Research Article

Obstructive Sleep Apnea in General Surgery Patients: Is Screening Required Preoperatively?

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Abstract: Aim: To screen cases who are at high risk and low risk for obstructive sleep apnea in general surgery patients.

Materials & Methods: It is a cross-sectional study. It was done in Liaquat National Hospital from January 2019 to June 2019. After institutional approval, 335 patients were included in this study, who presented to general surgery OPD. STOP-BANG questionnaire was used to screen cases who are at high risk and low risk for obstructive sleep apnea in general surgery patients.

Results: 335 patients were screened and 38.5% of individuals in population had age of more than 50 years. In this population 149(44.5%) of patients were male. Out of 335 patients, 135(40.3%) of them were found to have high risk of obstructive sleep apnea while the remaining 199(59.7%) were classified in low risk group. All of the parameters of STOP-bang questionnaire including age ($p<0.001$), gender ($p=0.026$), BMI ($p<0.001$), snoring ($p<0.001$), tiredness ($p<0.001$), sleep apnea ($p=0.001$), diastolic blood pressure ($p<0.001$) and neck circumference ($p<0.001$) were significantly different between high risk and low risk patients.

Conclusion: This study can provide a catalyst for more meticulous screening for OSA preoperatively to diagnose high risk group.

Keywords: Sleep Apnea, Obstructive, Care, Preoperative, Surgery, General, Operative Procedures.

INTRODUCTION

Sleep apnea is common condition. In general population, it has an incidence of 2-26% [1] and involving 14% of men and 5% of women [2]. The prevalence in bariatric surgical population is found to be as high as 70% [3] but in other surgeries it varies but one study found it to be 55% [4]. There is a significant study done in Pakistan which showed 14.2% had mild severity while 50.7% had severe OSA and they only performed polysomnography test of everyone who presented to their sleep lab [5] but we screened them with STOP-BANG Questionnaire and only in elective surgical population to group them into high risk and low risk.

Periodic reduction or cessation of breathing during sleep are characteristic features of sleep apnea. Obstructive sleep apnea (OSA) and central sleep apnea (CSA) are the main types of sleep apnea with third type being called mixed sleep apnea which is a combination of both central and obstructive types.

Sleep apnea symptoms include, sleepiness and tiredness during daytime, memory problems, headaches, poor focus and concentration, anxiety, difficulty in performing work duties and irritability. Obstructive sleep apnea can also be associated with comorbidities like hypertension, cardiovascular disease and gastroesophageal reflux [6]. OSA in surgical population causes adverse outcomes as complications which include cardiac complications (acute myocardial infarction and cardiac arrest), septicemia, septic shock, stroke, respiratory failure, and need for reintubation or mechanical ventilation, and pulmonary embolism, deep venous thrombosis, pneumonia and postoperative anemia [7] and dreadful complications like ischemic heart disease, heart failure, pulmonary hypertension and irregular heart rate have shown associations with sleep apnea [8-12].

Sleep apnea prevention includes preventive measures against medical conditions which predispose to sleep apnea. Again, proper sleep hygiene, exercise, weight loss, avoidance of drug use and smoking cessation are the key steps which can help in prevention of sleep apnea. Populations of high risk of obstructive sleep apnea remain undiagnosed because of reluctance of people to get screened and among healthcare professionals, lack of information or no access to diagnostic tools are the reasons for low rates [13, 14].

Our aim is to determine the high risk of OSA in preoperative patients in tertiary hospital in Pakistan. The study rationale is early identification of high risk of OSA in previously undiagnosed patients using questionnaire can lead to appropriate management.

MATERIALS AND METHODS

This cross-sectional study was done in outpatient clinic of general surgery in Liaquat National Hospital after acquiring approval from Institutional Review Board. The study was conducted in duration of 6 months from January 2019 to June 2019. Patients included in this study are all those patients admitted in general surgery department undergoing preopera-

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tive evaluation and does not fit in exclusion criteria. Our exclusion criteria is all those patients with secondary causes of obstructive sleep apnea are excluded from this study, for example, a deviated nasal septum, nasal congestion, enlarged tonsils, disrupted airway passages caused by facial trauma, some sedative medications, cerebrovascular diseases (such as stroke, leading to airway muscles weakness), and smoking. Inclusion criteria is all preoperative patients not coming under exclusion criteria. Sample size was taken using the consecutive sampling technique.

