Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(4), 1085-1088 | ISSN:2251-6727

An Observational Study on the Assessment of Obstructive Sleep Apnea in Patients Undergoing Surgeries Using the Stopbang Questionnaire

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(**Received**: 14 April 2024 **Revised**: 01 May 2024 **Accepted**: 18 June 2024)

KEYWORDS
OSA, Obstructive sleep apnea, BMI, STOP BANG Questionnaire

ABSTRACT:

Introduction: Obstructive sleep apnea (OSA) is a sleep disorder characterized by repetitive episodes of partial or complete obstruction of the upper airway during sleep, leading to apnea or hypopnea. The prevalence of obstructive sleep apnea is higher among obese population. This study shows the risk prediction of Obstructive Sleep Apnea in patients who are undergoing surgeries under general and spinal anesthesia by utilising the STOP BANG questionnaire.

Objectives: The aim of the study was to assess the risk of obstructive sleep apnea in patients undergoing elective surgeries using the STOP BANG questionnaire. The objective of this study was to evaluate the utility of the STOP-BANG questionnaire.

Methods: This observational study was performed among 60 patients who were about to undergo elective surgeries. The STOP BANG questionnaire was given to patients with BMI >/=30 kg/m^2 and was asked to answer the questions.Then the result were evaluated by the number of "yes" or "no" answers. After gathering the information, patients are ranked based on total score. We categorised the patients as having high, intermediate or low risk based on the total score from the STOPBANG questionnaire.

Results: For each questionnaire, chi-square test was done and the "p values" of snoring, tiredness, observed apnea, high blood pressure, BMI >35, age>50, neck circumference >17 inches in male and >16 inches in female and male gender were determined. A STOPBANG questionnaire score of 6-8 indicates high risk, a score of 4-5 indicates intermediate risk, and a score of 0-3 indicates low risk. Out of the overall findings, 27 patients were of male gender and 33 patients were of female gender. 20 out of 27 male patients had high risk (score >5) for OSA and 17 out 33 female patients had high risk (score >5) for OSA. The calculated P value was 0.09, which was significant. Out of this 37 patients in high risk category, 17 patients were female, thus giving us a significant "p value" of 0.09 under gender category.

Conclusions: Male gender is one among the various predictors of OSA in the STOP BANG questionnaire, indicating it as one of the risk factor for OSA. But, from our study, we found that females have higher STOP BANG score, depicting the insignificance of male gender as one of the risk predictor. Inspite of the above finding, still the STOPBANG questionnaire can be used as a tool to predict OSA.

1. Introduction

Obstructive sleep apnea (OSA) is a sleep disorder characterized by repetitive episodes of partial or complete obstruction of the upper airway during sleep, leading to cessation (apnea) or significant reduction (hypopnea) in airflow. It is more common in individuals who are overweight or obese [1].

During sleep, tongue, soft palate, uvula, tonsils, and muscles of the throat and neck can relax and collapse to varying degrees and partially or completely block the upper airway, leading to hypopnea or apnea. This causes hypoxemia and hypercapnia, leading to brief arousals from sleep. Episodes of apnea and hypopnea trigger the body's stress response, leading to an increase in sympathetic nervous system activity. This can result in elevated blood pressure and increased cardiovascular stress over time. OSA presents unique challenges during general anesthesia due to its impact on respiratory function and airway management. Patients with OSA are at higher risk of difficult mask ventilation and intubation. Anesthetic agents, especially those causing muscle relaxation or sedation, can exacerbate upper airway collapse in OSA patients. Respiratory depression can occur under anesthesia, particularly after opioids or

Journal of Chemical Health Risks

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JCHR (2024) 14(4), 1085-1088 | ISSN:2251-6727

sedatives are given. In patients with OSA, this may worsen hypoxemia and hypercapnia due to pre-existing compromised respiratory function. Patients with OSA are at higher risk of respiratory complications post-surgery, including airway obstruction, hypoxemia, and respiratory failure. Continuous pulse oximetry, capnography, and vigilant observation for signs of airway obstruction or hypoventilation are recommended. Anesthesiologists should conduct a comprehensive preoperative assessment to identify OSA risk factors. This includes evaluating patient history (e.g., snoring, witnessed apneas, daytime sleepiness), physical examination (e.g., Mallampati score), and considering additional tests like polysomnography if needed.

The STOP-BANG questionnaire [2] is a widely used tool to screen for obstructive sleep apnea (OSA) risk. A score of 1 is given for each of the following criteria- if the patient snores loudly, if the patient often feels tired, fatigued, or sleepy during waking hours, if someone observes the patient stop breathing during sleep, if the patient has been diagnosed with high blood pressure, if the patient's BMI is >/= 35 kg/m² [3,4], if the patient is older than 50 years, if the patient's neck circumference is greater than 17 inches in males or >16 inches in females. The total score ranges from 0 to 8. A score of 0-3 is considered to have low risk, 4-5 is considered to have intermediate risk and 6-8 is considered as high risk for OSA.

