Original Article

Otorhinolaryngologic Evaluation of Patients with Obstructive Sleep Apnea Syndrome in Tertiary Hospital of Nepal

Inku Shrestha[1,*], Subodh Dhakal[2], Sudeep Acharya[3], Meera Bista [4]

[1]Department of ENT-HNS, Kathmandu Medical College, Sinamangal, Kathmandu, Nepal
[2] Professor, Department of Medicine, KMC, Sinamangal, Om Hospital and Research Center, Chabahel
[3]Professor, Oral and Maxillofacial surgeon, B.P. Eye Foundation, Lokanthali
[4] Professor and HOD, Department of ENT-HNS, Kathmandu Medical College, Sinamangal, Kathmandu
***Corresponding Author**: Dr. Inku Shrestha, Email/Contact: shresthainku@gmail.com ; 9861990009

ABSTRACT

Background: Obstructive sleep apnea is a global health problem characterized by repeated partial or complete obstruction of the upper airways during sleep accompanied by nocturnal hypoxemia, interruptions during sleep and sleepiness during daytime. It is commonly associated with road traffic accidents, diabetes mellitus and cardiovascular disease. The study was aimed to measure the different otorhinolaryngologic parameters of patients with obstructive sleep apnea and to compare these findings with different classes of polysomnography.

Methods: A hospital based cross-sectional study was carried out among patient coming to department of Otorhinolaryngology of Kathmandu Medical College and Teaching Hospital. In total, 74 patients with obstructive sleep apnea participated in this study. Sociodemographic details, co-morbid illness and anthropometric measurements were recorded. Data was presented in the form of mean, standard deviation and percentage. Chi-square, student's t-test were done using Statistical Package for the Social Sciences version 21. A p-value of <0.05 was considered statistically significant.

Results: The mean age of the patient was 47.43±11.30 years. Majority of the patients were male. Out of 74 patients, 24 (32.4%) patients were obese, 22 (29.7%) were overweight. The PSG showed 49 (66.2%) participants had severe obstructive sleep apnea. According to Modified Mallampati score, 28 (37.8%) of patients belonged to Class 3, 20 (27%) belonged to Class 2. There was no significant association observed between the studied variables and polysomnographic results.

Conclusion: Male and old age were the predominant factor in obstructive sleep apnea patients. In patients with snoring, the Otorhinolaryngologist should rely on thorough medical history, anatomic examination of head and neck and polysomnography reports.

Keywords: Modified Mallampati Score; Obstructive sleep apnea; Otolaryngology; Polysomnography.

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INTRODUCTION

Obstructive sleep apnea (OSA) is a potentially disabling condition characterized by repeated partial or complete obstruction of the upper airways during sleep accompanied by nocturnal hypoxemia, arousals during sleep frequently and daytime sleepiness. [1] It is a highly prevalent disease affecting 6-17% of the general adult population.[2] It is more predominant in males than females.[2,3] OSA is also reported to be associated with hypertension, traffic accidents, diabetes mellitus and cardiovascular diseases.[4] Studies have demonstrated the differences in ethnicity for the prevalence and severity of OSA.[1]

Studies have shown many ENT related disorders to be associated with OSA. Most commonly obstructed nasal airway passage, deformity of nasal septum, severe retrognathia, hypertrophic tonsils, macroglossia and redundant pillars, elongated uvula, and a crowded oropharynx have been shown to play a vital role in severity of OSA.[2,3,5] Other conditions such as cysts and tumors of the neck, large circumference of neck which is also associated with higher BMI also lead to OSA.[5]

Currently the condition is diagnosed by history, physical examination, imaging studies, and polysomnography.[6,7] In spite of the recent advances in the diagnosis and treatment plans, majority of the cases remain undiagnosed. In many situations, patients visit ENT department for OSA. There has not been any baseline study to observe the OSA from ENT perspectives in Nepal. The aim of the present study was, therefore, to measure the different otorhinolaryngologic parameters of patients with obstructive sleep apnea in a tertiary care hospital of Nepal and to compare these findings with polysomnography.

