Prevalence of Obstructive Sleep Apnea and its Association with Oral Health among Subjects Attending a Dental Institution

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Abstract

Background and Objectives: It may seem odd to speak about dental habits in relation to a sleep disorder, but OSA is a medical condition that affects one's entire body including teeth and gums. Furthermore dentists are frequently involved in diagnosis and treatment of OSA. Dental sleep medicine is constantly evolving, and now studies show that oral health is associated with sleep disordered breathing. As dentists examines the oral cavity and also have a clear view of oral pharynx they can play a vital role in screening the patients with sleep disorders using validated questionnaires and further referring the patient to specialist department for final diagnosis, thus promoting the interdisciplinary approach. Thus, the purpose of this study was to assess prevalence of OSA and its relation with oral health among subjects attending a dental college in Virajpet, India.

Methodology: A descriptive cross-sectional study was conducted among 740 adults aged 35 years-44 years in Virajpet, under a 2 step procedure. First socio demographic information was collected, followed by Berlin questionnaire to assess OSA and then clinical assessment of oral health was done using OHIS, DMFT and CPITN indices. Statistical analysis was done by using SPSS version 17.

Results: among the participants, in the non OSA group, 160 (47.2%) were males and 210 (52.4 %%) were females and in the OSA group, 179 (52.8%) were males and 191 (47.6%) were females. The mean age in years among non OSA group was found to be 40.12 and among OSA group were 40.05. Among the participants from non OSA group, 50.1%, brushed once daily and 49.8% brushed twice daily. Among the participants from the OSA group, 49.9 % and 50.2% brushed once and more than once respectively. Among the participants from non OSA group 48.6%, 51.4% used other aids and did not use other oral hygiene aids, among the participants from the study population, 51.4 % and 44.8% used other aids and did not use other oral hygiene aids. Among the non OSA group, mean DMFT score was 3.49 ± 2.75 and among the OSA group the mean DMFT score was 3.49 ± 2.83. It was found to be statistically non-significant (p=0.990). Among the non OSA group, mean OHIS score was 2.10 ± 0.95, and among the OSA group the mean OHIS score was 1.41 ± 0.63. It was found to be statistically highly significant (p=<0.001). Among the non OSA group, mean CPITN score was 1.98 ± 1.19, and among the study population the mean CPITN score was 2.60 ± 1.14. It was found to be statistically highly significant (p=<0.001).

Conclusion: There is a great need of health education programs to educate and motivate population towards oral health and also to increase awareness of sleep disordered breathing.

Keywords: Oral health status; Obstructive sleep apnea; Dental institution

Introduction

Sleep plays a vital role in day time functionality. It has long term effects on overall health and has major benefits in healing, memory; mood and oral health. 24.1% more likely to visit dentist as compared with an annual exam by a physician; thus, dental health professionals are in a position to be the first providers to detect systemic health conditions. Dental hygienists play a crucial role in detecting disease and health risks and are able to communicate findings to their patients. Therefore, it is essential that dentist in conjunction with medical staff needs to be knowledgeable about systemic and oral health conditions enabling them to discuss risks, characteristics of diseases, medical referrals and treatment options. According to Aubrey shih am 2 compartmentalization involved in viewing the mouth separately from the rest of the body must cease because oral health affect general health by causing considerable pain and suffering and by changing what people eat, their speech and

their quality of life and well-being. Oral health also has an effect on other chronic diseases. In Thailand, 74% of 35 years-44years old had daily performances affected by their oral state: 46% reported their emotional stability was affected. Thus, we all know that oral health is the mirror to body's overall health.

Today, Dental Sleep Medicine represents a synergistic blend of medicine and dentistry as dentists bring their unique skills associated with the stomatognathic system to bear on the problems that physicians face attempting to create and maintain a patent airway during sleep.

American Academy of Pediatric Dentistry (AAPD) recognizes that Obstructive Sleep Apnea (OSA) occurs in the pediatric population. Undiagnosed and/or untreated OSA is associated with cardiovascular complications, impaired growth (including failure to thrive), learning problems, and/or behavioral problems. In order to reduce such complications, AAPD encourages healthcare professionals to routinely screen their patients for increased risk for OSA and to facilitate medical referral when indicated.

