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Original Article

Prevalence of Obstructive Sleep Apnea in Surgical Patients Attending at SKIMS Hospital, Kashmir, and its Correlation with Perioperative Morbidity

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Abstract

Background and Objective: Patients presenting for surgical procedures often get undiagnosed for obstructive sleep apnea (OSA), thus increasing the incidence of perioperative adverse outcomes. Hence, early diagnosis of this disease is important in formulating anesthetic management and specific means which may decrease the complications and improve outcome, and therefore, the study was conducted to evaluate the prevalence of OSA in patients presenting in our institute for surgical procedures.

Materials and Methods: A total of 600 patients of aged >18 years, American Society of Anesthesiologists I-III scheduled for elective surgeries under anesthesia, were randomly enrolled in the study. Their demographic data, anthropometric measurements were noted. They were screened for OSA by STOP-BANG questionnaire and were followed to assess correlation between OSA and perioperative morbidity.

Results: We observed that out of a total of 600 patients, 23 patients had moderate and severe OSA. Hence, the prevalence of moderate-to-severe OSA was 3.8% in our study. Mean age of subjects was 43.1 years and female predominance was seen in this study. Out of a total of 600 patients, 23 patients had moderate and severe OSA. There was a significant correlation between severity of OSA and anthropometric measurements and perioperative morbidity.

Conclusion: Early screening can help in detecting the OSA among patients and thus help in alleviating perioperative morbidity.

Key words: OSA, Perioperative morbidity, Prevalence, Stop-Bang

INTRODUCTION

Sleep disordered breathing includes a spectrum of conditions, the most severe of which is obstructive sleep apnea (OSA) syndrome. It is a potentially disabling condition characterized by disruptive snoring, repeated episodes of complete or partial pharyngeal obstruction during sleep resulting in nocturnal hypoxemia, frequent arousals, and excessive daytime sleepiness.[1]

OSA is a sleep disorder that involves cessation or significant decrease in airflow in spite of a breathing effort. It is the most common form of recurrent episode of upper airway collapse during sleep. These episodes are associated with recurrent oxygen desaturations and arousal from sleep, with excessive daytime sleepiness; it is referred to as "OSA Syndrome."

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Pathophysiologically, the upper airway, which is a tube, collapses during sleep, causing obstruction to airflow either at the level of soft palate (nasopharynx) or tongue (oropharynx). Both anatomic and neuromuscular factors are involved.

Patients with OSA who are undergoing procedures that require sedation, anesthesia, and/or analgesia are at higher risk for complications than patients who do not have OSA. This may be due to upper airway collapse and/or OSA-related comorbidities.

The following perioperative factors increase the frequency and/or duration of upper airway collapse in patients with OSA:

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- Perioperative medications (e.g., sedatives, general anesthetic agents, and narcotic analgesics).
- Upper airway narrowing – post-intubation edema, post-operative edema, nasal packing, nasal tubes, and/or hematomas.
- Supine positioning.
- Sleep deprivation.
- Cessation of continuous positive airway pressure (CPAP) therapy.

Numerous perioperative complications are more common among patients with OSA than among those without OSA. They include difficulty in intubating patients,[2,3] complicated post-extubation course, large blood pressure fluctuations,[4] profound oxyhemoglobin desaturation,[4] myocardial ischemia,[4] cardiac arrhythmias,[4] delirium,[5] post-obstructive pulmonary edema (from breathing against an obstructed upper airway),[6,7] and respiratory arrest.[8,9]

OSA nearly affects 13–19% in India.[10,11] The previous reports suggest that around 3.2–24% number of patients undergoing surgery suffer from OSA depending on the population studied.[12,13]

There is a paucity of data on the prevalence of OSA among patients presenting for surgical procedures. With this background, we conducted a study to evaluate prevalence of OSA in patients presenting in our institute for surgical procedures. We also studied the correlation between demographic profile and anthropometric measurements with the risk of OSA and between severity of OSA and perioperative morbidity.

