

Obstructive sleep apnea in dentistry: A knowledge, attitude and practice (KAP) study

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Abstract

Introduction: To investigate the knowledge, attitudes, and clinical practice regarding obstructive sleep apnea (OSA) among general dentists and dental specialists.

Material and methods: A cross-sectional study was carried out during the period from December 2020 to April 2021. Self-administered questionnaires, including a cover letter, were distributed to 170 dentists and specialists at teaching hospitals and private practices in Islamabad and Rawalpindi.

Results: 153 participants (90%) completed and returned the questionnaire. Increased years of clinical experience were not significantly associated with lesser knowledge about OSA. However, there was a statistically significant difference between general practitioners and specialists ($p < 0.001$). Most respondents indicated positive attitudes regarding OSA. The majority didn't have any clinical experience regarding the management of OSA patients.

Conclusions: Limited knowledge and clinical practice regarding OSA management among dentists and dental specialists. Development of additional continuing educational courses and practical implementation strategies should be considered in order to overcome these barriers.

Keywords: Assessment; dental education; oral health; public health; sleep apneas

Introduction

Obstructive sleep apnea (OSA), a multifactorial disease which is characterized by an episodic cessation of breathing because of the narrowing of the upper airways during sleep.¹ Various symptoms such as snoring, gasping, choking, or silent pauses in breathing during sleep, day time hypersomnolence and fatigue are associated with it.² It constitutes a major

public health problem, affecting 10–20% of the adult population worldwide.³ Factors that contribute to OSA include various behavioral, systematic and anatomic factors such as obesity, sleeping in supine positions, male gender, aging, menopause, fluid retention, smoking, maxillary or mandibular retrognathism, increased lower face height, large tongue, elongated soft palate, and an inferiorly positioned hyoid bone.⁴

In Pakistan, a recent study showed that OSA have significant morbidity affecting both genders making it a cause of great health concern.⁵ Lack of awareness regarding OSA often leads to underdiagnoses thus under treatment. This has led to long term health related implications such as cardiac problems, hypertension, and other problems such as impairment of function which impacts the quality of life (QOL).

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OSA is diagnosed by history, examination, polysomnography, limited channel testing, split-night testing, and oximetry. Overnight polysomnography (PSG) in a sleep laboratory is the diagnostic gold standard.^{6,7}

Orthodontist plays a vital role in management of OSA patients, starting from diagnosing the patients to imparting relevant treatment. In everyday practice, one can observe various signs and symptoms related to OSA such as high arched or narrow hard palate, jaw relations, relative tongue size, and other soft tissue characteristics (e.g., elongated or enlarged uvula, lateral peri-tonsillar narrowing, tonsillar hypertrophy which aid in diagnosing OSA. An OSA patient may also present with orofacial pain symptoms, bruxism, and temporomandibular disorders (TMD)⁸ which commonly report to dentists.

Among various treatment modalities used to treat OSA; CPAP is the gold standard.⁹ Apart from CPAP, Oral Appliances, such as Mandibular Advancement appliances (MAD) are used as an effective treatment option for patient presenting with mild to moderate OSA, mandibular retrognathia, or who are intolerant towards CPAP. Other treatment modalities include lifestyle changes, Orthognathic Surgery or medical treatment.^{10,11}

This emphasizes on the pivotal role of dentist and dental specialist in improving the lives of patient suffering from OSA. They can identify patients, provide them with treatments and refer them to the concerned physician, if needed. This necessitates that dentists should be knowledgeable about the diagnosis, treatment options for OSA and be able to identify the need to include this subject as a component of curriculum at both under and post graduate levels of dental education.

In this regard, no studies have been previously carried out in Pakistan. The purpose of this study is to identify the gaps in knowledge, behavioral pattern and clinical practices regarding OSA management among general dental practitioners and dental specialist so that the emphasis can be laid upon the intervention regarding these barriers.

