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Original article

Knowledge and Awareness of Xerostomia Among Dental Practitioners in Tripoli, Libya

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Abstract
Xerostomia, or dry mouth, is a common condition associated with reduced salivary flow. It often results from systemic diseases, some medications, radiation therapy, psychological factors, and aging. It significantly impacts oral health and patients' quality of life, increasing the risk of dental caries and oral infections. Dental practitioners play a crucial role in its early diagnosis and management; however, their knowledge and awareness may differ widely. This study aimed to assess the knowledge and awareness of xerostomia among dental practitioners in Tripoli, Libya. A cross-sectional study was conducted among dental practitioners working in private clinics and public centers across Tripoli, Libya. Data were collected using a structured, self-administered questionnaire addressing demographics, knowledge of xerostomia etiology, and clinical management strategies. Statistical analysis was performed to evaluate associations between demographic variables and knowledge levels. A study of 139 dental practitioners found that 66.2% were female and 33.8% were male, with an average age of 38.04 ± 7.05 years. Most had a Bachelor of Dental Surgery (BDS) degree (64.0%) and postgraduate degrees, including Master of Dental Surgery (MDS) (22.3%) and PhD (13.7%). Nearly half of the dentists (49.6%) had over 10 years of clinical experience. Most of the participants identified xerostomia as "dryness of the mouth," with 87.8% of participants recognizing common symptoms of xerostomia. However, only 63.3% correctly identified key clinical signs. Most participants had high awareness of general causes of xerostomia, including Sjögren's syndrome. Regarding medication-induced xerostomia,74.8% of the participants identified drug classes such as antihistamines, antihypertensives, and antipsychotics as causes of xerostomia. Most respondents were familiar with general management strategies, but awareness of adjuvant therapies was low. The study highlights a moderate level of knowledge and awareness regarding xerostomia among dental practitioners in Tripoli. Continuing education programs focusing on the diagnosis and management of xerostomia are recommended to enhance patient care and improve clinical outcomes.
Keywords. Xerostomia, Dry Mouth, Dental Practitioners, Dentists, Knowledge, Awareness.

Introduction

Saliva plays an essential preventive role in maintaining the health of the oral cavity by helping in hydration, lubrication, mastication, swallowing, and speaking, as well as protecting against dental caries and oral infections, and any decrease in the amount of saliva can increase the risk of oral diseases (1). Xerostomia, often known as dry mouth, is a general oral health problem defined by a decrease or absence of saliva production. The diagnosis of xerostomia is based on a thorough history from the patient, a clinical examination, and many investigation methods, including sialometry. Sialometry is a useful diagnostic tool for measuring salivary flow rates (2). Normally, stimulated salivary flow ranges from 1.5 to 2.0 mL/min, while unstimulated flow ranges from 0.3 to 0.4 mL/min. However, in the sialometry approach, a stimulated flow of less than 0.5 to 0.7 ml per minute or an unstimulated flow of less than 0.1 ml per minute is identified as dry mouth, albeit reduced salivary flow may not necessarily be associated with oral dryness (3). Moreover, reduced saliva can have detrimental effects on oral health, making it harder to perform daily tasks and raising the risk of periodontal and dental caries (1). Elderly persons are more likely to experience xerostomia, but this is not related to aging; rather, it is most likely caused by increased drug intake for chronic conditions, which lowers salivary flow (4). In addition to impairing oral health by raising the risk of dental cavities, periodontal disease, and oral infections, xerostomia also has a detrimental effect on patients' general comfort and quality of life by impairing their ability to speak, taste, masticate, and retain dentures (5). Given all of these repercussions, dentists are essential in identifying dry mouth and assisting patients in receiving early treatment.

However, xerostomia can be an unpleasant condition that can be caused by a variety of underlying etiologies. Among the most common causes are the use of pharmaceuticals such as anticoagulants, antidepressants, antihypertensives, hypoglycemic agents, and nonsteroidal anti-inflammatory drugs (6). Moreover, Xerostomic medications can alter the relationship between saliva and dental caries, leading to a decrease in salivary flow, which consequently causes dental caries (7). Furthermore, salivary glands play a role in a variety of systemic disorders that can lead to xerostomia. Most of these disorders are autoimmune illnesses, including Sjögren's syndrome and systemic lupus erythematosus, as well as endocrine diseases like diabetes, which are frequently linked to salivary hypofunction (2). Additionally, head and neck radiation greatly contribute to the development of xerostomia. Other causes of dry mouth include psychological stress,

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anxiety, despair, and nutritional deficits (8). Dry mouth may also be induced by mouth breathing due to rhinitis or snoring, particularly during sleep (9).

