

Original Article

Knowledge and practice of Iranian prosthodontists regarding the diagnosis and treatment of sleep apnea: Design and development of a questionnaire

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ABSTRACT

Background: The present study was conducted to develop a standard questionnaire to assess the knowledge and practice of prosthodontists regarding the diagnosis and treatment of obstructive sleep apnea syndrome (OSA).

Materials and Methods: This study had questionnaire designing and cross-sectional-descriptive phases. Questionnaire domains were identified by a panel of eight experts. The face and content validity of the questionnaire was assessed by experts and four laypeople. The internal consistency reliability of the questionnaire was checked using Cronbach's alpha coefficient. Moreover, its stability was tested using the test-retest method. The questionnaire was completed online by 282 Iranian prosthodontists and the relationship between different variables and scores of knowledge and practice of them with simple and multiple linear regression tests were analyzed.

Results: A 32-item questionnaire was designed. The Scale Content Validity Index was >0.8 for clarity, simplicity, and necessity in all domains and the content validity of all questions was above 0.8. As for reliability, Cronbach's alpha coefficient was above 0.7 on average. Faculty members had more knowledge ($P = 0.04$) and better practice ($P = 0.001$) compared to others. Prosthodontists who participated in sleep disorders training courses had higher scores in knowledge ($P = 0.001$) and practice ($P = 0.001$). Prosthodontists who referred patients to sleep disorders clinics had higher knowledge ($P = 0.001$) and practice ($P = 0.001$) than those who did not.

Conclusion: The questionnaire developed in this study can be considered a comprehensive and executable scale with appropriate reliability and validity. There is a positive relationship between being exposed to information and the level of knowledge and practice of prosthodontists about OSA.

Key Words: Knowledge, obstructive sleep apnea, practice, prosthodontists, questionnaire, validation study

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INTRODUCTION

Both breathing and sleep are essential for maintaining life. On average, a third of life is spent in sleep. Changes that occur in the body during sleep increase the probability of some types of sleep disorders.^[1,2]

Sleep apnea occurs in three forms: central, obstructive, and mixed. Obstructive sleep apnea syndrome (OSA) is one of the most common sleep

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disorders. It is estimated that 4% of men and 2% of women have this problem.^[3] In OSA, breathing stops for 10 s or even longer although OSA is not often diagnosed. Symptoms of OSA include prolonged snoring, intermittent breathing, daytime drowsiness, and gastrointestinal reflux.

Dental examinations may disclose symptoms of respiratory apnea caused by muscles of the throat, tonsillar muscles, uvula, soft palate, tongue, and throat walls. In addition, at dental visits, patients with sleep disorders may complain about facial symptoms and toothache associated with temporomandibular disorders.^[4-7]

Failure to diagnose apnea can lead to cardiovascular disease, stroke, hypertension, and reduced overall quality of life. Dentists, especially prosthodontists, can play an important role in the diagnosis and treatment of respiratory apnea using intraoral appliances.^[8] The construction and adjustment of these devices should be done by specialized and experienced dentists who have the ability to choose the best treatment after the examination.^[9] Therefore, the role of dentists, as a member of the treatment team, is very important in the diagnosis and treatment of apnea as multidisciplinary entity.^[10,11]

Before dentists can take responsibility for patients with respiratory apnea, they must have sufficient knowledge of sleep medicine and assistive devices.^[12-16] They should be able to provide the best way to manage respiratory apnea in teamwork with prosthodontists and sleep disorders specialists.^[17,18]

Most of the previous studies focused on physicians' knowledge and awareness of sleep problems, and found that physicians had insufficient information about sleep disorders. It is believed insufficient knowledge is due to the inadequacy of planning, resources, and teaching of relevant courses in dental schools.^[19] The aim of this study was developing and implementation a standard questionnaire to measure the knowledge, attitude, and practice of prosthodontists regarding the diagnosis and treatment of sleep apnea. According to our search, no article has addressed this issue.

MATERIALS AND METHODS

This study had two steps, first questionnaire designing, and the second is cross-sectional-descriptive which was approved by the Ethics Committee of Tehran University of Medical Sciences (IR.TUMS.DENTISTRY.REC 1398.022).

The participants were selected independently in each phase of the study and did not participate in other parts of the study. Written informed consent was obtained from all participants and they were informed that they could withdraw from the study at any time. They did not receive monetary compensation for their participation.

