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Knowledge level of dental practitioners about obstructive sleep apnea

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Abstract

Objective: The importance of dentists in detecting and treating sleep disorders such as obstructive sleep apnea (OSA) and snoring is increasing daily. Therefore, dentists should have a good command of the clinical findings of OSA patients and should be included in the OSA treatment protocol when necessary. This study aims to measure dentists' level of knowledge about the diagnosis and treatment of OSA.

Materials and methods: A questionnaire was prepared using Google Forms WhatsApp to dentists in the 23-70 age range in Turkey, email and sent via Instagram and private social platforms like Facebook. The first part of the questionnaire contained basic questions providing demographic data, and the second part included questions about OSA. The data obtained were analyzed using the Statistical Package for Social Science version 23.0 (SPSS Inc., Chicago, IL, USA).

Results: A total of 584 dentists, 272 males, and 312 females, with a mean age of 29.45 ± 5.88 , participated in the survey. OSA knowledge scores of males were calculated as 11.87 ± 4.65 and 12.20 ± 4.23 for females. When the knowledge scores of 228 specialist dentists and 356 practitioners who participated in our study were compared, a statistically significant difference was found ($p < 0.05$). It was determined that 30 (5.1%) of 584 participants had an ESS score of 11 or higher. It was concluded that 23.8% of the participants were overweight, and 7.5% were obese. No significant correlation was found between ESS scores and BMI values ($p > 0.05$).

Conclusions: Although dentists do not have enough information about OSA diagnosis and treatment, they want to improve themselves on this issue. The dental education curriculum in Turkey is not sufficient for OSA. In light of our study, the dentistry curriculum can be updated and complementary training can be organized for graduate physicians.

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Introduction

Obstructive sleep apnea (OSA) is a vital health problem that can affect the quality of life by causing blood oxygen desaturation and leading to life-threatening complications (1). OSA can be due to intermittent partial (hypopnoea) or complete (apnoea) obstruction of the upper airway and collapse of the pharynx in the adult population (2,3). Common features of OSA include excessive daytime sleepiness, sleep fragmentation, and repetitive apnoea/hypopnoea (3,4). The main predisposing factor for OSA is obesity (5). It is associated with hereditary, older age, high stress, smoking, alcohol and periodontal disease, and orofacial anatomical abnormalities such as macroglossia, mandibular micrognathia, enlarged uvulas, and hypertrophy of palatine tonsil (6).

Polysomnography (PSG) involves the overnight recording of oxygen saturation and sleep breathing patterns, and it still serves as the gold standard or confirmatory test in diagnosing OSA (7). However, polysomnography is an expensive and time-consuming test that requires special equipment. In addition, increasing awareness of OSA in society causes an increase in the need and demand for polysomnography and long waiting lists for polysomnography appointments. For this reason, simple and reliable diagnostic methods have been developed to detect high-risk patients. One of the most accepted non-polysomnography diagnostic methods used in this subject is questionnaires (8). Clinical evaluation using a basic questionnaire can help us to diagnose the disease at an early stage to manage the patient (9) successfully.

The Epworth sleepiness scale (ESS), used to evaluate excessive daytime sleepiness, one of the common symptoms of OSA, is a simple scale consisting of eight items and rated over four points (8). Both doctors and dentists can easily apply it.

Treatment of OSA is based on the severity of symptoms, etiology of upper airway obstruction, and degree of clinical complications. Continuous positive airway pressure (CPAP) is the most effective treatment known until today, but it has insufficient patient compliance (10). Therefore, using oral appliance (OA) in treating OSA and snoring has increasingly become an alternative treatment modality for CPAP in patients with mild to moderate OSA (2,3,11). Therefore, dentists can play an important role in detecting, referring, advising, and treating patients with OSA (12,13). Therefore, it is significant to identify how well the present-day dentists are equipped to determine these patients early.

In this survey study, we aim to evaluate dentists' knowledge level about OSA. In addition, we aim to contribute to the literature by determining the tendency of dentists to OSA through ESS.

Material and methods

The Ethics Committee of Harran University approved the study protocol and procedures, and informed consent was obtained from all participants before the formal questionnaire was conducted (reference number: HRU/20.14.10; 17.08.2020).

In the direction of the relevant literature, a new questionnaire about OSA was developed for this study using previously used scales and evaluated as high reliability. Four experts (one statistician, one maxillofacial radiologist, and two prosthetic dentists) assessed the clarity of the statements and the adequacy of the content of the questionnaire that was prepared using Google forms. We performed a pilot questionnaire with 10 participants who were later excluded from the final analysis. According to the suggestions of these participants, we revised the questions that used the term "disorder," those that were difficult to understand, and those with grammatical errors.