Once xerostomia is diagnosed and an underlying cause is identified, a treatment strategy can be developed to initiate preventive measures, improve symptoms, treat oral manifestations, and increase salivary secretion. There are several strategies available for controlling xerostomia, including maintaining good dental health, using fluoride products, antibacterial treatments, and artificial saliva. In some circumstances, medicines that increase salivary flow, such as pilocarpine or cevimeline, may be recommended (10). However, the treatment of xerostomia remains an important clinical challenge, and management has primarily focused on increasing the salivary flow rate through the use of medication. Nevertheless, the use of systemic cholinergic medications has not yielded significant or permanent relief from dry mouth symptoms, and their use is significantly restricted due to the high toxicity associated with their administration (11).

As a substitute, complementary treatments such as acupuncture and Transcutaneous Electrical Nerve Stimulation (TENS) have demonstrated promise. TENS, which is particularly effective, has been shown to enhance overall salivary flow in xerostomia patients and is regarded as a safe and non-invasive therapy option. It may be useful in people who have salivary gland hypofunction as a result of illnesses, including Sjögren's syndrome, drug side effects, or head and neck radiation therapy (12). Another therapy is acupuncture, which was developed in China more than three thousand years ago. It is effective in the treatment of xerostomia and stimulates salivary production, which has numerous benefits, notably for individuals suffering from post-radiation dry mouth symptoms (13, 14). Additionally, acupuncture therapy offers numerous benefits for patients with xerostomia, including enhanced salivary flow and improvements in the quality of mastication, speech, and sleep, ultimately providing a better quality of life (15). However, there is insufficient knowledge on dental practitioners' understanding and the use of adjuvant therapy in treating xerostomia in Libya. The purpose of this study is to analyze the knowledge and clinical awareness of xerostomia among dentists in Tripoli, Libya. It seeks to identify areas in which additional learning or training may be required to improve patient care.

Methods

Study design

A cross-sectional, questionnaire-based study was conducted among 139 dental practitioners working in Tripoli, Libya. The questionnaire was developed based on a questionnaire that was conducted for four months in 2025. Before distributing the questionnaire, each participant's verbal agreement was obtained, and they were guaranteed that their answers would remain Private. The study used a structured questionnaire designed to evaluate the knowledge and awareness of dental practitioners about xerostomia.

Data collection

The questionnaire consisted of two sections of questions, the first section consisted of personal information such as qualification, gender, age, and experience. The second section is the questionnaire which consist of 10 multiple choice questions covering the xerostomia topics, the question was about definition of xerostomia, the method used to measure salivary flow rate, the most complaint of xerostomia, the drugs that causes xerostomia, the clinical signs elicited xerostomia, the syndrome associated with xerostomia, the management of xerostomia, the adjuvant therapy of xerostomia, and the common dental disease associated with xerostomia. The questionnaire was distributed in a hard copy format to dental practitioners working in both private dental clinics and public dental centers in Tripoli. Participation was voluntary, and responses were collected anonymously to ensure confidentiality. Data collection took place over a period of four months.

Statistical Analysis

For statistical analysis, the collected data were entered and analyzed using SPSS version 25. Descriptive statistics, including means, standard deviations, frequency, and percentage, were calculated to report the demographic profile of the participants and their performance on the xerostomia knowledge assessment.

Independent t-tests and one-way ANOVA were applied to find mean knowledge score differences across different demographic variables such as sex, educational qualification, and clinical experience. Pearson's correlation coefficient was used to find out the correlation between xerostomia knowledge scores and age. Significance level for all statistical tests was $p < 0.05$.

Results

Demographic Characteristics of Participants

This cross-sectional study was conducted among 139 dental practitioners in Tripoli, Libya, with an average age of 38.04 ± 7.05 years, ranging from 24 to 54 years. Most participants were female, 92 (66.2%), and held a BDS degree, 89 (64.0%). Others had postgraduate degrees, including MDS 31 (22.3%) and PhD 19 (13.7%). Nearly half of the dentists, 69 (49.6%), had more than 10 years of clinical experience (Figure 1).