All the new patients admitted consecutively and they themselves completed the STOP questionnaire and BANG was calculated by trained assessors. Patient's demographics were identified after reviewing electronic medical records. Neck circumference was measured using measuring tape in centimeters. BMI was taken more than 35kg/m^2 which is class 2 obesity according to WHO classification [15].

Data was analyzed using statistical package SPSS version 25. Frequencies and percentages were computed for categorical variables whereas mean ±standard deviation was computed to summarize quantitative variables. Chi-square test was applied to compare patients' characteristics among high and low risk group of OSA. A P-value <0.05 considered statistically significant meaning that there is a significant evidence proving association between groups.

STOP-BANG questionnaire [16] was used to screen and classify high risk and low risk individuals. The questionnaire has total of 8 questions and if the individual score ≥3 then its high risk and if scored ≤2 then it is low risk in Fig. (**1**).

STOP-Bang Questionnaire
1. Snoring: Does one snore loud enough to be heard in adjacent room?.....Yes/No
2. Tired: Does one often feel daytime sleepiness, fatigued or tiredness? .....Yes/ No
3. Observed apneas: Has someone seen you having difficulty in breathing during sleep?.....Yes/No
4. Blood pressure: Does one have high blood pressure or taking medications for it? .....Yes/No
5. Body mass index (BMI) : >35 kg/m?.....Yes / No
6. Age: 50 years old or older? Yes / No
7. Neck circumference: more than 40 cm?.....Yes/ No
8. Gender: is your sex male? .....Yes/ No
If your answers are Yes to = or >3 questions then there is High risk of obstructive sleep apnea If your answers are Yes to <3 questions then there is Low risk of obstructive sleep apnea

Fig. (1). STOP-Bang Questionnaire to Stratify Low and High Risk Group.

RESULTS

The detailed descriptive statistics of patients is presented in Table **1**. 335 patients were presented in general surgery OPD and were added on preoperative list. In this population 44.5% of patients were male while frequency of females was higher than males. 38.5% of patients were elderly having age of more than 50 years. Most of the patients had BMI<35 Kg/m². There were 26.6% cases of loud snoring, 46.9% had day time tiredness and 10.4% had difficulty in breathing during sleep. Some of them had high diastolic BP while 71% had low diastolic BP. The neck circumference ≥40 cm was found in 19.7% cases in Table **1**.

Table. 1. Descriptive Statistics of Population under Study.

STOP-BANG	**Frequency (%)**
Age	
<50 years	206(61.5)
≥50 years	129(38.5)
Gender	
Male	149(44.5)
Female	186(55.5)
Body Mass Index(BMI)	
<35 Kg/m²	308(91.9)
≥35 Kg/m²	27(8.1)
Snoring	
Yes	89(26.6)
No	246(73.4)
Tired	
Yes	157(46.9)
No	178(53.1)
Sleep Apnea	
Yes	35(10.4)
No	300(89.6)
Diastolic Bp	
<90mmHg	238(71)
≥90mmHg	97(29)
Neck Circumference	
<40 cm	269(80.3)
≥40 cm	66(19.7)
Risk	
High	135(40.3)
Low	199(59.4)

Out of these 40.3% of patients were found to have high risk of obstructive sleep apnea while the remaining 59.7% were classified in low risk group.

Summary of total procedures performed in both low and high risk groups is presented in Fig. (**2**). Among all patients, hepatobiliary surgery (28.7%) is the commonest performed procedure followed by colorectal surgery (25.1%), hernia repair (11.9%), breast and endocrine surgery (10.4%), miscellaneous (6%), amputation (5.7%), abscess I & D (4.2%), vascular surgery (3.6%), perinatal surgery (3.6%), upper GI surgery (0.9%).