The final online questionnaire was sent to dentists aged 23–70 by WhatsApp, email, and private social platforms, such as Instagram and Facebook. A stratified random sampling method was used in this cross-sectional observational study. Dental students were excluded from the study, and data were collected between July 1 and 7, 2021.

Participants were informed of the study's purpose, risks, and benefits, and they could opt out of the study—the questionnaire comprised 42 questions (single-choice, numeric, and open-ended). First, the participants were directed to complete the self-report questionnaire, and some personal information (e.g., age, sex, weight, and length) was collected through six questions (Q1-Q6). After, the ESS questionnaire (24 questions) was asked of all participants. The answers to the ESS questionnaire questions were scored as follows. Moreover, participants with ESS questionnaire scores of 11 and above were considered to have sleep apnea predisposition.

I never fall asleep = 0

Sometimes or very rarely, I fall asleep = 1

I usually fall asleep or sleep = 2

I often fall asleep or sleep = 3

Body mass indexes (BMI) were calculated by questioning the height and weight of the participants. The relationship between BMI and ESS scores was

Table 1: Questions in the survey

Questions in the survey	
Q1	It is not obligatory for the dentist to diagnose the sleep disorder, but dentists should be able to distinguish the symptoms of Obstructive Sleep Apnea and refer them to the relevant physician?
Q2	'Apnea' is a condition in which the upper airway is completely blocked during sleep?
Q3	'Hypopnea' is a condition in which the upper airway is partially blocked during sleep and the airflow is reduced?
Q4	Obstructive Sleep Apnea is the intermittent cessation of breathing during sleep. During sleep, the upper airway is either completely or partially obstructed?
Q5	Apnea/hypopnea index (AHI) is the number of apneas, hypopneas observed in one hour?
Q6	The severity of sleep apnea according to the results of polysomnography; If AHI is 5-20 attacks/hour, it is classified as mild, if AHI is 20-40 attacks/hour, it is classified as moderate, and AHI >40 attacks/hour is classified as advanced.
Q7	Severe snoring is observed in most patients with "Obstructive Sleep Apnea"?
Q8	Polysomnography is considered the gold standard for diagnosing sleep apnea and other sleep disorders?
Q9	Computed tomography, magnetic resonance imaging, nasalpharinoscopy, cone-beam computed tomography, cephalometric and panoramic films are imaging techniques used in sleep disorders?
Q10	Obstructive Sleep Apnea is associated with body mass index and obesity?
Q11	Untreated sleep apnea causes serious systemic diseases.
Q12	Bruxism is a movement disorder that can occur during sleep and is associated with Obstructive Sleep Apnea.
Q13	Sleep disorders are associated with temporomandibular joint disorders?
Q14	CPAP therapy is a more effective treatment than oral appliances?
Q15	Most of the patients prefer to use oral appliance instead of CPAP?
Q16	There is little evidence to support the notion that the use of oral appliances in patients with sleep apnea can lead to positive changes in blood pressure and a reduction in long-term cardiovascular morbidity and mortality?
Q17	Adjustable and custom-made oral appliances give better results than fixed and prefabricated appliances?
Q18	After oral appliance use, conditions such as temporomandibular joint disorders, posterior openbite, increased salivation, orthodontic movements in the teeth and deterioration of periodontal health can be observed?
Q19	Temporomandibular joint symptoms seen in patients using oral appliances are temporary?
Q20	Obstructive Sleep Apnea can also be seen in children?
Q21	In children with sleep-related respiratory disorders, snoring, nightmares, mouth breathing, hyperactivity, bruxism, failure in school life and behavioral problems occur?

investigated by grouping participants with a BMI value below 18 as low weight, between 18–25 as normal weight, those between 25 and 30 as overweight, and those with a BMI value of 30 and above as obese.

Moreover, finally, the participants' knowledge of OSA was evaluated by 21 questions (Table 1). These questions were answered on a yes/no basis with an additional "I do not know" option. A correct answer was assigned 1 point, and an incorrect/unknown answer was assigned 0 points. The total knowledge scores ranged from 0 to 21, and a higher score indicated better knowledge of OSA. Our questionnaire's Cronbach's alpha coefficient (indicating acceptable internal consistency) was 0.73 (14). Also, the participants were then asked to grade the level of knowledge on clinical signs, diagnosis, and treatment of obstructive sleep apnea between 1 and 10.