Obstructive Sleep Apnea (OSA) is a health condition for which the dental community can identify and screen. However, less than 50% of dentists are actually capable of identifying the signs and symptoms of this sleep disorder. OSA is the most common breathing disturbance, with up to 80% of moderate to severe OSA remaining undiagnosed. Obstructive Sleep Apnea (OSA) is a prevalent condition affecting at least 2% to 4% of the adult population. Is a chronic condition characterized by repetitive upper airway obstructions resulting in intermittent hypoxia and sleep fragmentation caused by arousals. In adults, the most common cause of Obstructive Sleep Apnoea (OSA) is excess weight and obesity, associated with soft tissue of the mouth and throat. During sleep, when throat and tongue muscles are more relaxed, this soft tissue can cause the airway to become blocked. OSA occurs when muscles that support soft- palate, uvula, and tonsils relax which causes narrowing of airways and there is no adequate oxygen supply to blood and it can lead to reopening of airway, which causes arousal from sleep. This sleep disorder is defined as repeated episodes of complete or partial obstruction of the upper airway during sleep and characterized by snoring, witnessed stopped breathing and excessive daytime sleepiness. OSA is associated with many health conditions such as hypertension, reduced quality of life and diabetes mellitus. It has been observed sleep deprivation has an adverse effect on physical health of individuals due to decrease in overall immunity which is caused due to inflammatory markers and up regulation of hormones that may cause deterioration of periodontal health.

Studies suggest that there is a significant association between OSA and moderate to severe periodontitis. In subjects with high risk for OSA, mouth breathing is observed and known that chronic mouth breathing leads to xerostomia and thereby causes dental caries. This correlation suggests that optimum oral health is imperative, especially when there is risk for OSA dental professionals have the opportunity to screen for risk factors and disease patterns of OSA and have the ability to assess one's risk. There are several OSA detection tools available that determine risk of OSA.

OSA is closely associated with obesity epidemic globally and characterized by repetitive, partial, or complete collapse of the upper airway during sleep, causing impaired gaseous exchange and sleep disturbance. It is estimated that nearly 80% of men and 93% of women with moderate-to-severe sleep apnea are undiagnosed. The prevalence of symptoms and signs of OSA in the community varies by region and ethnicity. Prevalence of OSA appears to be more in the USA as compared to Europe.9 OSA represents a public health problem that directly and indirectly results in considerable health-care costs which

is comparable to that of cigarette smoking. The estimated prevalence of sleep disordered breathing as obtained from the Wisconsin Sleep Cohort study was 9% for women and 24% for men across all age groups. Between 30 years and 60 years of age 2% of women and 4% of men met the minimal diagnostic criteria of OSA with a male: female ratio for the prevalence of sleep disordered breathing of 3:1. Obesity, older age, and male gender are strong risk factors for OSA. Other risk factors include increased Neck Circumference (NC), craniofacial abnormalities, hypothyroidism, and acromegaly. It has been proposed that the physiological pathways linking these risk factors for OSA can be explained by anatomical abnormalities, increased pharyngeal dilator muscle dysfunction, lowered arousal threshold, increased ventilator control instability, and/or reduced lung volume.

Even though multiple screening tools are available for adult sleep apnea measurement including STOP, BANG etc. patients are not routinely screened for symptoms of OSA as a part of their initial medical evaluation. Therefore despite the recent advances in diagnostic technology in the field of sleep medicine and increased awareness of OSA in the public, a majority of those affected still remain undiagnosed. Hence, it is important for primary-care physicians and specialists to be competent to recognize and identify those affected subjects for early and appropriate treatments.

A positive diagnosis of OSA likely will be made by a sleep physician in the presence of signs/ symptoms concurrent with at least one predominantly obstructive respiratory event, mixed apnea, or hypopnea per hour of sleep or a pattern of obstructive hypoventilation with hyper-capnia for at least 25% of total sleep time during the polysomnography. Although the "gold standard" for diagnosis of OSA is laboratory Poly-Somno-Graphy (PSG); however, the occurrence of OSA is far more prevalent than can be handled by the available sleep laboratories. Therefore, a screening tool is necessary to stratify patients based on their clinical symptoms, their physical examinations, and their risk factors, in order to ascertain patients at high risk and in urgent need of PSG and/or further treatment and patients at low risk who may not need PSG.

The Asian continent is heavily populated, and many groups live in an underdeveloped environment. These factors pose some difficulties in assessing the disease burden in this area. As expected most studies came from developed countries such as Japan, China, Singapore, Turkey and others. Interestingly, no epidemiologic studies have been conducted in Israel, despite the many works performed there in the area of OSA path-physiology. In a study conducted in Delhi with predominantly male sample, population who had a heavier BMI and older prevalence was found to be 13.74% for OSA. Dentists who encounter sleep health and sleep disorders may work with clinicians from many other disciplines and specialties, including oral and maxillofacial surgery, prosthodontics, orthodontics, family and internal medicine. Improving sleep quality and sleep characteristics, oral health, and oral function involves pathology and disease management. As dentists examines the oral cavity and also have a clear view of oral pharynx they can play a vital role in screening the patients with sleep disorders using validated questionnaires and further referring the patient

to specialist department for final diagnosis, thus promoting the interdisciplinary approach. Against this background the present study was undertaken to screen the patients reporting to dental Out Patient Department (OPD) of Coorg Institute of dental sciences and Hospital for OSA through Berlin questionnaire which provides a well-validated means of identifying patients who are at high risk for OSA and would need further evaluation.15 followed by performing an oral examination of the screened high and no risk OSA patients so, as to know the sleep traits and its association with oral health status. To know the prevalence of OSA and its association with oral health in subjects attending a dental teaching institution.