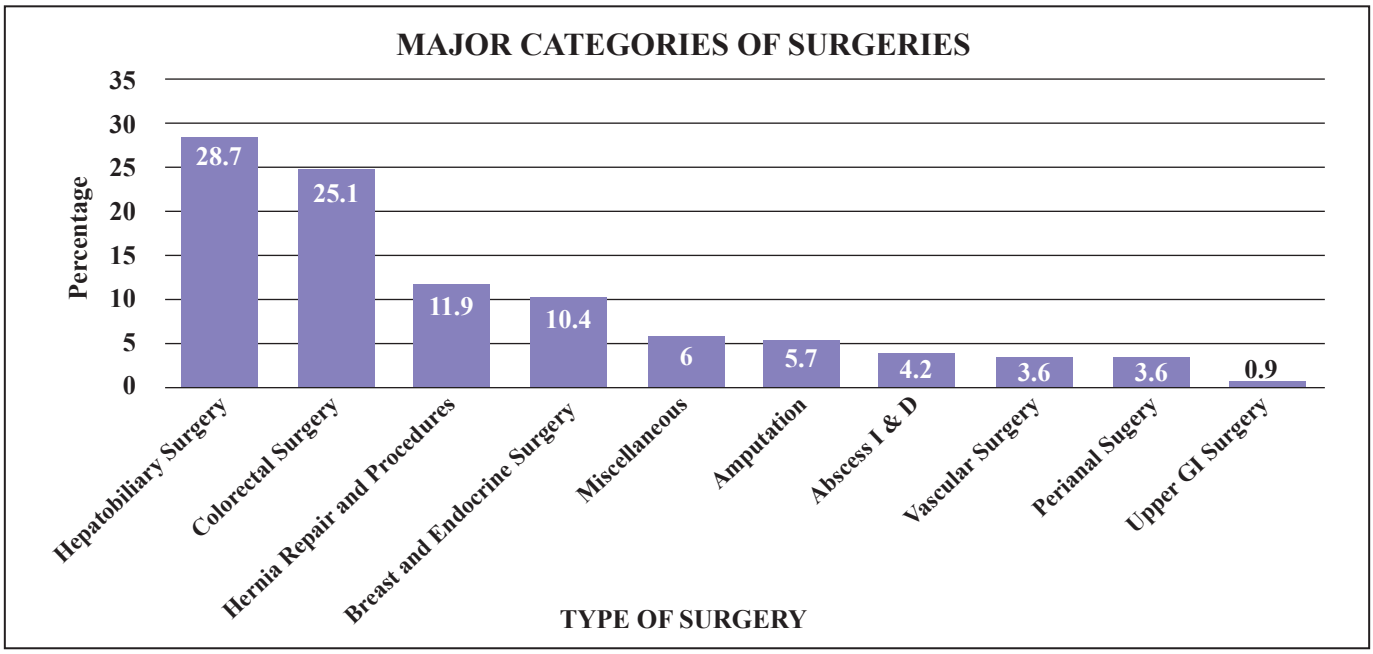

Fig. (2). Showing Percentage of Planned Procedures Done during the Course of Study which are Categorized into Major Surgeries.

All of the parameters of STOP-bang questionnaire including age (p<0.001), gender (p=0.026), BMI (p<0.001), snoring (p<0.001), tiredness (p<0.001), sleep apnea (p=0.001), diastolic blood pressure (p<0.001) and neck circumference (p<0.001) were significantly different between high risk and low risk patients with significantly higher frequency of high risk patients belonging to age group ≥50 years (66.7%), males gender (51.9%), BMI of ≥35kg/m2 (19.3%), snoring group (51.1%), having tiredness (65.2%), had sleep apnea (17%), diastolic BP of ≥90mmHg (56.3%), neck circumference of ≥ 40cm (40%) than patients who belonged to low risk group in Table **2**.

Table. 2. Association of Factors with the Risk of Severe Obstructive Sleep Apnea.

STOP-BANG	Risk		P-value
	High n (Percent)	Low n (Percent)	
Age			
<50 years	45(33.3)	161(80.5)	<0.001*
≥50 years	90(66.7)	39(19.5)	
Gender			
Male	70(51.9)	79(39.5)	0.026*
Female	65(48.1)	121(60.5)	
Body Mass Index(BMI)			
<35 Kg/m²	109(80.7)	199(99.5)	<0.001*
≥35 Kg/m²	26(19.3)	1(0.5)	
Snoring			
Yes	69(51.1)	20(10)	<0.001*
No	66(48.9)	180(90)	
Tired			
Yes	88(65.2)	69(34.5)	<0.001*
No	47(34.8)	131(65.5)	
Sleep Apnea			
Yes	23(17)	12(6)	0.001*
No	112(83)	188(94)	
Diastolic Blood Pressure			
<90mmHg	59(43.7)	179(89.5)	<0.001*
≥90mmHg	76(56.3)	21(10.5)	
Neck Circumference			
<40 cm	81(60)	188(94)	<0.001*
≥40 cm	54(40)	12(6)	