The questionnaire was developed in three sequential stages:

Stage one

The available literature and resources were searched for diagnosis and treatment of sleep apnea, an online search of PubMed, Scopus, Science Direct, and Google Scholar was conducted using key words "Questionnaire, Reliability, Validity, Obstructive apnea, Prosthodontists, Knowledge, Attitudes, and Practice." Studies that did not use questionnaires or were not peer-reviewed were excluded.

Two consulting meetings were held with a multidisciplinary group to develop a preliminary 125 items pool. This panel of eight experts includes two dental prosthodontists, one psychiatrist, one ear, nose, and throat specialist, one pediatrician, one neurologist, one orthodontist, and one oral and maxillofacial specialist.

Stage two

According to the objectives of the study, the questionnaire domains were made and grouped into three categories, knowledge, attitude, and practice. The face and content validity of the questionnaire was assessed by eight experts and four lay people (prosthodontists who were faculty members).

The inter-rater agreement (IRA) index was measured and the experts agreed on the domains.

Relevant questionnaires and studies were extracted, and items measuring the same concept were grouped together on a scale. The second draft was formulated with 105 questions.

The internal consistency reliability of the questionnaire was checked using Cronbach's alpha coefficient. Moreover, its stability was tested using the test-retest method.

Also, lay people evaluated the questions in terms of necessity, transparency, and simplicity. Finally, the third draft including 62 questions was prepared. As a pilot study, the draft questionnaire was completed online by 50 prosthodontists that were members of

the Iranian Association of Prosthodontists. Moreover, they completed the questionnaire again 2 weeks later. The questionnaire clearly stated that participation was voluntary and completing and returning the questionnaire indicated consent to participation and use of the results. Furthermore, to maintain confidentiality, the questionnaires were anonymous. Only the combination codes of the last three numbers of the identity card number, plus the last three numbers of the mobile phone for the purpose of retest.

The test-re-test method was used to evaluate the reliability of the questionnaire.

Transparency, necessity, and simplicity of the questionnaire were determined by the 50 prosthodontists, and the IRA and content validity index (CVI) were calculated. Exploratory factor analysis was used to categorize questions, and the level of agreement between them and the value of the kappa coefficient was calculated to assess the reliability of the questionnaire. The final questionnaire (including 32 questions) was used to measure the knowledge, attitude, and practice related to the diagnosis and treatment of sleep apnea among prosthodontists. Questionnaire 1

The steps involved in the questionnaire design are shown in Flow Chart 1.

Tips to be considered for designing the questionnaire, including mentioning the introduction and stating the general purpose at the beginning of the questionnaire,

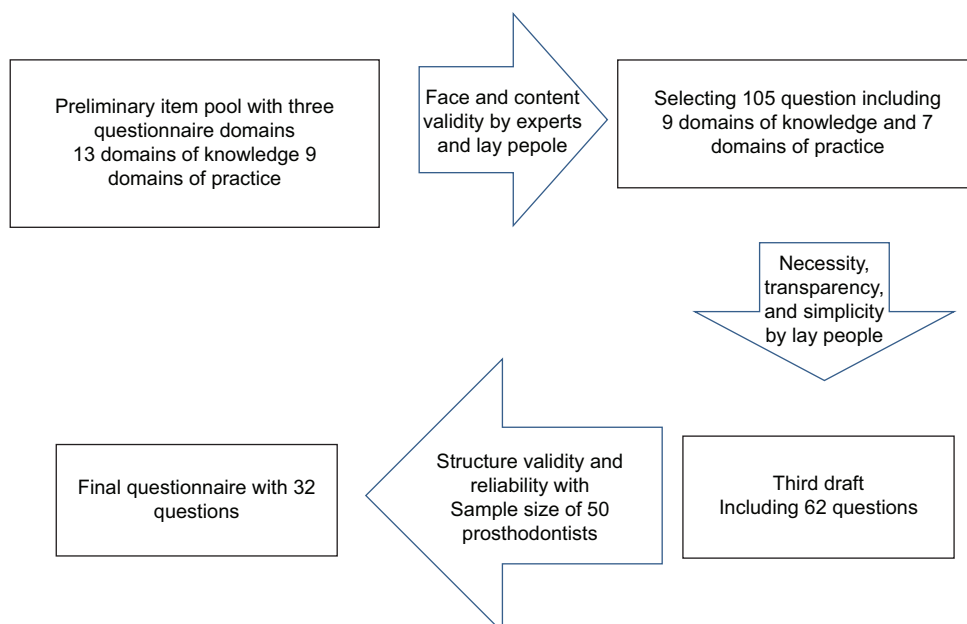
paying attention to the logical course of the questions in the questionnaire, starting questions from general characteristics, considering control questions, paying attention to nondirectional questions, the use of short and simple questions, specifying the place of coding in the questions, paying attention to the time required to complete the questionnaire, also the questionnaire had five options for each question: totally agree, agree, no comment, disagree, totally disagree. A total of 282, including members of the Iranian Association of Prosthodontists, were selected on the social network using the counting method. They were all graduates of the field of prosthodontics and lived in Iran, and, if they do not want to participate in the research, will not be included in the study.