• To assess the prevalence of Obstructive Sleep apnea among 35 years-44 years olds attending dental teaching institution.

• To assess and compare oral hygiene status among subjects with Obstructive Sleep apnea.

• To assess and compare dental caries prevalence among subjects with Obstructive Sleep apnea.

• To assess and compare periodontal disease prevalence among subjects with Obstructive Sleep apnea.

Materials and Methods

The present study was conducted to assess and compare the oral health perceptions and status of participants attending outreach programmes and dental care centers in Virajpet taluk, India.

Brief profile of study area

Kodagu (Coorg) is a picturesque high land, which is situated on the slopes of the Western Ghats. It is one of the smallest districts out of the 30 districts of the state and comprises of 3 talukas namely Virajpet, Madikeri and Somwarpet [1].

Source of data: The source of data was primary, which consisted of clinical examination and questionnaire.

Study population: A descriptive cross-sectional survey was carried out among: Adults aged 35 years-44 years attending dental institution, Coorg Institute of Dental Sciences Virajpet.

Ethical clearance: The ethical clearance for the present study was obtained from the Institution Review Board of Coorg Institute of Dental Sciences, Virajpet.

Study duration: The study was conducted during January to March 2019.

Pilot study and sample-size determination: A pilot study was conducted on 25 adults of age group 35 years-44 years who attended dental college, Virajpet to validate the questionnaire and to determine the feasibility of the study. The prevalence of obstructive sleep apnea was found to be 40%. The participants included in the pilot study were excluded from the final study.

Sample size: Sample size was calculated using the formula

$$n = \frac{Z^2 2PQ}{d2}$$

$$n = \frac{1.96 \ X 1.96 \ X \ 40 \ X \ 60}{25}$$

$$= 368.79$$

Final sample size is 740 subjects (370 subjects with obstructive sleep apnea and 370 control-subjects without obstructive sleep apnea) were considered for the study.

Sampling method

Convenient sampling: Subjects belonging to 35 years-44 years will be evaluated using berlins questionnaire by personal interview for diagnosing obstructive sleep apnea and included for the study until required sample size is met based on inclusion and exclusion criteria's [2].

Inclusion criteria: The following are the objectives include

Subjects visiting dental college of the age group 35 years-44 years.

Subjects who are willing to participate and who will give consent for the study.

Exclusion criteria: The following are the objectives include

Subjects under sleep medication

Nasal obstruction

T.M.J disorders

Lower respiratory diseases

Subjects with systemic diseases.

Study schedule: A detailed schedule of the survey was prepared well in advance and the concerned authorities were informed regarding date and timings of the study. On an average, 15-20 participants were interviewed and examined on each day. Examination of each participant took approximately 08 mins-10 mins [3].

Data collection: In the present study, data was collected by personal interview method using printed proforma (English) and berlin's questionnaire. Proforma consisted of two parts. The first part included questions related to socio-demographic characteristics like age, gender, socioeconomic status, and the second part consisted of questions regarding sleep habits of the individual. Intra-oral clinical examination comprised of type 3 examinations by using DMFT, CPITN AND OHIS to record Dental caries, periodontal status and oral hygiene status of the study participants by means of a sterile mouth mirror and CPI probe. Copy of the Proforma is appended in Annexure. A single examiner will collect all data [4].

Armamentarium: The following instruments and supplies were used for the study.

Plane mouth mirrors

CPI probes

Tweezers

Gauze

Kidney trays

Steel tumblers

Chemical disinfectant

Gloves and Mouth Masks

Survey proforma (Berlin questionnaire).

Training and calibration of examiner of principal investigator: Interview and examination was carried out by single person (Principal Investigator). The investigator was trained and standardized through series of training exercises. Before the start of the survey, a senior faculty member carried out training of the investigator regarding the criteria for diagnosing and recording the codes in assessment proforma. Calibration was done by examining 20 subjects in department of Public Health Dentistry, Coorg Institute of Dental Sciences, Virajpet. Each subject was examined twice and the results were compared, to know the diagnostic variability agreement. The result so obtained was subjected to assess intra examiner variability using kappa variability test and the mean kappa co-efficient value was found to be of 0.8 which showed good agreement. The recorder was made to sit close enough to the examiner so that instructions and measurements could be easily heard and examiner could see that the findings are recorded correctly [5].