The data were analyzed using Statistical Package for Social Science version 23.0 (SPSS Inc., Chicago, IL, USA).

The median, minimum-maximum, and percentage values were calculated for descriptive statistics. The normality of the data distribution was tested using histograms and the Kolmogorov-Smirnov test. As the data were normally distributed, the Independent t-test was used for intergroup comparisons. The relationships between categorical variables were calculated using the Pearson chi-square test. In all analyses, $p < 0.05$ was considered to indicate statistical significance.

Results

A total of 584 dentists, 272 males and 312 females, with a mean age of 29.45 ± 5.88 , participated in the survey. OSA knowledge scores of male participants (11.87 ± 4.65) were calculated to be lower than female participants (11.87 ± 4.65) ($p > 0.05$).

A total of 356 (61.0%) general dentists and 228 (39.0%) specialist dentists participated in our study (Table 2). OSA knowledge scores of specialist dentists

Table 2: OSA scores of specialist dentists and general dentists

Speciality	N (%)	Mean±SD	p-value
Oral and Maxillofacial Surgery	28 (4.8)	12.55±4.56	p<0.005
Dentomaxillofacial Radiology	15 (2.6)		
Restorative Dentistry	22 (3.8)		
Endodontics	21 (3.6)		
Prosthodontics	54 (9.2)		
Orthodontics	20 (3.4)		
Pedodontics	39 (6.7)		
Periodontology	29 (5.0)		
General Dentists	356 (61.0)	11.74±4.33	

Table 3: Frequency of encountering/questioning/treating OSA by participants

	Never N (%)	Often N (%)	Total N (%)
Frequency of encountering to OSA	220 (37.7)	345 (59.1)	19 (3.3)
OSA	342 (58.6)	217 (37.2)	25 (4.3)
Oral Appliance Application Frequency	530 (90.8)	42 (7.2)	12 (2.1)
			584(100.0)

are statistically significantly higher than the OSA knowledge scores of general dentists (p<0.05).

Table 3 shows the frequency of encountering OSA, questioning OSA in the anamnesis, and applying OA treatment. It was found that 58.6% of the participants never questioned OSA in the anamnesis, and 90.8% never applied OA treatment.

Table 4 shows the distribution of the answers given by the participants to the questions measuring their OSA knowledge level. The most correctly answered questions were Q4 (92%), Q10 (84.8%), and Q3 (83.2), respectively, while the least correctly answered

questions were Q16 (19.7%), Q15 (27.6) and Q6 (28.8), respectively. The average scores given to the question in which the participants were asked to rate the level of knowledge about the clinical symptoms, diagnosis, and treatment of obstructive sleep apnea between 1 and 10 was calculated as 4.57±2.25. In addition, 65.5% of the participants stated that they did not receive OSA-related training at the university, and 70.2% stated that they would like to attend if there is an OSA-related training (Table 5).

Table 6 shows the relationship between participants' ESS questionnaire scores and BMI values. It was determined that 30 (5.1%) of 584 participants had an ESS score of 11 or higher. It was concluded that 23.8% of the participants were overweight, and 7.5% were obese. No significant correlation was found between ESS scores and BMI values (p>0.05).

Discussion

Early diagnosis of OSA is necessary to intervene in the disease early and to prevent complications and comorbidities that may impair the patient of living comfort before the disease progresses (15,16). Dentists have an important role in diagnosing OSA early and treating simple/moderate OSA (13,17-19). In our survey study, we aimed to collect data about the knowledge level of dentists in Turkey about the diagnosis and treatment of OSA.

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Table 4: Relationship between ESS and BMIs

	ESS score <10	ESS score ≥11	Total	p-value
BMI≤17.99	14 (2.4%)	0 (0.0%)	14 (2.4%)	0.083
18<BMI<24.99	361 (61.8%)	26 (4.5%)	387 (66.3%)	
25<BMI<29.99	137 (23.5%)	2 (0.3%)	139 (23.8%)	
BMI≥30	42 (7.2%)	2 (0.3%)	44 (7.5%)	
Total	554 (94.9%)	30 (5.1%)	584 (100.0%)	

Table 5: Distribution of the answers given by the participants to the survey questions