* Significant at P-value <0.05

DISCUSSION

We found in our study that sleep apnea prevalence rate is higher in preoperative patients. It has negative predicted value of 93% to 100% [16] and it is developed by Chung, *et al*. [17]. Our results showed 40.3% of the Pakistan populations were of high risk which is consistent but lower than results by Kulkarni GV, *et al*. [16] which showed 64.6%. In Kulkarni study, there was strong association with Male gender but no significant association found between age, weight, BMI and any other component of STOP-BANG questions but we found significant association between age, BMI, gender and all other components of STOP-BANG questions. Vasu, *et al*. [18] showed in his cohort study of elective surgical patients which had prevalence rate of 41% exactly same as our results of Pakistan population. There are some other studies which have taken 30kg/m^2 as a YES index for STOP-BANG questionnaire while we took 35kg/m^2, which could be the reason for variable results in different studies. BMI higher than 30kg/m^2 shown higher sensitivity but lower specificity [16]. The factor of obesity is very important as one study evaluated the patients in bariatric surgery clinic which showed the prevalence rate of OSA in obese people is upto 70% [19].

The STOP-BANG questionnaire is easy to calculate and it take into account risk factors like obesity, age, circumference of neck, and male/female gender in addition to symptoms such as snoring and tiredness. This STOP-Bang questionnaire has sensitivity of 100% for patients with severe OSA and 96.2% sensitivity for moderate OSA [16]. Another factor worth noting is no one in our study underwent polysomnography test which is a limitation in our study. Young, *et al*. [1] observed 80% men and 90% women have OSA who were previously undiagnosed and showed that most sensitive and strongest predictor of sleep apnea is snoring. Kulkarni, *et al*. [16] also showed he had 19.3% of patients with high risk of OSA on STOP-BANG questionnaire and were diagnosed by PSG.

There is also high prevalence of comorbidities in severe OSA as shown by our study that 56% of patients of high risk OSA have been previously or being treated for raised blood pressure. Lattimore JD, *et al*. [6] shows that OSA and raised blood pressure are connected and that both have same risk factors. There is also high morbidity associated with OSA as observed by Marshall NS, *et al*. [8] in his study. He also showed that there is strong association between high risks of all-cause mortality with moderate-to-severe OSA. These findings shows that there is high risk of perioperative complications with patients with severe OSA.

It is very important to evaluate patients preoperatively for OSA. In a STOP-BANG questionnaire score of less than 3 has low risk but scores of 5-8 is highly predictive of moderate-to-severe OSA and requires immediate attention to further evaluate these patients for diagnosing with PSG test [18]. High risk patients should have been subjected to polysomnography test (PSG) to confirm high risk patients but no one underwent sleep study which is a limitation of this study. The American Society of Anesthesiologists guidelines from 2014 also stress that preoperative evaluation of patients is very important for any perioperative complications and to evaluate anything that can lead to perioperative complications as identifying the risk factors which were previously undiagnosed is the significant step to avoid any unwanted complication postoperatively [20].

The strength of our study rely on the sample that is representative of surgical patient population coming to a tertiary care clinic using a simple, reliable and valid tool. The limitation of our study is the fact that our sample neither had PSG done before nor underwent for PSG, limiting our study to quantify negative predicted value of questionnaire. This study did not look at perioperative complications related to OSA due to limitations of the study.

This study shows that if patients are diagnosed early and before surgery it can help by giving necessary treatment and streamlining the perioperative care [20]. This study can help improve the collaboration between surgeons, anesthetists and physicians to treat sleep apnea to get better postoperative outcomes of patients [18, 19]. In our society the patients agree for any preoperative evaluation regarding OSA as long as it is a prerequisite for surgery but they will not get screen or get treated until it bothers them.

CONCLUSION

Obstructive Sleep Apnea (OSA) is not uncommon in surgical patients presenting in Opd. None of them undergo further evaluation in Pakistan. Further, inquest is needed to find out the impacts of preoperative diagnosis and treatment of OSA on postoperative care and complications.

AUTHORS' CONTRIBUTION

All authors have contributed equally.

CONFLICT OF INTEREST

Declared none.

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