Oral health education: After the interview and clinical examination of the study participants, they were educated regarding oral health with emphasis on importance of oral health, maintenance of oral hygiene and periodic dental visits.

Courtesy reporting: The participants were provided with basic and complex dental treatments by referring to respective departments depending upon their chief complaint reported at the institution, Coorg Institute Dental Sciences and Hospital, Virajpet [6].

Statistical analysis: The data was entered into the computer (MS-Office, Excel). Continuous and quantitative data are expressed as mean and standard deviation. Categorical data are expressed as numbers and percentages. Chi square test and t test were used to compare the statistical differences of oral health between OSA and general population. Level of significance was set at 0.05 at 95% Confidence Interval. Statistical package-SPSS (IBM version 17) software was used for the analysis [7].

Results

The distribution of study participants according to gender. In the non OSA group, 160 (47.2%) were males and 210 (52.4%) were females and in the OSA group, 179 (52.8%) were males and 191 (47.6%) were females (Table 1 and Figure 1) [8].

Table 1: Distribution of study subjects according to gender.

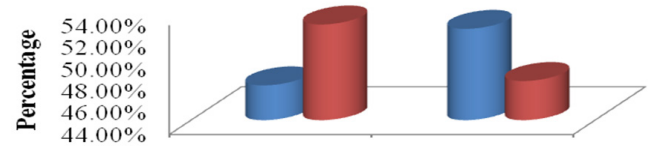| Participants	Population		Total
	Males	Females	
Non OSA	160	210	370
	47.20%	52.40%	50.00%
OSA	179	191	370
	52.80%	47.60%	50.00%
Total	339	401	740
	100.00%	100.00%	100.00%

Figure 1: Distrubution of study subjects according to gender. **Note:** (■) Non OSA: Males-47.20%, Females-52.40%, (■) OSA: Males-52.80%, Females-47.60%.

The distribution of study participants according to mean age. The mean age in years among non OSA group was found to be 40.12 ± 2.56 and among OSA group was 40.05 ± 2.58 respectively (p=0.70) (Table 2 and Figure 2).

Table 2: Mean age of study participants.

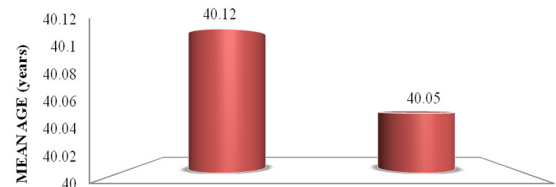| Participants	N	Mean	Std. Deviation	t value	p value and significance
Non OSA	370	40.1243	2.5674	0.385	0.700 NS
OSA	370	40.0514	2.58724		

Figure 2: Distrubution of study subjects according to gender. Note: Meanage: Non OSA-40.12, OSA-40.05.

The responses of study participants according to their frequency of brushing teeth. Among the participants from non OSA group, 50.1%, brushed once daily and 49.8% brushed twice daily. Among the participants from the OSA group, 49.9% and 50.2% brushed once and more than once respectively. There was no statistically significant difference between the responses of both the populations (p=1.000) (Table 3 and Figure 4).

Table 3: Responses of the study participants according to their frequency of brushing. Note: χ² = 0.007, p=1.000 NS.

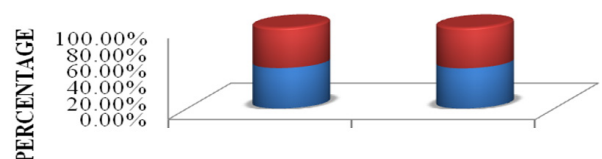| Participants	Frequency of brushing		Total
	Once daily	More than once	
Non OSA	263	107	370
	50.10%	49.80%	50.00%
OSA	262	108	370
	49.90%	50.20%	50.00%
Total	525	215	740
	100.00%	100.00%	100.00%

Figure 3: Distrubution of study subjects according to gender. **Note:** (■) OSA: once daily-49.90%, More than once-50.20%, (■) NON OSA: once daily-50.10%, More than once-55.20%.

The responses of study participants according to their use of other oral hygiene aids. Among the participants from non OSA group 48.6%, 51.4% used other aids and did not use other oral hygiene aids, among the participants from the study population, 51.4% and 44.8% used other aids and did not use other oral hygiene aids. There was no statistically significant difference between the responses of both the populations (p=1.000) (Table 4 and Figure 4).

Table 4: Responses of the study participants according to their frequency of brushing. Note: χ^2=2.099, p=0.174 NS.