2. Objectives

The aim of the study was to assess the risk of obstructive sleep apnea in patients undergoing elective surgeries using the STOP BANG questionnaire. The objective of this study is to evaluate the utility of the STOP BANG (snoring, tiredness, observed apnea, blood pressure, body mass index, age, neck size, gender) questionnaire.

3. Methods

After getting approval from the Institutional Human Ethical Committee, we included 60 patients who fulfilled the inclusion criteria, which included age group >18 years, patients undergoing surgery under general or spinal anaesthesia and patient with BMI >/=30 kg/m^2 (Figure 1). Patients who were excluded from this study were patients who denied consent, patients with BMI < 30 kg/m^2, patients who are unable to answer the questions like pediatrics, neonates, infants and mentally challenged patients. After getting informed and written consent, these patients were screened for OSA by using the STOP-BANG questionnaire (Table 1).

Table 1: STOP BANG Questionnaire

QUESTION	YES/NO*
Do you Snore Loudly?	
Do you often feel Tired, Fatigued, or Sleepy during the daytime?	
Has anyone Observed you Stop Breathing or Choking/Gasping during your sleep ?	
Do you have or are being treated for High Blood Pressure ?	
Body Mass Index more than 35 kg/m^2?	
Age older than 50 ?	
Is your shirt collar 16 inches / 40cm or larger?	
Gender = Male ?	

*If yes- score 1 was given and if no- score 0 was given

The questionnaire was designed to be answered as 'yes' or 'no' response. The questions which were answered "yes" were given a score of 1. Total possible score is 8. Patients were considered to be at high risk for OSA for the purposes of this study if their overall STOP-BANG score was more than 5 out of a maximum possible score of 8 points. Risk was measured using the same scale, and the data was collected and noted in the standard format.

$$BMI = \text{weight (kg)} / \text{height (m}^2\text{)}$$

Figure 1: Formula for calculating BMI

4. Results

The study was analyzed by descriptive statistical analysis and chi square test. After gathering the information, patients were ranked based on total score. We categorised the patients as having high, intermediate or low risk based on the total score from them questionnaire. After data collection, statistical analysis was done. For each question, chi-square test was done and the "p values" of snoring, tiredness, observed apnea, high blood pressure, BMI >35, age>50 years, neck circumference >17 inches in male and >16 inches in female and male gender were all determined. A STOPBANG questionnaire score of 6-8 indicates high risk, a score of 4-5 indicates intermediate risk, and a score of 0-3 indicates low risk (Figure 2).

According to this study, 31 patients were categorized to have high risk, 10 patients were categorized to have intermediate risk and 19 patients were categorized to have low risk of OSA. Out of 60 patients, 34 patients said yes to snoring and 26 patients said no to snoring. 18 out of 34 patients with snoring had high risk (score > 5) for OSA, 1 out of 26 patients without snoring had high risk (score >5)

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for OSA. Hence the P value for snoring was 0.00. 51 patients had tiredness and 9 patients didn't experience tiredness. 19 out of 51 patients with tiredness had high risk (score>5) for OSA, 0 out of 9 patients without tiredness had high risk (score>5) for OSA and the P value for tiredness was 0.00. 33 patients had observed sleep apnea and 27 patients did not have observed sleep apnea.17 out of 33 patients with apnea had high risk (score>5), 2 out of 27 patients without apnea had high risk (score>5) for OSA and so the P value was found to be 0.00. 32 patients had high blood pressure and 28 patients had no high blood pressure, 18 out of 32 patients with high pressure had high risk (score>5) for OSA,1 out of 28 patients without high pressure had high risk (score>5) for OSA and the P value was found to be 0.00. 38 patients were of BMI >35 and 22 patients were of BMI <35, 17 out of 38 patients with BMI >35 had high risk (score >5) for OSA, 2 out of 22 patients with BMI <35 had high risk (score >5) for OSA and the P value was found to be 0.00. 34 patients were of age group >50 and 26 patients were of age group <50, 17 out of 34 patients with age >50 years had high risk (score >5) for OSA, 2 out 26 patients with age group of >50 had high risk(score >5) for OSA and the P value was found to be 0.00. 26 patients were measured higher neck circumference and 34 patients were measured lower neck circumference. 11 out of 26 patients with higher neck circumference had high risk(score >5) for OSA. 26 out of 34 patients with lower neck circumference had high risk(score >5) for OSA and so the P value we found was 0.00.