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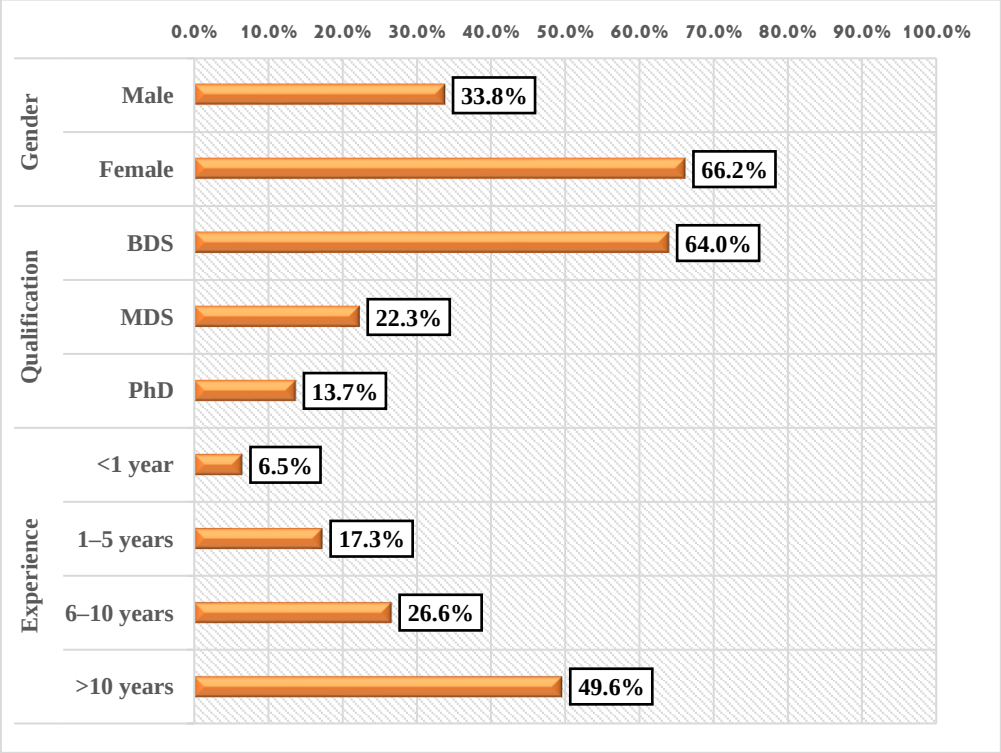

Figure 1. Demographic Profile of Participants (N = 139)

Xerostomia knowledge

Dentists from different parts of Tripoli, Libya, were selected for the study, and a total of 139 dentists participated in the present study. Almost all participants (138 out of 139; 99.3%) correctly identified xerostomia as "dryness of the mouth." The majority, 102 (73.4%), recognized sialometry as the standard method for measuring salivary flow rate, while the remaining 37 participants (26.6%) incorrectly selected methods like sialography or ultrasonography. Most respondents, 122 (87.8%), were aware of the common symptoms of xerostomia, such as difficulty chewing, swallowing, and a burning sensation in the mouth. However, only 88 participants (63.3%) correctly identified key clinical signs, including the tongue blade sign (where the tongue sticks to dry oral mucosa) and the lipstick sign (lipstick adhering to the teeth).

Awareness of general causes of xerostomia was high: 108 participants (77.8%) correctly associated xerostomia with factors like old age, radiation therapy, and antidepressant use. A majority also linked xerostomia to Sjögren's syndrome, 112 (80.6%), and dental caries, 114 (82.0%). Regarding medication-induced xerostomia, 104 participants (74.8%) correctly identified drug classes such as antihistamines, antihypertensives, and antipsychotics as causes. However, 35 participants (25.2%) named only one drug group. Most respondents, 116 (83.5%), were familiar with general management strategies, including increased hydration, artificial saliva, and dietary changes. In contrast, awareness of adjuvant therapies like acupuncture and TENS was low, with only 47 participants (33.8%) aware of these options and 92 (66.2%) unaware (Table 1).

Table 1. Item-wise Knowledge Assessment of Xerostomia (N = 139)

Question	Correct Responses	Incorrect Responses
	N (%)	N (%)
Definition of xerostomia	138 (99.3%)	1 (0.7%)
Method to measure salivary flow	102 (73.4%)	37 (26.6%)
Common patient complaints	122 (87.8%)	17 (12.2%)
Drugs causing xerostomia	104 (74.8%)	35 (25.2%)
Clinical signs of xerostomia	88 (63.3%)	51 (36.7%)
Association with Sjögren's syndrome	112 (80.6%)	27 (19.4%)
General causes of reduced salivary flow	108 (77.7%)	31 (22.3%)
Management strategies	116 (83.5%)	23 (16.5%)
Adjuvant therapies	47 (33.8%)	92 (66.2%)
Dental disease linked to xerostomia	114 (82.0%)	25 (18.0%)

Xerostomia Knowledge Scores

The average knowledge score among all participants was 7.56 ± 1.82 (range: 0 to 10), showing that most dental professionals had a moderate to high level of knowledge about xerostomia. As shown in Figure 2,

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more than half of the participants, 76 (54.7%), had good knowledge with scores between 8 and 10. Another 54 participants (38.8%) had fair knowledge (scores between 5 and 7), while only 9 participants (6.5%) had poor knowledge, scoring between 0 and 4.