The questionnaire was made in the form of an online survey form and its link was sent to the experts one by one on the social network. To attract cooperation, reminder letters were sent to them on a scheduled basis.

Simple and multiple linear regression tests were used to analyze the relationship between different variables with the knowledge and practice scores of prosthodontists and the factors affecting the knowledge and practice scores of specialists were identified and reported.

RESULTS

The overall agreement of the domains was 81.25% using the nonconservative approach. To calculate the



Flow Chart 1: The steps involved in the questionnaire design.

Content Validity Index of each question (I-CVA), the items of necessity, transparency, and simplicity of each question are examined, the value of which for the selected questions was above 0.8. The values of overall validity index using the mean method were 78.4% for simplicity, 97.6% for transparency, and 80.8% for necessity. To check the reliability, Cronbach's alpha coefficients, kappa coefficient of each question, Kappa *P* value, degree of general agreement, and interclass correlation were assessed.

Reliability is considered acceptable when Cronbach's alpha coefficient is above 0.7.^[20,21]

Kappa statistical model is commonly used to evaluate the levels of agreement between the rankings of different observers or between the rankings of one observer at different times in nominal cases.^[22,23] The kappa coefficient ranges between a negative value and a positive value, and the closer it is to one, the better the agreement. Since the kappa method is not used to compare more than two evaluators, the internal correlation method was used.

This method is used to evaluate the observational capability when using quantitative data, because it has high flexibility. It was not possible to use the Pearson correlation method since more than two evaluators were involved. The internal reliability of the instrument was assessed using Cronbach's alpha test in case removal mode.^[22]

Due to the lack of convergence and nondisplay of the ordered table of rotated values, the correlation matrix of the questions was investigated using factor analysis and values above 0.7 were extracted. The questions with less correlation were deleted. The validity of the structure was determined by exploratory factor analysis using the Principal Components method with Varimax rotation.

Table 1 shows Cronbach's alpha coefficient values of different domains of the questionnaire measuring Iranian knowledge and practice of prosthodontists regarding the diagnosis and treatment of sleep apnea.

According to the results of this study, the mean (standard deviation) knowledge scores of female and male participants were 63.35 (± 7.51) and 64.41 (± 8.56). Also, practice scores of females and males were 63.89 (± 13.67) and 64.98 (± 14.88) respectively.

Furthermore, the knowledge scores of nonfaculty and faculty members were 61.52 (± 6.38) and 65.69 (± 8.78),

Table 1: Cronbach's alpha coefficient values of different domains of questionnaire

Area	Cronbach's alpha coefficients
Knowledge domain 1 (questions 1, 2, 3, and 5)	0.74
Knowledge domain 2 (questions 6, 8, 9, 10, and 11)	0.76
Knowledge domain 3 (questions 19 and 21)	0.74
Knowledge domain 4 (questions 28 and 32)	0.64
Knowledge domain 5 (questions 33, 34, and 35)	0.75
Knowledge domain 6 (questions 41, 42, 43, 44, 45, and 46)	0.81
Practice domain 1 (questions 48, 50, 52, 55, 56, 59, 60, and 61)	0.89
Practice domain 2 (questions 53 and 54)	0.79

respectively. Moreover, their practice scores were 58.89 (± 14.27) and 68.54 (± 13.01), respectively.

The knowledge scores of participants working in private offices, universities, and clinics were 65.11 (± 8.46), 65.56 (± 8.74), and 61.07 (± 6.33), respectively, also practice scores of them were 67.01 (± 14.67), 65.21 (± 14.25), and 59.67 (± 12.63), respectively.

The knowledge scores of noncooperating in sleep clinics and collaborating specialists in these clinics were 63.5 (± 7.61) and 78.76 (± 10.96). Their practice scores were estimated to be 63.68 (± 13.69) and 91.8 (± 7.6).

The knowledge scores of participants without a history of participation in sleep disorders training courses and who with a history of participation were 63.24 (± 7.3) and 80.92 (± 8.63), respectively, also practice scores were 63.43 (± 13.46) and 90.2 (± 10.8), respectively.