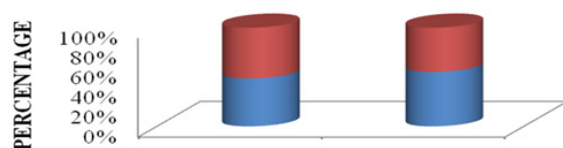| Participants	Other aids		Total
	Yes	No	
Non-OSA	285	85	370
	48.60%	0.552	0.5
OSA	301	69	370
	51.40%	0.448	0.5
Total	586	154	740
	1	1	1

Figure 4: Comaprision of study participents according to use of other oral hygiene aids. Note: (■) OSA: Yes- 51.40%, No-44.80%, (■) NON OSA: Yes-48.60%, No-55.20%.

The distribution of study subjects according to mean DT, MT, FT, DMFT, OHIS and CPITN scores (Table 5).

Table 5: Distribution of study subjects according to mean DT, MT, FT, DMFT, OHIS and CPITN scores.

Participants	Group	Mean	Std. Deviation	t value	p value and significance
Decayed Teeth (DT)	Non OSA	2.7622	2.45891	0.044	0.965 NS
	OSA	2.7703	2.52224		
Missing Teeth (MT)	Non OSA	0.2324	0.57029	0.065	0.948NS
	OSA	0.2351	0.56679		
Filled Teeth (FT)	Non OSA	0.5081	0.69156	0.429	0.668 NS
	OSA	0.4865	0.67961		
DMFT	Non OSA	3.4946	2.75882	0.013	0.990 NS
	OSA	3.4919	2.83917		
OHIS	Non OSA	2.1016	0.95724	11.568	<0.001 HS
	OSA	1.4114	0.63334		
CPITN	Non OSA	1.9811	1.19492	7.215	<0.001 HS
	OSA	2.6027	1.14834		

Decayed Teeth (DT): Among the non OSA group, mean number of decayed teeth were 2.76 ± 2.45, and among the OSA group the mean DT score were 2.77 ± 2.52. It was found to be statistically non significant (p=0.965) (Figure 5).
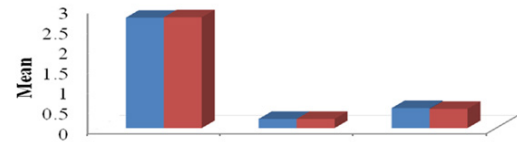

Figure 5: Mean decayed, missing and filled teeth among participants. Note: (■) Non OSA: DT-2.76, MT-O.23, FT-O.5, (■) OSA: DT-2.77, MT-O.23, FT-0.48.

Missing Teeth (MT): Among the non OSA group, mean number of missing teeth were 0.23 ± 0.57, and among the OSA group the mean number of missing teeth were 0.23 ± 0.56 and is statistically non significant (p=0.948). Filled teeth (FT) :Among the non OSA group, mean number of filled teeth were 0.50 ± 0.69, and among the OSA group the mean number of filled teeth were 0.48 ± 0.67 and is statistically non significant (p=0.668). Decayed, Missing and Filled teeth(DMFT) total :Among the non OSA group , mean DMFT was 3.49 ± 2.75, and among the OSA group the mean DMFT was 3.49 ± 2.83 and is statistically non significant (p=0.990) (Figure 6).
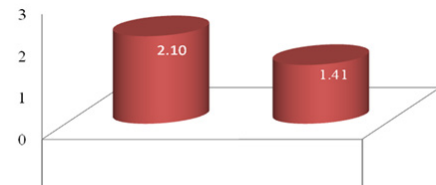

Figure 6: Mean decayed, missing and filled teeth among participents. **Note:** NON OSA-2.10, OSA-1.41.

OHIS (Oral Hygiene Index Simplified): Among the non OSA group , mean oral hygiene score was 2.10 ± 0.95, and among the OSA group the mean oral hygiene score was 1.41 ± 0.63 and is statistically highly significant (p=<0 .001) (Figure 7).
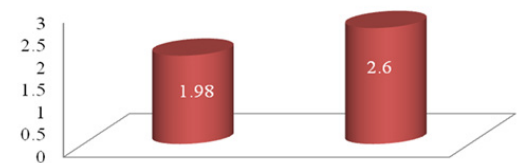

Figure 7: Mean CPITN score of study subjects. **Note:** Non OSA-1.98, OSA-2.6.

CPITN (Community Periodontal Index Treatment Needs): Among the non OSA group , mean CPITN score was 1.98 ± 1.19, and among the study population the mean CPITN score was 2.60 ± 1.14 and is statistically highly significant (p=<0 .001) (Figure 8).