MATERIALS AND METHODS

The study entitled "Prevalence of OSA in surgical patients attending at Sher-i-Kashmir Institute of Medical Sciences Srinagar in Northern India and its correlation with intraoperative morbidity" was conducted in the Department of Anaesthesiology and Critical Care, Sher-i-Kashmir Institute of Medical Sciences Srinagar, Soura, Jammu and Kashmir, India, after seeking clearance from the Institutional Ethics Committee.

Patients >18 years of age, American Society of Anesthesiologists (ASA) Class I-II scheduled for elective surgical procedures under anesthesia over a period of 6 months (October 2015–March 2016), were enrolled for the study. All patients were explained the purpose of the study and informed consent to participate in the study was taken from all patients.

Children below the age of 18 years, pregnant females, history of substance dependence (except tobacco), emergency surgery, and patients not willing to provide consent were excluded from the study.

Patients were evaluated with the pre-operative STOP BANG questionnaire (Appendix-I) and were classified on basis of score into mild, moderate, and severe OSA. All patients were followed in the perioperative period to see statistical correlation between the severities of OSA with perioperative morbidity. Physical examination of patients was done in the outpatient department (Pre-anesthetic clinic Room).

For the purpose of the study, the following parameters were measured and recorded:

1. Height – using stadiometer.
2. Weight – using a calibrated spring scale.
3. Body mass index (BMI) – calculated using above two variables (1 and 2).
4. Neck circumference – using a non-elastic tape at the level of cricothyroid.

STOP-BANG Sleep Apnea Questionnaire

Chung F et al Anesthesiology 2008 and BJA 2012

STOP		
Do you SNORE loudly (louder than talking or loud enough to be heard through closed doors)?	Yes	No
Do you often feel TIRED, fatigued, or sleepy during daytime?	Yes	No
Has anyone OBSERVED you stop breathing during your sleep?	Yes	No
Do you have or are you being treated for high blood PRESSURE?	Yes	No

BANG		
BMI more than 35kg/m2?	Yes	No
AGE over 50 years old?	Yes	No
NECK circumference > 16 inches (40cm)?	Yes	No
GENDER: Male?	Yes	No

TOTAL SCORE		

High risk of OSA: Yes 5 - 8

Intermediate risk of OSA: Yes 3 - 4

Low risk of OSA: Yes 0 - 2

Statistical Methods

The recorded data were compiled and entered into a spread sheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were summarized in the form of means and standard deviations and categorical variables were expressed as frequencies and percentages. Graphically, the data were presented by bar diagrams. Analysis of variance was employed for comparing continuous variables. Chi-square test was applied for comparing categorical variables. $P < 0.05$ was considered statistically significant. All P values were two tailed.

RESULTS

A total of 600 patients were enrolled in our study during the study period. Out of these 600 patients, 23 patients had OSA (moderate and severe) as per the STOP BANG model. However, 577 patients had mild OSA as per the criteria laid down in the STOP BANG model [Tables 1-9].

Table 1: Prevalence of OSA in studied population

OSA	Number of patients	Prevalence (%)
Yes	23	3.8
No	577	

OSA: Obstructive sleep apnea

Table 2: Age, gender, ASA status, BMI, and severity of OSA in the study patients

Parameters	No. (%)
Age (years)	
18–39	290 (48.3)
40–59	233 (38.8)
≥ 60	77 (12.8)
Total	600 (100)
Gender	
Male	279 (46.5)
Female	321 (53.5)
Total	600 (100)
ASA	
ASA I	403 (67.2)
ASA II	197 (32.8)
Total	600 (100)
BMI (kg/m^2)	
<20	84 (14)
20–24.9	262 (43.7)
25–29.9	183 (30.5)
30–34.9	54 (9)
≥35	17 (2.8)
Total	600 (100)
Severity of OSA	
Mild OSA	577 (96.2)
Moderate OSA	11 (1.8)
Severe OSA	12 (2)
Total	600 (100)

OSA: Obstructive sleep apnea, BMI: Body mass index, ASA: American Society of Anesthesiologists