	Correct N (%)	Unknown N (%)	Incorrect N (%)		Correct N (%)	Unknown N (%)	Incorrect N (%)
Q1	485 (%83)	79 (%13.5)	20 (%3.4)	Q12	224 (%38.4)	201 (%34.4)	159 (%27.2)
Q2	378 (%64.7)	65 (%11.1)	141 (%24,1)	Q13	293 (%50.2)	171 (%29.3)	120 (%20.5)
Q3	486 (%83.2)	81 (%13.9)	17 (%2.9)	Q14	210 (%36)	349 (%59.8)	25 (%4.39)
Q4	537 (%92)	37 (%6.3)	10 (%1.7)	Q15	161 (%27.6)	364 (%62.3)	59 (%10.1)
Q5	227 (%38.9)	338 (%57.9)	19 (%3.3)	Q16	115 (%19.7)	392 (%67.1)	77 (%13.2)
Q6	166 (%28.4)	401 (%68.7)	17 (%2.9)	Q17	299 (%51.2)	269 (%46.1)	16 (%2.7)
Q7	428 (%73.3)	114 (%19.5)	42 (%7.2)	Q18	357 (%61.1)	203 (%34.8)	24 (%4.1)
Q8	245 (%42)	327 (%56)	12 (%2.1)	Q19	234 (%40.1)	289 (%49.5)	61(%10.4)
Q9	303 (%51.9)	217 (%37.2)	64 (%11)	Q20	445 (%76.2)	131 (%22.4)	8 (%1.4)
Q10	495 (%84.8)	64 (%11)	25 (%4.3)	Q21	471 (%80.7)	96 (%16.4)	17 (%2.9)
Q11	482 (%82,5)	86 (%14,7)	16 (%2.7)				

has reported that; The dentist may refer the patient suspected of having OSA to a sleep specialist for a final diagnosis. The sleep specialist is the person who determines whether OSA can be resolved with a simple oral device or requires a surgical approach. If the problem is at a level that can be solved with OA, the sleep specialist can refer the patient with OSA back to the dentist for personalized OA (20).

OSA treatments offered by dentists include mandibular advancement appliances (MAD), which are especially effective in simple and moderate OSA and preferred by patients, tongue holding or tongue stabilizing appliances (TSD), and maxilla-mandibular advancement (MMA) by orthognathic surgery (21,22).

MAD is an effective method to reduce the apnea-hypopnea index (AHI) (23). MAD as an alternative treatment in patients with OSA who cannot tolerate the use of CPAP has increased dentists' effectiveness and importance in treating OSA. (24).

The questions in our survey were created to determine the dentist's role in treating OSA, the definition, diagnosis, treatment of OSA, and the relationship of OSA with other diseases (25).

The questionnaire questions in our study are similar to the previously validated OSAKA (OSA Knowledge and Attitudes) questionnaire defined by Sperber and were created by scanning current publications measuring OSA knowledge level and attitude in the literature (7,15,18,26-31). In the literature, there are survey studies in which the OSAKA questionnaire is used (15,25,27), and there are also studies that do not use the OSAKA questionnaire (7,19,31).

All general practitioners and specialist dentists should be competent in identifying potential OSA patients and managing this disease. In many surveys that measure knowledge levels, most participants stated that they were inadequate in diagnosing and clinical management of OSA (7,15,31).

Ojeda et al. (15) measured the OSA knowledge level of medical doctors using the OSAKA questionnaire and reported that less than 50% of the participants could answer the questions correctly. In addition, although more than 70% of the participants reported that they were confident in identifying patients at risk, only 35% stated that they were confident in treating patients with OSA.

Table 6: Responses of the participants to the questions “Have you received training on OSA at the university and would you like to attend a training on OSA?”

	Yes n (%)	No idea n (%)	No n (%)	Total n (%)
Did you study OSA at university?	134 (%22.9)	66 (%11.3)	384 (%65.5)	584(%100)
Would you like to attend a training on OSA?	410 (%70.2)	82 (%14)	92 (%15.8)	

In their study measuring OSA knowledge level, Swapna et al. (7) found that trainee dentists and general dentists had a significant lack of knowledge, that all dental professionals should update their knowledge regularly, and that they should be adequately equipped to diagnose and treat such patients at an early stage. While 30% of the participants stated that they applied OA, most referred patients to a medical doctor. 65% of the participants stated that they were unaware of the diagnostic tests for the diagnosis of these patients, 63.5% of the participants stated that OSA can also be seen in children, and 85% of the participants wanted to participate in a training program to learn more about OSA. It was reported that the rate of giving correct answers in knowledge-based questions was higher in specialist dentists than in general dentists. Also, it was observed that the rate of correct answers in females was higher than in males (7).