Knowledge scores of participants without a history of referral of patients to sleep clinics and who with a history of referral were 61.57 (± 6.61) and 68.82 (± 8.76), respectively, also their practice scores were 60.06 (± 13.13) and 73.63 (± 12.32), respectively.

Table 2-5 presents the results of multiple regression tests on the relationship between different variables and the knowledge and practice of prosthodontists about OSA.

DISCUSSION

The purpose of this study was to prepare a standard questionnaire to determine the level of knowledge, attitude, and practice related to the diagnosis and treatment of sleep apnea among prosthodontists.

Several indicators, including the IRA, content validity of the tool, content validity of individual questions,

Table 2: Relationship between the studied variables and the knowledge of prosthodontists about obstructive sleep apnea (results of simple regression test)

Variable	The regression coefficient	95% confidence limit	P
Gender			
Female	1	-0.89-3.0	0.29
Male	1.05		
Age (years)	0.19	0.09-0.3	0.001
Work experience	0.21	0.11-0.31	0.001
Faculty membership			
No	1	2.28-6.06	0.001
Yes	4.17		
Workplace			
Private office	1	-2.3-3.19	0.75
University	0.45		
Workplace			
Private office	1	-6.17-1.92	0.001
Clinic	-4.05		
Activity in sleep disorders clinic			
No	1	9.81-20.71	0.001
Yes	15.26		
Participate in sleep disorders training courses			
No	1	13.22-22.13	0.001
Yes	17.68		
Refer patients to the sleep disorders clinic			
No	1	5.39-9.12	0.001
Yes	7.25		

Table 3: The relationship between residual variables in the regression model and the knowledge of denture specialists about obstructive sleep apnea (multiple regression test results)

Variable	The regression coefficient	95% confidence limit	P
Faculty membership			
No	1	0.15-3.92	0.04
Yes	2.03		
Participate in sleep disorders training courses			
No	1	11.02-19.52	0.001
Yes	15.27		
Refer patients to the sleep disorders clinic			
No	1	2.84-6.89	0.001
Yes	4.86		

kappa coefficient, and Cronbach's alpha coefficient were used to assess the validity and reliability of the questionnaire. The IRA should be 70%–80%.^[23] In the present study, the IRA of eight experts in the evaluation of domains with a less conservative approach was 81.25%, indicating an acceptable agreement.

If there was a difference in the opinions expressed by experts, the accuracy and validity of the opinions were determined in brainstorming sessions with the presence of all experts, and finally, more attention was paid to the opinions of experts with more clinical experience and relevant scientific publications.

It is possible to use two approaches, i.e., the general agreement approach, and the average approach, to determine the relevance and transparency of the whole tool. In general, a high value of content validity indicates that the designed tool is desirable.^[24,25]

When designing questionnaires, the importance of content validity is not limited to ensuring that the desired content validity indicators (appropriateness, transparency, and comprehensiveness) are achieved. In addition to achieving indicators, improving the reliability index of the questionnaire along with helping to reduce the resources required to prepare the questionnaire (efficiency) are benefits that are not easily overlooked.

Table 4: Relationship between the studied variables and the practice scores of prosthodontists' obstructive sleep apnea (results of simple regression test)

Variable	The regression coefficient	95% confidence limit	P
Gender			
Female	1	-2.35-4.52	0.54
Male	1.08		
Age (years)	0.47	0.29-0.65	0.001
Work experience	0.49	0.32-0.67	0.001
Faculty membership			
No	1	6.39-12.91	0.001
Yes	9.65		
Workplace			
Private office	1	-6.67-3.06	0.47
University	-1.81		
Workplace			
Private office	1	-11.09-3.58	0.001
Clinic	-7.34		
Activity in sleep disorders clinic			
No	1	18.53-37.7	0.001
Yes	28.12		
Participate in sleep disorders training courses			
No	1	18.67-34.87	0.001
Yes	26.77		
Refer patients to the sleep disorders clinic			
No	1	10.31-16.83	0.001
Yes	13.57		

Table 5: Relationship between the studied variables and the practice scores of prosthodontists on obstructive sleep apnea (multiple regression test results)

Variable	The regression coefficient	95% confidence limit	P
Faculty membership			
No	1	4.43-13.44	0.001
Yes	8.94		
Workplace			
Private office	1	-3.93-4.76	0.85
University	0.42		
Workplace			
Private office	1	0.53-9.47	0.03
Clinic	4.99		
Activity in sleep disorders clinic			
No	1	5.49-25.07	0.002
Yes	15.28		
Participate in sleep disorders training courses			
No	1	8.53-25.6	0.001
Yes	17.06		
Refer patients to the sleep disorders clinic			
No	1	5.06-12.36	0.001
Yes	8.71		

In the present study, the CVI calculated for each question was quite acceptable in the questions selected by the experts. In addition, the CVI of the whole tool was calculated using the average approach, which was 80.8% for necessity, 78.4% for simplicity, and

97.6% for transparency, indicating the desirability of the content of the designed questionnaire.