Material and Methods

A cross sectional study was done in which a questionnaire was used to evaluate the knowledge, attitudes, and clinical practices (KAP) of dental practitioners and dental specialists. The validated questionnaire was adapted from a previous study done on Lithuanian dentist.³

The questionnaires developed included demographic data, items on dentists' basic knowledge of OSA; risk factor, sign and symptoms associated with it, items addressing attitudes and opinions, and items asking to mark previous clinical experiences and daily routines related to OSA.

Ethical approval was obtained from the Ethics Review Committee, Margalla Institute of Health

Sciences. Assuming 90% Confidence interval and 5% margin of error, the sample size was 152 which was calculated using the finding of J. Laurynas.³ WHO calculator was used to calculate sample size.

The inclusion criteria was general dental practitioner who had at least completed 1 year of house job, and specialists who had completed any 4 year training program e.g. Master of Dental Surgery (MDS) or Fellowship of the College of Physicians and Surgeons (FCPS), pertaining to any clinical field of dentistry. Those individuals who were undergoing specialty training were excluded from the study.

Before distribution of the questionnaire to the targeted population, it was distributed among the subject matter experts who judged the questionnaire for its relevance, understanding and clarity and corrections were made accordingly. Then, questionnaires were manually distributed among the dentists and the specialists working at different hospitals and private settings in Islamabad and Rawalpindi. The questionnaire included the cover letter with the consent form for participation in the study. The study was carried out from Dec 2020 to April 2021.

Responses were coded and analyzed using IBM® Statistical Package for the Social Sciences (SPSS®) version 25.0. Descriptive

statistics were used to summarize the data. All Quantitative variables were measured as mean and standard deviation (SD). The chi-square test and Fischer's exact test was used to compare difference between categorical variables.

For qualitative data, normal distribution was tested using the Shapiro-Wilk test. Data in this study was not normally distributed. Non Parametric test, Man Whitney U test was used to compare two groups and Kruskal-Wallis test was used to compare the difference between more than 2 groups. In all statistical analyses, a p -value of < 0.05 was considered to be statistically significant.

Results

155 out of 170 dentists completed and returned the questionnaires. 65.8 % (n=102) were general dentists and 34.2% (n=53) were specialist dentists. Among specialists, the highest percentage who filled the questionnaires were Restorative dentists; 30.2(n=16) and Orthodontists; 28.3 (n=15) followed by Prosthodontists, Oral and Maxillofacial Surgery and Periodontists 17% (n=9), 13.2% (n=7) and 5 % (n=3) respectively.

Furthermore, the study included young dentists with work experience of ≤ 5 years (n=62, 42.6%), dentists with professional work experience of 5-16 years (n=66, 42.6%), followed by, 16-26 (n=13, 8.4%) and 26 and more (n=14, 9.0%) years of practice.

Knowledge scores were computed for each respondent as correct and incorrect answer, with "don't know" considered as an incorrect answer. There was a significant difference between knowledge of general dentist practitioners and specialist dentist ($p < 0.001$).

The knowledge score ranged from 0-19, with the average mean score (mean \pm SD) 8.7 ± 4.2 . The average mean score did not significantly differ according to years of experience with least experience mean being 9.03, 6-15 years'

experience mean being 8.8 ($p = 0.506$), 16-25years experience mean being 7.8($p = 0.138$) and 26 and more having mean of 7.9 ($p = 0.371$).

The result didn't statistically differ between different dental specialties; with mean score of 6.5 of Oral and Maxillofacial surgery specialists in comparison to Orthodontists (4.4; $p = 0.79$), Periodontists (6.0; $p = 0.818$), Restorative dentists (8.6; $p = 0.237$) and Prosthodontists (5.2; $p = 0.310$).

The risk factors, signs and symptoms and consequences of OSA were moderately recognized irrespective of years of practice by research participants. However, these parameters were poorly recognized by general dental practitioners. Nine of these parameters did differ significantly between general dental practitioners and specialist dentists. Among these, the risk factors which differed included role of weight, short and wide neck circumference and alcohol consumption ($p = p < 0.001$). The signs included chronic insomnia, daytime hypersomnolence, and snoring and morning headache ($p < 0.001$). Long term consequences of OSA such as systematic hypertension and Diabetes Mellitus Type II were not recognized by the general dentists ($p < 0.001$).