Comparison of response of participants according to frequency of brushing .Among the 370 subjects 70.8% brushed once daily 156 belonged to mild OSA, 84 moderate and 22 severe OSA group. Among the 370 subjects 29.2% brushed twice daily

65 belonged to mild OSA, 35 moderate and 8 severe OSA group. There was no statistically significant difference between responses of participants (p=0.951) (Table 6).
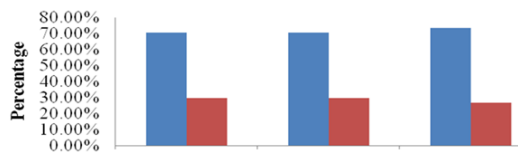

Figure 8: Distrubution of OSAsubjects according to frequency of brushing. Note: (■) Once: Mild-70.60%, Moderate-70.60%, Severe-73.30%,(■) >1: Mild-29.40%, Moderate-29.40%, Severe-26.70%.

Table 6: Distribution of study subjects according to mean DT, MT, FT, DMFT, OHIS and CPITN scores.

Brushing frequency		OSA category			Total
		Mild	Moderate	Severe	
Once	N	156	84	22	262
	%	70.60%	70.60%	73.30%	70.80%
>1	N	65	35	8	108
	%	29.40%	29.40%	26.70%	29.20%
Total	N	221	119	30	370
	%	100.00%	100.00%	100.00%	100.00%

Comparison of response of participants according to use of other oral hygiene aids. Among the 310 subjects who used other oral hygiene aids , 178 belonged to mild OSA, 97 moderate and 26 severe OSA group. Among the 370 subjects, 69 subjects i.e. 18.6% did not use other oral hygiene aids .Among the subjects who did not use other oral hygiene aids 43(19.5%) belonged to mild OSA , 22 moderate and 4 in severe OSA group .There was no statistically significant difference between response of participants (p=0.720) (Table 7).

Table 7: Inter-group comparison of responses of the participants according to use of other oral hygiene aids. Note: χ2=0.656, p=0.720.

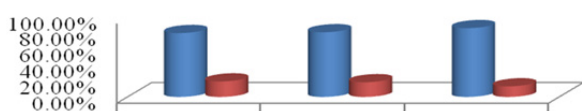| Other oral hygiene aids		OSA category			Total
		Mild	Moderate	Severe	
Yes	Count	178	97	26	301
	%	80.50%	81.50%	86.70%	81.40%
No	Count	43	22	4	69
	%	19.50%	18.50%	13.30%	18.60%
Total	Count	221	119	30	370
	%	100.00%	100.00%	100.00%	100.00%

Figure 9: Inter group comparision of responses of the participants according to use of other oral hygiene aids. Note: (■) YES: Mild-80.50%, Moderate-81.50%, Severe-86.70%, (■) NO: Mild-19.50%, Moderate-18.50%, Severe-13.30%.

Comparison of OSA subjects with decayed, missing, filled teeth, oral hygiene and periodontal parameters (Table 8).

Table 8: Inter-group comparison of OSA subjects with decayed, missing, filled teeth, oral hygiene and periodontal parameters.

Comparision of OSA		N	Mean	Std. Deviation	F value	p value and significance
Decayed teeth	Mild	221	2.5928	2.48024	1.764	0.173
	Moderate	119	3.1261	2.5397		
	Severe	30	2.6667	2.69525		
Missing teeth	Mild	221	0.2489	0.58509	0.317	0.728
	Moderate	119	0.2017	0.53011		
	Severe	30	0.2667	0.58329		
Filled teeth	Mild	221	0.5023	0.71111	0.183	0.833
	Moderate	119	0.4706	0.66158		
	Severe	30	0.4333	0.50401		
DMFT	Mild	221	3.3484	2.82857	0.967	0.381
	Moderate	119	3.7899	2.82505		
	Severe	30	3.3667	2.97673		
OHIS	Mild	221	1.4548	0.67638	1.395	0.249
	Moderate	119	1.3588	0.54078		
	Severe	30	1.3	0.63626		
CPITN	Mild	221	2.5023	1.17792	2.146	0.118
	Moderate	119	2.7395	1.10823		
	Severe	30	2.8	1.03057		

Decayed Teeth (DT): Among the mild OSA group mean number of decayed teeth were 2.59 ± 2.48, among moderate OSA group the mean number of decayed teeth were 3.12 ± 2.53 and among severe OSA group the mean number of decayed teeth were 2.66 ± 2.69 respectively. It was found to be statistically non significant (p=0.173) (Figure 10).
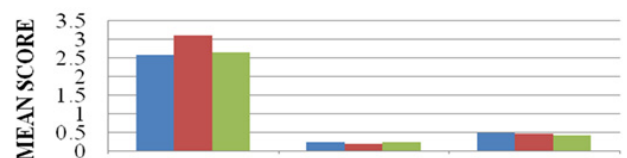

Figure 10: Mean decayed, missing, filled teeth of OSA subjects. **Note:** (■) Mild: Decayed-2.59, Missing-0.24, Filled-0.5 (■) Moderate: Decayed-3.12, Missing-0.2, Filled-0.47 (■) Severe: Decayed-2.66, Missing-0.26, Filled-0.43.