MATERIALS AND METHODS

A hospital based cross-sectional study was conducted from July 2020–June 2021 at Kathmandu Medical College and Teaching Hospital. Ethical clearance for the study was obtained from KMC-IRC (Ref: 1208202002). Patients above the age of 18 years coming to Kathmandu Medical College and Teaching Hospital seeking the diagnosis and treatment of OSA were included into the study. Participants who were unwilling to participate in the study, with other lower respiratory diseases, undergone a tracheostomy, having a clinical suspicion of other sleep disorders and with other co-morbidities (chronic renal, cardiac, or hepatic failure) were excluded from the study.

Convenience sampling was done to include the study participants. In total, 74 patients who gave consent, participated in the study. The objective of the study was explained to the patients in detail after which the principal investigator examined the upper airway of the patient and findings were noted. The data was entered in the predesigned proforma, which included age, sex, co-morbid illness and anthropometric measurements (BMI and Modified Mallampati Score). Subjective daytime sleepiness was assessed by using Epworth sleepiness Scale (ESS). Risk factors and other co-morbid conditions were also recorded.

Patients who were suspected with obstructive sleep apnea underwent detailed ENT examination to rule out upper airway obstruction if any followed by polysomnography to diagnose the type of obstructive sleep apnea and its different parameters associated with upper airway obstruction. Height (m) and weight (kg) were taken in order to measure BMI by dividing weight in kilogram by the square of height in meters (kg/m^2). Neck circumference was measured with a measuring tape in centimeter (cm) at the level of cricothyroid membrane at right angle to the long axis of the neck.

Observation of facial profile of the patient to look for any developmental disorders of mandible and maxilla was done. Mandibular retrognathism was investigated by placing patient in Frankfort horizontal position and an imaginary vertical line drawn from vermilion border of the lower lip to the chin. Mandibular retrognathism was considered if the anterior prominence of the chin was greater than 2 mm behind this line.

Nasal examination was carried out with the help of Anterior Rhinoscopy using a speculum with the

patient's head slightly tilted backward. The main objective of this was to make sure if the patient had any nasal septal defect, hypertrophy of turbinate, nasal polyps and other masses in the nasal pathway. Examination of oral cavity was done by inspection of relative position of the palate and base of tongue inside the mouth using Modified Mallampati Classification (MMC). MMC was recorded by asking patients to open mouth while keeping tongue relaxed inside mouth. It can be graded as Class 1; all the oropharynx including tonsils, pillars, soft palate and the tip of uvula is easily visible: Class 2, upper pole of tonsils and uvula are visible; Class3, part of the uvula and soft palate are visible; Class 4, and hard palate and part of soft palate are barely visible.

Examination of throat was done to get a clear picture of pharyngeal tonsils and Modified Mallampati score. Tonsils were classified according to degree of their hypertrophy as Grade I, tonsils inside tonsillar fossa lateral to the posterior pillars: Grade II, tonsils occupying 25% of oropharynx: Grade III tonsils occupying 25-50%of oropharynx: Grade IV, tonsils occupying 75% or more of oropharynx, or meeting in the midline. Tongue base was classified from 1-3. It was ranked Grade 1 when valeculla was partially visible while examination with 70-degree rigid endoscope; Grade 2 when valeculla was invisible and tongue base touched the epiglottis and Grade 3 when the tongue base pushed the epiglottis. The obstructive lesions in larynx and hypopharynx were evaluated with rigid 70degree endoscope when necessary. All subjects underwent full overnight Polysomnographic study in laboratory. AHI (Apnea Hypopnea Index) was calculated as the sum of the number of apneas and hypoapneas per hour of sleep. OSAS was defined as an AHI of 5 events/h and the presence of clinical symptoms. Patients were distributed according to AHI as mild sleep apnoea when AHI is between 5-15; moderate sleep apnoea when AHI is 15-30 and severe sleep apnoea when AHI is greater than 30.

Data was presented in the form of mean, standard deviation and percentage. To determine relationship between the study variables and polysomnographic results, Chi-square, student's t-test. Statistical analyses were performed using SPSS version 16. A p-value of <0.05 was considered statistically significant.