Knowledge variables didn't differ significantly between the years of experience as shown in Table I.

Weight control (77.4%), Orthognathic surgery (64%), MAD's (58%) and CPAP (57.1%) were generally recognized as an effective mode of treatment whereas medication (38.7%), and tennis ball attached to pajama top or nightgown (7.1%) were poorly recognized. There was a significant difference between general practitioners and specialists in recognizing weight control ($p < 0.001$), CPAP ($p = 0.005$) as effective modes of treatment. No significant difference was present for Orthognathic surgery and MAD's whereas,

Table I: Knowledge of risk factors, signs and symptoms and possible consequences of OSA among general practitioners (GP) and dentists with a specialist diploma (SPD), and according to years of professional work experience.

	Years of Professional experience				General Practitioner or a Specialist dentist				
	≤5	6-15	16-25	≥26	<i>P value</i>	GP	SPD	Total	<i>P value</i>
Number (percentage) of questions answered correctly	62	66	13	14		102	53	155(100)	
<i>OSA is more common in people with obese patients(true)</i>	44(71)	52(78.8)	10(76.9)	10(71.4)	0.763	68(66.7)	48(90.6)	116	0.01
<i>OSA is more common in elderly people(true)</i>	33(53.2)	29(43.9)	5(38.5)	6(42.9)	0.654	50(49.0)	23(45.0)	73	0.506
<i>Tongue size is important for the development of OSA(true)</i>	51(82.3)	41(62.1)	7(53.8)	10(71.4)	0.37	72(70.6)	37(69.8)	109	0.920
<i>A short and wide neck is a risk factor for OSA(true)</i>	31(50.0)	37(56.1)	8(61.5)	10(71.4)	0.494	46(45.1)	40(75.5)	86	0.000
<i>Alcohol consumption can aggravate OSA(true)</i>	25(40.3)	33(50.0)	9(69.2)	9(64.3)	0.149	43(42.2)	33(62.3)	76	0.018
<i>Craniofacial structures (Structure of Skull and face) is related to OSA(true)</i>	50(80.6)	45(68.2)	9(69.2)	11(78.6)	.403	71(69.6)	44(83.0)	115	0.070
<i>OSA is more common in men than women(true)</i>	19(30.6)	28(42.4)	7(53.8)	3(21.4)	0.182	33(32.4)	24(45.3)	57	0.113
<i>Sleep posture has a connection with OSA(true)</i>	51(82.3)	45(68.2)	8(61.5)	11(78.6)	0.188	73(71.6)	42(79.2)	115	0.300
<i>OSA may be associated with chronic insomnia(true)</i>	36(58.1)	42(63.6)	8(61.5)	10(71.4)	0.813	57(55.9)	39(73.6)	96	0.031
<i>Drowsiness during day time may be a sign of OSA(true)</i>	33(53.2)	48(72.7)	9(69.2)	8(57.1)	.126	56(54.9)	42(79.2)	98	0.03
<i>Bruxism during sleep can often occur in patients with OSA(true)</i>	25(40.3)	23(34.8)	7(53.8)	7(50.0)	0.510	38(37.3)	24(45.3)	62	0.333
<i>Snoring may be associated with OSA(true)</i>	47(75.8)	55(83.3)	12(92.3)	10(71.4)	0.406	74(72.5)	50(94.3)	124	0.01
<i>OSA is often characterized by morning headache(true)</i>	30(48.4)	43(65.2)	8(61.5)	10(71.4)	0.185	47(46.1)	44(83.0)	91	0.00
<i>Attention deficient Hyperactivity Disorder can indicate OSA(true)</i>	21(33.9)	29(43.9)	7(53.8)	8(57.1)	0.278	35(34.3)	30(56.6)	65	0.08
<i>Increased night sweats can be associated with OSA(true)</i>	27(43.5)	22(33.3)	3(23.1)	7(50.0)	0.329	39(34.3)	30(56.6)	59	0.08
<i>OSA can be associated with cardiovascular problems(true)</i>	27(43.5)	34(51.5)	7(53.8)	8(57.1)	0.706	45(44.1)	31(58.5)	76	0.09
<i>OSA may lead to systemic hypertension(true)</i>	27(43.5)	32(48.5)	11(84.6)	8(57.1)	0.055	41(40.2)	37(69.8)	78	0.000
<i>OSA can cause diabetes mellitus (type II) (true)</i>	9(14.5)	10(15.2)	7(53.8)	3(21.4)	0.014	12(11.8)	17(32.1)	29	0.002
<i>Untreated OSA is associated with an increased risk Of mortality(true)</i>	32(51.6)	27(40.9)	9(69.2)	6(42.6)	0.246	45(44.1)	29(54.7)	74	0.210