DISCUSSION

In our study, majority of patients were 18–39 years of age with a mean age of 43.1 ± 13.44 years. Similar demographic profile was seen by Agarwal *et al.* (2013) in their study.[14] They found a mean age of 42.7 years with female preponderance. Our results are consistent with their study as we found 321 (53.5%) female patients in our study out of a total of 600 patients. In our study, 262 (43.7%) patients had a BMI of 20–24.9 (kg/m^2) while as 17 (2.8%) patients had a BMI of > 35(kg/m^2) with a mean BMI of 24.3 ± 3.96 (kg/m^2). Five hundred and seventy-seven (96.2%) patients were found to have mild OSA, 11 (1.8%) patients having moderate OSA, and 12 (2.0%) patients were having severe OSA. Five hundred and seventy-seven patients with mild OSA had a mean age of 42.1 ± 13.24 years, 11 patients with moderate OSA had a mean age of 53.4 ± 8.57 years, and 12 patients with severe OSA had a mean age of 61.5 ± 9.01 years. When BMI was compared with OSA, we observed that 577 patients with mild OSA had a mean BMI of 24.1 ± 3.30 (kg/m^2). Eleven patients of moderate OSA were having 33.5 ± 1.76 (kg/m^2). Twelve patients with severe OSA had a mean BMI of 36.9 ± 2.14 (kg/m^2). Five hundred and seventy-seven patients with mild OSA had a mean neck circumference of 32.4 ± 4.54 cm. Eleven patients of moderate OSA were having mean neck circumference of 37.5 ± 2.54 cm. Twelve patients with severe OSA had a mean neck circumference of 40.7 ± 2.13 cm. When association of severity of OSA with Mallampati grading score was done, it was found that majority of patients with severe OSA, 8 (66.7%) patients belonged to Grade IV, and 4 (33.3%) patients belonged

Table 3: Mean±SD age in patients with OSA

Severity of OSA	Number of patients	Age (years)	Comparison	*P*-value
		Mean±SD		
Mild OSA (I)	577	42.1±13.24	I versus II	<0.001*
Moderate OSA (II)	11	53.4±8.57	II versus III	<0.001*
Severe OSA (III)	12	61.5±9.01	III versus I	<0.001*

OSA: Obstructive sleep apnea

Table 4: Mean±SD, BMI in patients with OSA

Severity of OSA	Number of patients	BMI (kg/m^2)	Comparison	*P*-value
		Mean±SD		
Mild OSA (I)	577	24.1±3.30	I vs. II	<0.001*
Moderate OSA (II)	11	33.5±1.76	II vs. III	0.005*
Severe OSA (III)	12	36.9±2.14	III vs. I	<0.001*

OSA: Obstructive sleep apnea, BMI: Body mass index

Table 5: Mean±SD, neck circumference (cm) in patients with OSA

Severity of OSA	Number of patients	Neck circumference	Comparison	*P*-value
		Mean±SD		
Mild OSA	577	32.4±4.54	I vs. II	<0.001*
Moderate OSA	11	37.5±2.54	II vs. III	0.007*
Severe OSA	12	40.7±2.13	III vs. I	<0.001*

OSA: Obstructive sleep apnea

Table 6: Association of severity of OSA with Mallampati scoring

MP grade	Mild OSA	Moderate OSA	Severe OSA
	No. (% age)	No. (% age)	No. (% age)
Grade I	165 (28.6)	0 (0)	0 (0)
Grade II	353 (61.2)	1 (9.1)	0 (0)
Grade III	48 (8.3)	7 (63.6)	4 (33.3)
Grade IV	11 (1.9)	3 (27.3)	8 (66.7)
Total	577 (100)	11 (100)	12 (100)

Chi-square=210.3; *P*<0.001*. OSA: Obstructive sleep apnea

Table 7: Incidence of bougie usage in patients with OSA

Bougie used	Mild OSA	Moderate OSA	Severe OSA
	No. (% age)	No. (% age)	No. (% age)
Yes	13 (2.3)	5 (45.5)	9 (75)
No	564 (97.7)	6 (54.5)	3 (25)
Total	577 (100)	11 (100)	12 (100)