In the questionnaire study of Jokubauskas et al. (31) (n 353), the knowledge and attitudes of dentists about clinical practice in patients with OSA were examined. This study stated that the level of OSA knowledge decreased as the years of clinical experience increased. There was no difference in the level of knowledge between specialists and general practitioners, and it was stated that most participants were inexperienced in the clinical management of OSA (19). Few of the participants note that they get educated before graduation in OSA management. Although 78.8% of the participants stated that dentists and medical practitioners should cooperate in diagnosing and treating OSA patients, the vast majority reported that they did not consult a sleep specialist or any specialist in the case of OSA.

Bian H. (13), in a survey study in which he measured the level of knowledge about OSA and OA, stated that 58% of dentists could not describe the common signs and symptoms of OSA, and 55% of dentists did not know the mechanism of mandibular advancement devices. He also reported a general lack of knowledge about OSA and OA in the participants. Only 16% of the participants had pre-graduate training in OSA, and 40% knew little or nothing about OA treatment for OSA patients; It was stated that 30% knew OSA and OA, thanks to their specialization training. 54% of the participants have never consulted specialist physicians for a patient with suspected OSA in their practice. Of 80%, the participants stated that they never or less than five times prescribed OA to their OA patients.

Kale et al., (32) in their survey in which they evaluated the knowledge and attitudes of dentists about OSA, stated that more than 50% of the participants were informed about the definition, general findings, and

risk factors of OSA however less than 50% of the participants were informed about the diagnosis and treatment of OSA.

Of 90.8% of the dentists participating in our study stated that they never applied OA for the treatment of OSA, and 58.6% of the participants did not question the presence of OSA in the anamnesis. In our study, it was determined that the knowledge score levels of specialist dentists were higher than general practitioners. The mean knowledge score levels of the female participants were higher than the male participants. 83% of the participants stated that dentists should be aware of the diagnosis/existing disorder of sleep disorders. While more than half of the participants answered the general information about the definition and diagnosis of OSA correctly, the more detailed questions (Q5-Q6-Q8) about the definition and diagnosis were found to be less likely to be answered correctly. More than 80% of the participants stated that there is a relationship between systemic diseases and obesity, and OSA. Of 38%, the participants stated that bruxism was associated with OSA, and 50% stated that TMD and OSA were associated. Most participants reported that OSA can be seen in children and that OSA affects children. In addition, 65.5% of the participants stated that they did not receive OSA-related training at the university, and 70.2% stated that they would like to attend if there is OSA-related training.

Although PSG is considered the gold standard for diagnosing the presence and severity of OSA, its high cost, difficulty accessing centres with PSG, and the need for patients to stay in a sleep centre for one night may delay the diagnosis and treatment of OSA. Using a concise and precise screening tool in patients with suspected OSA may be helpful for diagnosis (33). Berlin questionnaire (BQ), STOPBANG questionnaire (SBQ), STOP questionnaire, ESS, Stanford Sleepiness Scale and Pittsburg Sleep Quality Scale are used to define OSA (33).

In meta-analyses conducted on other scales used for OSA, such as ESS, it has been suggested that variables such as age, gender, and body mass index effectively evaluate scale scores (34,35). Silva et al. (36) emphasized the importance of using high-sensitivity screening tools such as STOP-Bang to avoid missing cases that could lead to adverse health outcomes and increased healthcare costs. Walter et al. (37) reported a positive correlation between ESS scores and PSG findings. Various studies have reported that the mean ESS score is between 4.4 and 7 in normal individuals, between 5.8 and 10.3 in patients with simple snoring, and between 11.7 and 15.1 in patients with OSA (38).

In our study, 30 (5.1%) of 584 participants had an ESS score of 11 or higher.

A positive correlation between OSA and BMI has been reported in many studies (21,28,39-41). It was concluded that 23.8% of the participants in our study were overweight, and 7.5% were obese. No significant correlation was found between ESS scores and BMI values. ($p>0.05$). We think that this is because variables such as age, gender, and body mass index are not taken into account in the scoring of scales such as ESS. The inclusion of variables such as age, gender, and body mass index affects the accuracy of the questionnaires in diagnosing OSA susceptibility (34,35,42).

Conclusions

The results of our study show that dentists do not have enough knowledge about the diagnosis and treatment of OSA, but they are aware of their deficiencies in this regard. It can be concluded that the dentistry curriculum in Turkey is insufficient in terms of OSA. In the light of our study, the dentistry curriculum can be updated and complementary trainings can be organized for graduate physicians.

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Contributions

Research concept and design: YK

Data analysis and interpretation: SK, HIT

Collection and/or assembly of data: SK, YK, HIT Writing the article: SK, YK

Critical revision of the article: SK, YK

Final approval of the article: SK, YK, HIT

All authors read and approved the final version of the manuscript.

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