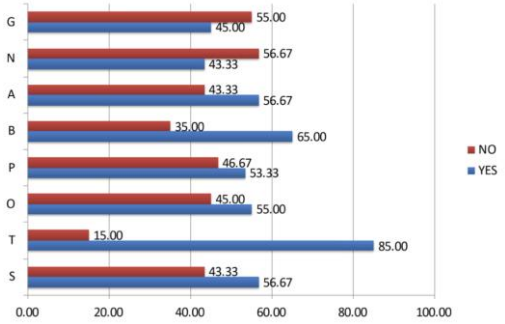

Figure 2: Percentage of patients who have answered yes or no to the STOP BANG Questionnaire

27 patients were of male gender and 33 patients were of female gender. 20 out of 27 male patients had high risk (score >5) for OSA and 17 out 33 female patients had high risk (score >5) for OSA. The calculated P value was 0.09, which was significant. Out of 37 patients in high risk category, 17 patients were female, thus giving us a significant “p value” of 0.09 under gender category.

5. Discussion

We assessed 60 patients using the STOPBANG questionnaire to determine whether they possibly have obstructive sleep apnea. We found that any patient who checked “yes” to any of the questions in the STOP BANG questionnaire like snoring, day time tiredness, observed apnea, high blood pressure or getting treated for the same, BMI >35, age >50, and neck circumference >17 inches in male and >16 inches in female and male gender, were concluded to have higher possibility of OSA. We discovered that those individuals who checked the box for snoring were more likely to have OSA, yet we were unable to provide a precise diagnosis. This study demonstrated that variables like snoring, triedness, observed apnea, high blood pressure, BMI>35, age>50, and neck circumference >17 inches in male and >16 inches in female are all statistically significant except gender, which demonstrates a P value of 0.09.

Seet et al. conducted a retrospective cohort study aimed to establish the use of the STOP-BANG questionnaire for perioperative patient risk stratification. Out of 5,432 patients analysed, 7.4% had unexpected intraoperative and early postoperative adverse events. He found that the risk of unexpected intraoperative and early postoperative adverse events was greater in patients with STOP-BANG scores ≥ 3 compared to those with a STOP-BANG score of 0. Patients with STOP-BANG scores ≥ 5 had a fivefold increased risk of unexpected intraoperative and early postoperative adverse events, while patients with STOP-BANG scores ≥ 3 had a ‘one in four’ chance of having an adverse event and concluded that STOP-BANG score may be used as a preoperative risk stratification tool to predict the risk of intraoperative and early postoperative adverse events [5]. In our study, 31 out of 60 patients depicted high risk for OSA. Seet et al. conducted another study to examine the association between OSA and difficult intubation or difficult mask ventilation. They also explored the utility of the Snoring, Tiredness, Observed apnea, high blood Pressure, Body mass index, Age, Neck circumference, and Gender (STOP-BANG) score for difficult airway prediction. 869 patients without prior diagnosis of OSA were screened for OSA risk with the STOP-BANG tool. Moderate and severe OSA were associated with difficult intubation, and increasing neck circumference was associated with difficult mask ventilation. Thus, the author concluded that a higher STOP-BANG score of 3 or more may be associated with difficult intubation [6]. Chung et al. assessed sensitivity and specificity of the instrument among patients referred to a sleep disorders laboratory, and also its performance characteristics when BANG

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JCHR (2024) 14(4), 1085-1088 | ISSN:2251-6727

physical measures are patient-reported rather than measured. Adults referred for diagnostic polysomnography completed the STOP questions and answered four yes/no questions (BANG self-reported) about their body mass index (weight and height), age, neck circumference, and gender, which were also assessed by laboratory technologists (BANG-measured). The STOP-BANG measured and STOP-BANG self-reported scores showed essentially equivalent test characteristics against polysomnography. A STOP-BANG in which all information is self-reported was found to be as effective as the original version, and has potential to facilitate research or community screening where good negative predictive value is required for an effective screening tool [7].

But, our study signifies that it is challenging to accurately diagnose OSA with male gender as a risk predictor for OSA, though conventional wisdom holds that male population is more susceptible to OSA. But still STOPBANG questionnaire is a great tool for predicting OSA and can still be used as a measurement tool to predict OSA [8].

6. Conclusion

Male gender is one among the various predictors of OSA in the STOP BANG questionnaire, indicating it as one of the risk factor for OSA. But, from our study, we found that females have higher STOP BANG score, depicting the insignificance of male gender as one of the risk predictor. Inspite of the above finding, still the STOPBANG questionnaire can be used as a tool to predict OSA.

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