The kappa coefficient of all knowledge, attitude, and practice questions was above 0.7, which was very good and was stronger than previous studies.

Nunnally and Bernstein reported a minimum Cronbach's alpha coefficient of 0.6 for acceptable reliability.^[26]

In the present study, the value of Cronbach's alpha coefficient for the final domains was in the range of 0.64–0.89, indicating the reliability of the tool. The kappa coefficient of the final questions was above 0.7, which indicates an appropriate value.^[27,28] In this study, experts were selected from various specialties related to OSA and all aspects of the issue were weighed. Moreover, the number of experts and lay people and the sample size of the experimental study were larger than previous studies, which allowed for more accurate analysis.

According to the results of the questionnaire, 29.6% reported that were referred patients to a physician. Referral of patients to specialist physicians indicates an awareness of OSA, and prosthodontists who referred patients to appropriate specialists had higher knowledge and practice about OSA.

In the present study, faculty members compared to nonfaculty, specialists participating in sleep disorders training courses compared to nonattending courses and specialists who referred patients to sleep disorders clinic, they have more knowledge.

Manohar researched the knowledge, attitude, and practice of Indian dentists regarding the treatment of respiratory apnea through oral appliances and showed that 21% of participants had no knowledge about OSA.^[21]

Li *et al.* determined that participants who in the OSA-related occupational group had more information about sleep apnea syndrome than those in the unrelated occupational group.^[22]

Vourjoki reported the use of oral appliances among general dentists (69.8%) but the use of these applications was more among specialists (89.3% with significant differences).^[29]

Jauhar *et al.* showed only 24% of dentists participated in OSA treatment courses and 74% of them were interested in participating in these courses^[30] all findings indicate a lack of awareness about OSA and the need for participating in training courses related to sleep disorders. To improve the knowledge of physicians and dentists about the complication of OSA, it has been suggested that this issue be further emphasized in related curricula. The role of the dentist in screening OSA patients is so important because OSA could be determined at a dental visit. In addition, the need for

better cooperation among medical professionals and overall knowledge of OSA should also be considered in pre- and post-graduate dental education.^[31,32]

In the Alzahrani study, dentists had a low OSA-related knowledge and a negative attitude towards OSA, and dentists with high knowledge scores have a positive attitude towards OSA. Authors suggested that participants require more education and training in sleep medicine.^[33] Swapna *et al.* conclude that there is a gap of knowledge among final-year students, interns, and general dentists. This study explained the need of improving their knowledge to diagnose and treat OSA patients.^[34] Dental clinicians in Ramesh's study were informed regarding the knowledge associated with sleep apnoea. Their knowledge with years of experience showed positive relation. Also, there is a lack of awareness of OSA in the dental curriculum also a need for continued dental education for improving the knowledge on OSA.^[35]

Overall, it can be concluded that, if a dentist or prosthodontist does not have enough knowledge about OSA then, they couldn't correctly diagnose OSA patients. Dentists could play an important role in the early diagnosis and referral of OSA patients by screening for oral findings of OSA patients. The dentist can also has a contribution for the treatment of medical symptoms associated with OSA. It is suggested to include the OSA context in undergraduate curricula. Of course, dentists should have continuing education programs of OSA.^[36]

Limitations

One of the limitations of this study was the need for frequent reminders to fill out and submit a questionnaire. Furthermore, this study was performed on prosthodontists in Iran and can not be generalized to the whole world, but this designed and validated questionnaire can be used after translation in other studies.

Suggestions

Future studies design questionnaires that provide more information about complications and clinical consequences of OSA also educational materials on OSA in the dental curriculum and holding training courses for dentists and prosthodontists.

CONCLUSION

Due to the use of standard techniques for designing the questionnaire and its validity and reliability, the

designed questionnaire can be used as a valid and reliable tool to determine the knowledge, attitude, and practice of prosthodontists. It can be concluded that faculty members, specialists participating in related training courses, and specialists who referred patients to other specialists, in this study had higher scores of knowledge and practice about OSA.

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Conflicts of interest

The authors of this manuscript declare that they have no conflicts of interest, real or perceived, financial or nonfinancial in this article.

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