Missing teeth: Mean number of missing teeth among mild OSA group were 0.24 ± 0.58, 0.20 ± 0.53 in moderate OSA group and among severe OSA group were 0.26 ± 0.58 respectively. It was found to be statistically non-significant (p=0.728).

Filled teeth: Mean number of filled teeth in mild OSA group was 0.50 ± 0.71, moderate OSA group 0.47 ± 0.66 and in severe OSA group was 0.43 ± 0.50 respectively. It was found to be statistically non-significant (p=0.833).

DMFT (Decayed Missing Filled Teeth): Mean number of decayed missing filled teeth among the mild OSA group was

3.34 ± 2.82, 3.78 ± 2.82 moderate OSA and 3.36 ± 2.97 among severe OSA group and is statistically non-significant (p=0.381).

Oral Hygiene Index Simplified (OHIS): The mean oral hygiene scores among mild OSA group was 1.45 ± 0.67, 1.35 ± 0.54 in moderate OSA group and 1.30 ± 0.63 in severe OSA group respectively and is statistically non-significant (p=0.249).
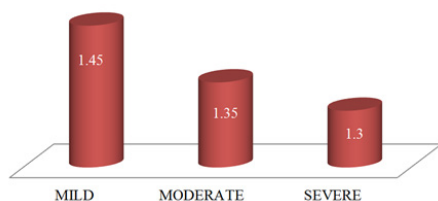

Figure 11: Mean oral hygiene score of OSA subjects. Note: Mild-1.45, Moderate-1.35, Severe-1.3.

Community Periodontal Index for Treatment Needs (CPITN): The mean periodontal score among the mild OSA group was 2.50 ± 1.17, 2.73 ± 1.10 in moderate OSA group and 2.80 ± 1.03 among severe group respectively and it was statistically non-significant (p=0.118) (Figure 12).
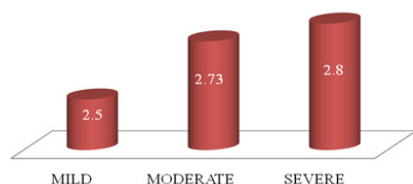

Figure 12: Mean CPITN score of OSA subjects. Note: Mild-2.5, Moderate-2.73, Severe-2.8.

Discussion

As the dentist routinely examines oral cavity there are few findings which may be linked with OSA. The present age and gender matched study was conducted to assess and compare these oral findings of high risk OSA patients with that of no risk OSA patients. This descriptive cross-sectional study was conducted to assess prevalence of OSA and its association with oral health in subjects aged 35 years-44 years attending a dental teaching institution in Virajpet, India [9].

Varieties of methods have been utilized for assessment of sleep quantity and quality like administration of the questionnaire, clinical interviews, sleeps diaries, etc., in our study, we have selected Berlin questionnaire for assessing sleep apnea. It has 86% sensitivity and 77% specificity for identifying "mild, moderate" and "severe" OSA using a cut-off global score of 5. It also has internal consistency and a reliability coefficient (Cronbach's alpha) of 0.68 for its 3 domains. Numerous studies using the questionnaire in a variety of older adult population internationally have supported high validity and reliability. Age group of 35 years-44 years was chosen as it is a WHO index group and is a standard age group for surveillance of oral health conditions in adults. As there is a dearth of similar studies in the literature, effort has been made to compare the findings of the present study with studies done on other age groups within the country and also with other countries [10].

Dental sleep medicine is a rapidly growing field that is in close and direct interaction with sleep medicine and comprises many

aspects of human health. As a result, dentists who encounter sleep health and sleep disorders may work with clinicians from many other disciplines and specialties. The main sleep and oral health issues that are related are obstructive sleep apnea, chronic mouth breathing, sleep-related gastroesophageal reflux, and sleep bruxism. The multiple interactions between oral health and sleep underscore the need for an interdisciplinary clinical team to manage oral health related sleep disorders that are commonly seen in dental practice [11].

In the present study, 740 participants in the age group of 35 years-44 years were included i.e 370 subjects with OSA and 370 subjects without OSA were considered. The number of subjects studied were 370, out of these 179 (52.8%) were male and 191 (47.6%) were female. The prevalence of OSA, in males was found to be higher compared to females. Eva and Karl 5 in an epidemiological review stated that OSA is more common in men than women. The male; female ratio is 2; 1 in general populations. Possible explanations for the male predominance include hormonal effects on upper airway muscles and collapsibility, gender differences in body fat distribution and differences in pharyngeal anatomy and function. Hormonal influences could play an important role in the pathogenesis of OSA, as the prevalence seems to be higher in post- versus pre-menopausal women. The patho-physiological roles of hormones are, however, unclear and the gender differences in prevalence remained also in the elderly. Hypertension, obesity and age were associated with sleep apnea in females. It is, thus, possible that sleep apnea has not been observed as a public health problem in females, as they have other signs of sleep apnea than males. The prevalence of OSA symptoms was 21.7% in female and 78.3% in male adult dental patients in Saudi Arabia. The results were similar with other studies indicating males at higher risk for OSA as compared to females due to the difference in fat deposition area over the body [12].