RESULTS

The demographic data, anthropometric measurements and the medical co-morbid conditions are shown in Table 1-3. In total 74 patients participated in the study. The mean age of the patients was 47.43±11.30 years. Around 3/4th of the patients 56 (75.7%) were male. Regarding habits 30 (40.5) reported that they smoke while nearly 60% of the patients said they take alcohol (Table 1). The co-morbidity was also accessed in this study in which 24 (32.4%) of participants were hypertensive, 11 (14.9%) had diabetes mellitus (Table 2).

Table 1: Characteristics of participants

Variables		Frequency (%)
Age Groups (year)	18-40	22 (29.7)
	41-60	41 (55.4)
	>60	11 (14.9)
	Mean±SD	47.43±11.30
Sex	Male	56 (75.7)
	Female	18 (24.3)
Smoking	Yes	30 (40.5)
	No	44 (59.5)
Alcohol	Yes	46 (62.2)
	No	28 (37.8)

Table 2: Presence of co-morbidities

Hypertension	Yes	24 (32.4)
	No	50 (67.6)
Diabetes mellitus	Yes	11 (14.9)
	No	63 (85.1)
Coronary artery disease	Yes	4 (5.4)
	No	70 (94.6)

Table 3: Examination findings

AHI (events/hr)	Mean±SD	45.55±26.16
Neck circumference (cm)	Mean±SD	39.22±2.58
ESS Score	Mean±SD	14.82±3.29
BMI	Normal	5 (6.8)
	Overweight	23 (31.1)
	Obese	24 (32.4)
	Etreme obese	22 (29.7)
ENT Examination	Positive finding	60 (81.1)
	Negative finding	14 (18.9)
Oral cavity problems	Yes	5 (6.8)
	No	69 (93.2)
Nasal problems	Yes	42 (56.8)
	No	32 (43.2)
Tonsil Grade	Degree 1	2 (2.7)
	Degree 2	17 (23.0)
	Degree 3	10 (13.5)
	Degree 4	1 (1.4)
Tonsil enlargement	Yes	31 (41.9)
	No	43 (58.1)
Base of tongue	Grade1	6 (8.1)
Retrognathism	Yes	1 (1.4)
	No	73 (98.6)
Polysomnographic results	Mild	14 (18.9)
	Moderate	11 (14.9)
	Severe	49 (66.2)
Modified Mallampati Score	Class1	14 (18.9)
	Class 2	20 (27.0)
	Class 3	28 (37.8)
	Class 4	12 (16.2)

Mean AHI (events/hr) was 45.55±26.16. The mean neck circumference (inches) was 39.22±2.58. During ENT examination, more than 80% of the participants had positive findings. High arched palate was observed in 5 (6.8%) of patients while 42 out of 74 patients had deviated nasal septum and hypertrophy of turbinate. Nearly 10% of participants had grade 1 base of the tongue. Out of 74 patients, 24 (32.4%) patients were obese, 22 (29.7%) were overweight. The PSG showed 49 (66.2%) participants had severe OSA while 14 (18.9%) had mild OSA. According to Modified

Mallampati score, 28 (37.8%) of patients belonged to Class 3, 20 (27%) belonged to Class 2 (Table 3). Polysomnographic results showed half of the males had severe OSA. Study also showed 23 patients belonging to severe sleepiness group according to ESS score had severe OSA. About 39 participants who had positive findings based on ENT examination and 27 participants who had nasal problems also had severe OSA. However, there was no significant association observed between the studied variables and polysomnographic results (Table 4)

Table 4: Association between polysomnographic results with clinical characteristics

Variables		Polysomnographic results			p-value
		Mild	Moderate	Severe	
Gender	Male (%)	11 (78.6)	8 (72.7)	37 (75.5)	0.943
	Female (%)	3 (21.4)	3 (27.3)	12 (24.5)	
ESS Score	Higher normal	1 (7.1)	2 (18.2)	3 (6.1)	0.413
	Mild	4 (28.6)	3 (27.3)	6 (12.2)	
	Moderate sleepiness	2 (14.3)	2 (18.2)	17 (34.7)	
	Severe sleepiness	7 (50.0)	4 (36.4)	23 (46.9)	
ENT Examination	Positive finding	13 (92.9)	8 (72.7)	39 (79.6)	0.35
	Negative finding	1 (7.1)	3 (27.3)	10 (20.4)	
Tonsils enlarged	Yes	3 (21.4)	4 (36.4)	24 (49.0)	0.153
	No	11 (78.6)	7 (63.6)	25 (51.0)	
Nose	Yes	10 (71.4)	5 (45.5)	27 (55.1)	0.386
	No	4 (28.6)	6 (54.5)	22 (44.9)	

