLUSION

The STOP inquiry was found to be a simple and effective screening tool for patients at high risk of Obstructive sleep apnea (OSA). It has been proven to be effective screening instrument among surgical patients attending preoperative clinics. The STOP-Bang rating system, which combines gender, age, BMI and neck size with the STOP survey, has shown high NPV and sensitivity, particularly in individuals with moderate - to - severe OSA.

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