As it was an age matched study, the mean age groups were similar in OSA and non OSA group .The mean age of the non OSA group was 40.12 ± 2.50 years, and 40.05 ± 2.58 yrs, for OSA group this might account to fact that according to research by national health and nutrition survey, US in subjects who belong to age group of 35 years-49 years, 94.3% is caries effected [13].

Among the participants from non OSA group, 50.1%, brushed once daily and 49.8% brushed twice daily. Among the participants from the OSA group, 49.9% and 50.2% brushed once and more than once respectively. There was no statistically significant difference between the responses of both the populations (p=1.000).The results are in contrast with the study conducted in Saudi Arabia 21 where 78.9% of low risk subjects brushed more than once daily and 21.4% of high risk category brushed more than once daily and 77.2% of low risk subjects brushed once daily and 22.8% of high risk category brushed once daily [14].

When the responses of study participants according to their use of other oral hygiene aids. Among the participants from non OSA group 48.6%, 51.4% used other aids and did not use other oral hygiene aids, among the participants from the study population, 51.4% and 44.8% used other aids and did not use other oral

hygiene aids. There was no statistically significant difference between the responses of both the populations (p=1.000). Low risk subjects the of use of other aids i.e dental floss was found to be 79.5% and among high risk OSA it was found to be 20.5% .and there was no statistically significant association between the same [15].

The comparison of study subjects according to mean DT, MT, FT, DMFT, OHIS and CPITN scores oral health status variables on basis of sleep health status. In a study conducted SEO et al in Korea using psg/home based sleep test ,the prevalence of OSA was 46.6% and 60% of OSA subjects had periodontitis and there was a statistically significant association between periodontitis and OSA. Parameters along with plaque were analyzed, and the results are in accordance with our study were OSA was not significantly associated with the presence of moderate or severe periodontitis except for % of sites with plaque. (P=0.037), but not significantly associated with % sites with bleeding on probing or CAL [16].

Inter-group comparison of OSA subjects with decayed, missing, filled teeth, oral hygiene and periodontal parameters does not show any significant association. Turkey where he found no significant association between periodontal parameters like CAL, BOP with OSA severity. These findings reveal that there is an independent relation between OSA categories and severity of oral diseases [17].

Sleep deprivation adversely affects cognition and motor performance. This might impair an individual's capacity to maintain adequate oral hygiene practices .If individuals are not aware about the sleep disorders, consequences of this on their life and are seen taking snoring lightly which is one of the sign of sleep disorders, it is necessary that dentist takes up this charge of screening his day-to-day patients when he notices any of the oral findings related to OSA and educate the patients accordingly to take treatment of the same. This study can throw light on the important role a dentist can play to identify the signaling oral findings of high risk OSA and refer those patients to sleep physicians. In the long run, early detection of OSA patients by the dentists will result in good prognosis [18].

As the present study is based on a questionnaire among patients attending a health care set up, hospital response bias is inherent in this study as, it is possible that individual participant replies are influenced by response style in each person's answers to respective questions. This could have been overcome by use of gold standard PSG or combination of PSG and clinical tests. Strength of the present study lies in the fact that there are fewer studies which have assessed the sleep apnea in a dental set up particularly in South India, but there are fewer studies in other parts of the globe where OSA symptoms have been studied and they have found association of prevalence of OSA and quality of oral health. The medical aspects were not considered even the parameters like anthropometric measurements will play a major role in OSA. Also other age groups were not considered in the study. Further studies are recommended which may include other age groups and also include other variables like stress characteristics, occupational workshifts, dietary habits, etc which affects oral conditions.

The results indicate that there is need to motivate people by giving information and most importantly paying individual attention to oral health issues in sleep disordered individuals [19].

Conclusion

The study has shown that a considerable proportion of adults attending dental hospital in Virajpet, India are at higher risk for obstructive sleep apnea. Males, poor oral hygiene habits, and those with history of periodontitis were at higher significant risk for OSA compared to their counterparts. Hence as a public health dentist, there is a need to educate and spread knowledge of proper dental care and prevention of dental diseases through the dentists, outreach programs and relevant public health awareness measures. The services provided should be based on the felt needs of the population so that both awareness and the utilization of health services can be increased thereby improving the oral health status of the population.

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