Notes: Number (percentage) of respondents in each category answering items (n = 19) correctly. χ^2 test. OSA: Obstructive Sleep Apnea. Bold values indicate statistical significance ($p < 0.05$).

Tennis ball attached to pajama top was poorly recognized as a mode of treatment regardless of specialty.

OSA as a health disorder was agreed upon by 81.3% of all respondents. Only 35.2% were confident that they can suspect patients at risk of OSA. 80% believed that a dentist can suspect OSA by asking specific questions and 86% accepted that dentists could participate in treatment of OSA. However, only 41.9% agreed that Oral Appliances could be given by general dentists. There was a consensus (95.5%) that dental and medical profession should cooperate in the diagnosis and treatment of OSA.

Dentist's specific daily routine for suspected OSA patients were not quite common. There were no significant differences regardless of years of experience and specialty. Less experienced dentists were more likely to ask about respiratory arrest during night time than their experienced colleagues ($p=0.014$) same was the case between general dentists in comparison to specialists ($p=0.019$). Dentists with more experience were likely to examine other intraoral structures such as palate, tongue size, uvula than their less experienced

colleagues ($p=0.012$) as shown in Table II. Approximately 58.7% and 33.5% of the dentists had never or less than 5 times referred a suspected patient to any of the sleep disorder specialist, respectively. Approximately 70% were never referred a patient from any other medical professional or had given Oral Corrective appliances to any of OSA patients. No significant difference was present between the years of experience ($p=0.188$) and specialty ($p=0.393$) regarding the treatment with Oral Appliances. Among various specialties, there was a significant difference among specialists of Oral and Maxillofacial Surgery and Orthodontists ($p=0.044$), Periodontists ($p=0.031$), Restorative dentists ($p=0.02$) and Prosthodontists ($p=0.031$).

In terms of learning source of Oral Appliances for treatment of OSA; 30% learned it in dental school or university, 30% in Professional development Courses and 31% learned through scientific articles and 21.9% got to know about it while surfing internet. Approximately 56% believed that they had little knowledge about OSA.

Table II. Dentists' daily routines related to OSA among general practitioners (GP) and dentists with a specialist diploma (SPD), and according to years of professional work experience

Number (percentage for answering Often and Always)	Years of Professional Work Experience				General practitioners or a specialist dentist				
	≤5	6-15	16-25	≥26	<i>p</i>	GDP	SPD	Total	<i>p</i>
Does the patient snore?	61 48(78%)	66 40(60%)	13 8(61%)	14 7(50%)	0.252	102 71(69.6)	53 32(60)	155 103	0.130
How often does the patient feel tired during the day?	40(65%)	36(54%)	6(46%)	10(71%)	0.351	63(61.7)	29(54.7)	92	0.148
Does the patient have a headache when he wakes up?	39(63.9%)	38(57.5)	7(53.8)	9(64.2)	0.071	61(59.8)	32(60)	93	0.675
Has the patient experienced respiratory arrest during sleep?	49(80%)	41(62.1)	7(53.8)	9(64.2)	0.014	73 (71.5)	33(62)	106	0.019
Does the patient grit his/her teeth at night?	45(73.7)	48(72.7)	7(53.8)	7(50)	0.0642	71(69.6)	36 (67.9)	107()	0.672
During the dental examination you also examine other structures (such as palate, tongue size, uvula) of the oral cavity	47(77)	55(83.3)	11(84.6)	14(100)	0.012	82(80)	45(84.9)	135	0.940

Fisher exact test. OSA: Obstructive Sleep Apnea

Notes: Number (percentage) of respondents in each category answering "often" and "always". χ^2 test.