OSA: Obstructive sleep apnea

Table 8: Relation of post-operative oxygen saturation with severity of OSA

SpO_2	Mild OSA	Moderate OSA	Severe OSA
	No. (% age)	No. (% age)	No. (% age)
<90	13 (2.3)	3 (27.3)	10 (83.3)
90–95	131 (22.7)	7 (63.6)	2 (16.7)
>95	433 (75)	1 (9.1)	0 (0)
Total	577 (100)	11 (100)	12 (100)

OSA: Obstructive sleep apnea

Table 9: Use of CPAP in patients with OSA postoperatively

CPAP used	Mild OSA	Moderate OSA	Severe OSA
	No. (% age)	No. (% age)	No. (% age)
Yes	14 (2.4)	4 (36.4)	10 (83.3)
No	563 (97.6)	7 (63.6)	2 (16.7)
Total	577 (100)	11 (100)	12 (100)

Chi-square=198.3; *P*<0.001*, OSA: Obstructive sleep apnea, CPAP: Continuous positive airway pressure

to Grade III. None of the patients in severe OSA had Grade I or Grade II Mallampati grading score. In moderate OSA, majority of patients, 7 (63.6%) patients belonged to Grade III and 3 (27.3%) patients belonged to Grade IV and 1 (9.1%) patient belonged to Grade II. None of the patients were present in Grade I Mallampati grading score. In mild OSA, majority of patients, 353 (61.2%) patients belonged to Grade II and 165 (28.6%) patients belonged to Grade I and 48 (8.3%) patients belonged to Grade III. Eleven (1.3%) patients belonged to Grade IV Mallampati grading score. We never used bougie in majority of patients with mild OSA 564 (97.7%) while as in only 13 (2.3%) patients of mild OSA bougie were used to facilitate intubation. In moderate OSA group, 5 (45.5%) patients used bougie to facilitate intubation while as in 6 (54.5%) patients, bougie was not used to facilitate intubation. In severe OSA group, bougie was used in 9 (75%) patients to facilitate intubation, while as in 3 (25%) patients, bougie was not used to facilitate intubation. In our study, 433 (75%) patients with mild OSA had oxygen saturation of >95, 7 (63.6%) patients with moderate OSA had an oxygen saturation of 90–95, while as 10 (83.3%) patients of severe OSA had oxygen saturation of <90 in the post-operative period. When association of severity of OSA with the usage of CPAP postoperatively was observed, 563 (97.6%) patients with mild OSA never needed CPAP postoperatively. However, 14 (2.4%) patients in mild OSA used CPAP postoperatively. In moderate OSA group, 7 (63.6%) patients never needed CPAP postoperatively while as 4 (36.4%) patients in moderate OSA group needed CPAP postoperatively. In severe OSA group, 10 (83.3%) patients needed CPAP postoperatively, 2 (16.7%) patients in severe OSA group did not need CPAP postoperatively.

In addition, these subjects had higher BMI, larger neck circumference, and abdominal girth. Male predominance was also seen in 72% in patients with moderate and severe OSA. Earlier studies have reported varied prevalence of OSA in surgical patients.[13]

Our results suggested that at least surgical population in India is not different from the Western population with regard to risk of OSA. This is important to recognize considering the potential intraoperative and post-operative complications of OSA.[15] These subjects were fatter than the other group. Male gender and high BMI are known risk factors for OSA and this is why these characteristics have been included in the STOPBANG questionnaire.[15-18]

In the study done by Aggarwal *et al.* (2013),[14] it was seen that the incidence of cardiovascular diseases, diabetes mellitus, and hypothyroidism was higher in patients with OSA. However, we did not study the incidence of cardiovascular diseases, diabetes mellitus, or hypothyroidism in this study. However, on reviewing the literature, these patients are at risk of developing complications related to cardiovascular diseases, diabetes mellitus, and hypothyroidism in the perioperative period. Hence, screening of these patients in the pre-anesthetic clinical evaluation may help to avoid and reduce these complications.[19-24]

CONCLUSION

We found that patients with moderate-to-severe OSA had a prevalence of 3.8%. Most of the patients were in the age group of 18–60 years with a female preponderance. Patients with severe OSA had an increased incidence of poor Mallampati scoring grades, increased use of bougie to facilitate intubation, increased incidence of oxygen desaturation, and increased use of CPAP in the post-operative period.

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