DISCUSSION

OSA has been a public health concern and has been linked to increased risk road traffic accidents, cerebrovascular and cardiovascular disease.[8] Many factors such as obesity, male sex, smoking, alcohol intake have been suggested to be risk factors for OSA.[8,9] OSA is characterized by repeated upper airway obstruction during sleep and may involve several anatomic sites such as high arched palate, long uvula, enlarged tonsils, retrognathia are also the predictors of OSA sites.[10,11] The present study is first of its kind in Nepal to study the sociodemographic and different otorhinolaryngologic parameters of patients with obstructive sleep apnea and to compare with the gold standard method to diagnose OSA, the polysomnography. The present study did not find any association between the different parameters and polysomnography.

Sleep related difficulties are a common problem as the age advances. Many people often complain of difficulty in falling asleep, awakening several times at night in advanced age.[6] The severity of OSA varies with age.[12,13] In the present study, the mean age of the patients was 47.43±11.30 years and OSA was mostly observed in age group 41-60 years supporting other studies.[14-17]

OSA is said to be a male disease.[18] Studies have shown male predominance on the severity of OSA than female.[2,8,19] Differences in the anatomy of upper airway, fat distribution, hormonal status have been said to interplay in this gender differences in OSA.[18,20] This study also observed that maximum number of patients taking part in the study were male. This was in line with many other studies.[12,21-24] However, Soler et al have also reported that there was no association of male gender with severity of OSA.[13]

The Modified Mallampati Score a simple procedure used by anesthetist to access the risk of difficult tracheal intubation.[25] It is simple, non-invasive technique requiring no special instrument. Modified Mallampati Score has also been

correlated with severity of OSA. The higher the Modified Mallampati Class, the more severe is the OSA in patient.[26] In the present study most of the patients belonged to Class 3.

Excessive daytime sleepiness is the common risk factor for various accidents due to poor quality of life.[27] Studies have shown positive correlation between the ESS and the polysomnographic parameters in OSA patients.[27] However the present study did not find any association between polysomnographic findings and ESS score.

Many ENT disorders may lead to obstructive sleep apnea. Enlarged tonsils cause obstruction of airway.[10,28] In children a weak positive association was reported between tonsil size and severity of OSA.[28] In another study, Tang et al also did not observe correlation of tonsil size with severity of OSA.[29] The result of present study is in line with the previous literature evaluating the association between tonsil size and OSA severity. This may be due to poor cooperation from the patient or difficulty in measuring the dimension of the tonsil or due to the difficulty in estimating the size of tonsil owing to the tonsil's position in the fossa.[29] However few other studies have also reported positive correlation between the tonsil grade, volume, OSA severity ad AHI.[10,30,31]

Neck Circumference also contributes to the severity of OSA. Neck circumference was higher in severe OSA patients.[32] The mean neck circumference was 39.22±2.58 inches which was also similar to study performed by Ahbab et al.[32] Neck circumference was not associated with severity of OSA.[13] Mehra et al have reported smaller neck circumference in females.[2]

Many skeletal problems of head and neck such as mandibular retrognathia, transverse maxillary constriction also contribute to the risk of OSA.[33] Gupta et al also reported the higher incidence of OSA in retrognathic patients. However, in this study we observed only one case of retrognathic mandible.

This study also has limitations. The study was conducted in smaller sample size. A large sample size taking a long period would yield significant finding which is also a study arena of concern. This was a single center study so the result cannot be generalized to larger region. However, it can be a baseline study for the future researches. The study would have added additional dimension if lateral cephalograms would have been used.

CONCLUSION

The prevalence of OSA was high in males. Most of the patients belonged to older age. Gender, ESS score, ENT examination, enlarged tonsils and nose were not statistically significant. Therefore, in the patient coming to ENT department with the complaint of snoring thorough medical history, anatomic examination, radiological examination of head and neck should be done.

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