Bold values indicate statistical significance ($p < 0.05$).

Discussion

In Pakistan, this study is the first attempt to assess knowledge, attitude and clinical practice (KAP) of dentists and dental specialists regarding Obstructive Sleep Apnea (OSA). As it is a major public health concern, it is imperative for every health care worker to identify patients with signs and symptoms of OSA, thus emphasizing the substantial role of a dentist in management of OSA. General dental practitioners are in most instances, first point of contact between any healthcare worker and patient, who can identify OSA and refer them to sleep physicians or even treat them with Oral Appliances.¹² Hence, their knowledge with respect to OSA should be up to the mark so that they can screen patients for OSA and have a positive attitude towards referring patients to physicians for their diagnosis and treatment.

Findings of this study showed that specialists were more knowledgeable than general dental practitioners regarding the risk factors, signs and symptoms and possible consequences of OSA. These findings were similar to conclusions drawn by Vuorjoki-Ranta et al.⁸ Another research by Kale et al also showed similar findings that there was lack of knowledge among general dental practitioners about screening and diagnosis of OSA.¹³ The rationale behind these results from our study could be linked to a more advanced educational level of specialists in comparison to general dental practitioners.

In our study, the difference between years of experience and knowledge levels were statistically insignificant. Vuorjoki Ratna et al.⁸ research results also presented similar findings in respect to knowledge levels. However, this was in contrast to the outcomes of Jokubauskas et al.³ who elaborated that less experienced dentists (young dentists) were aware more than experienced ones. Lack of significance in our research could also be due to small sample size in the experienced category, and among these experienced dentists, a higher percentage were of specialist dentists who had better knowledge

levels in contrast to general dental practitioners.

In respect to the modes of treatment, Weight loss, CPAP, Orthognathic surgery and MAD's were generally better recognized as a mode of treatment whereas medication and tennis ball attached to the pajama top were poorly recognized. Approximately 60% of the general dentist's involved identified Orthognathic surgery and MAD's as possible treatment options. However, Kale results showed contrasting results with 60% of dental practitioners being not aware of Oral appliances as a treatment modality. A recent literature review also highlighted the difference in recognizing MADs and Orthognathic surgery among general dental practitioners and specialists contrary to our findings where no significant difference was found among the general dental practitioners and specialists.¹⁴

It should be noted that mean overall knowledge score of respondents were lower, that emphasize limited knowledge of dentists irrespective of specialty. This appears to be because of lack of education on dental sleep medicine in our undergraduate and postgraduate educational programs.

Dentists and specialist in the present study did show a positive attitude towards OSA. Bian et al. ⁽¹⁵⁾ concluded that approx. 93% of General Dentist believed OSA to be a health disorder and 99% were of the opinion that Dentist and Physicians should collaborate in order to manage it. Respective percentages (74.2% and 78.8%) were different in the study by Jokubauskas et al.³ Similarly, our research percentages were coherent with the above-mentioned researches (81.3% and 95.5% respectively) signifying the positive attitude.

A paltry amount of examined dentists believed that general dental practitioners can provide Oral Appliances similar to the findings of Vuorjoki Ratna et al.⁸ As per the guidelines given by American Academy of Dental Sleep Medicine, it is the role of a qualified dentist "a dentist who treats sleep-related breathing disorders and who

continually updates their dental sleep medicine knowledge and training") to provide with the Oral Appliances followed by the referral to a physician, in order to achieve effective results.^{16,17}

Clinical practice regarding OSA management involves diagnosis, treatment with Oral Appliances and referral to or by the physicians were generally ranked as poor. Less than 30% were referred a patient by their medical professional colleagues or had given an Oral Appliances. These results were parallel with the findings of study by Ashraf et al.¹⁸ Referral from medical professional is dependent on the knowledge of physician about the role of a dentist in treating OSA. It is likely that awareness with respect to role of a dentist in managing OSA with Oral Appliances is also limited in medical profession in Pakistan, thus contributing to low referrals of the diagnosed patient for treatment with Oral Appliances.

Another result to be noted is that Oral and Maxillofacial Specialists had provided more Oral Appliances than their fellows from other dental specialties and were also referred more number of times by medical professionals. The reason might be that Oral and Maxillofacial Surgeons often work in close proximity with medical professionals and thus have a better chance for being referred a patient in comparison to an Orthodontist or Prosthodontist.

American academy of dental sleep medicine defined screening protocols to be followed by a qualified dentist during the examination of any presenting patient. These guidelines define the screening goal to assess the patient or bed partner's perception of both nocturnal and daytime symptoms (e.g., snoring, witnessed apneas, gasping, and sleepiness).¹⁹ Findings from our study suggests that dentists frequently asked these screening questions from patients who they suspected to have OSA. These finding were in contrast to the researches done previously who had a lower frequency of dentists asking these questions.^{3, 8} The reason behind the difference

between these finding was that the question asked in our survey was in regards to those patients who they suspected to have OSA, not as a routine part of dental and medical history.

Only 30% of all examined dentists had learnt OSA as part of their undergraduate or postgraduate curriculum at dental colleges. Majority of these dentist were specialist who had learned OSA as part of post graduate training program. As per the curriculum provided by the Pakistan Medical commission for undergraduate dental program, sleep medicine is not part of the curriculum. It is the prerogative of an institution to teach about the subject thus leading to lack of awareness among dentists regarding management of OSA and its importance as a major health issue.

American academy of dental sleep medicine defined the role of a dentist in screening, diagnosis, referral and treatment of OSA. These guidelines also emphasize on the importance of collaboration between a sleep physician and a qualified dentist to manage the patients suffering from OSA. The studies which were carried out on medical professionals²⁰ knowledge, attitude and clinical practices showed better results in comparison to dental professionals, highlighting the knowledge gap regarding OSA management in dental profession. This necessitates the addition of OSA as part of curriculum of undergraduate, postgraduate programs and also a major part of professional development courses so that general dental practitioners also have a fair chance of updating their knowledge regarding this subject.

Various strength of this study includes a higher response rate of about 90 %. Self-administered questionnaire which has low social desirability bias, low acquiescence bias, and willingness to disclose sensitive information, due to the assurance of confidentiality and anonymity.²⁰ The sample included dental community from all the major teaching hospitals and private practices

in Islamabad and Rawalpindi region thus providing a true image of level of knowledge and practices regarding OSA management.

Two of the limitation of this study were:

It is a questionnaire-based studies; which are subjected to various biases such as cognitive burden (i.e., visual channel of presentation requiring reading, following instructions, etc.), lower item response rates (i.e. incomplete questionnaire), question order effect (i.e. ability to preview the questions and adjust answers), and response-choice order effect (i.e. likelihood to begin with the first response option presented).

This result cannot be reflected upon Pakistan's dentists, as this study was not carried out Pan Pakistan and the sample size was relatively smaller.

Various KAP studies should be carried on dental practitioners, specialist regarding the awareness of OSA and studies which identify the knowledge gaps and barriers between medical and dental professionals with reference to OSA management and Oral Appliances.

Conclusions

In conclusion, dentists in this study reported limited knowledge of OSA, as well as scarce patterns of screening, referring, and managing OSA patients with OAs. Nonetheless, most of them indicated strong positive attitudes regarding this issue. It is important to emphasize that specialists who underwent 4 years of further training knew more about OSA than the general dentists owing to more advanced learning in postgraduate programs. Better cooperation between dental practitioners and physicians is pivotal for detection and provision of adequate treatment for patients with OSA. Additionally, development of additional educational courses and practical implementation strategies should be considered in order to overcome these barriers.

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