The mean knowledge score among all participants was 7.56 ± 1.82 (range: 0–10), indicating a moderate to high overall level of awareness regarding xerostomia among dental professionals. As shown in Figure 2, a majority of respondents, 76 (54.7%), demonstrated good knowledge, scoring between 8 and 10. A further 54 (38.8%) displayed fair knowledge (scores 5–7), while only a small proportion, 9 (6.5%), fell into the poor knowledge category (scores 0–4).

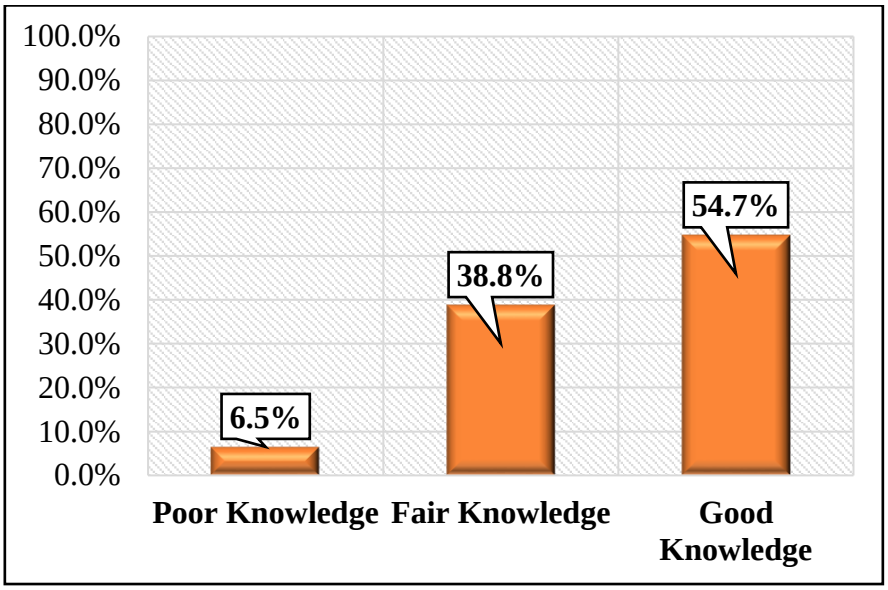

Figure 2. Distribution of Knowledge Levels on Xerostomia (N = 139)

Factors affecting Xerostomia knowledge scores

The study evaluated knowledge scores among dental professionals, revealing notable variations across demographic factors (Table 2). Male participants had slightly higher scores (7.94 ± 1.70) than female participants (7.37 ± 1.86), but this difference was not statistically significant (P = 0.083). Education level showed a significant impact on knowledge scores (P = 0.004). Dentists with only a BDS degree scored lower (7.08 ± 1.88) than those with higher qualifications—MDS (8.39 ± 1.26) and PhD holders (8.47 ± 1.54).

Clinical experience showed a trend of increasing knowledge scores with more years of practice. Recent graduates with less than one year of experience had an average score of 6.56 ± 1.88, while those with more than 10 years of experience scored higher, averaging 8.01 ± 1.68. However, this difference was not statistically significant (P = 0.077).

Table 2. Total Knowledge Scores by Demographic Variables

Variable	Subgroup	Mean ± SD	*P*-value
Sex	Male	7.94 ± 1.70	0.083[t]
	Female	7.37 ± 1.86	
Qualification	BDS	7.08 ± 1.88	0.004[F]
	MDS	8.39 ± 1.26	
	PhD	8.47 ± 1.54	
Experience	<1 year	6.56 ± 1.88	0.077[F]
	1–5 years	7.04 ± 1.71	
	6–10 years	7.30 ± 1.97	
	>10 years	8.01 ± 1.68	

[t] Independent t-test; [F] One-way ANOVA. Statistical significance set at p < 0.05.

Correlation Between Age and Knowledge Scores

The average age of participants was 38.04 ± 7.05 years. Pearson correlation analysis showed a statistically significant but weak positive correlation between age and knowledge scores (r = 0.242, *P*= 0.004).

Table 3. Descriptive Statistics and Correlation Between Age and Knowledge Scores

Variable	Mean ± SD	Pearson Correlation (*r*)	*P*-value
Age (years)	38.04 ± 7.05	1.000	–
Total Score	7.56 ± 1.82	0.242	0.004
Age vs. Score	–	0.242	0.004

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Discussion

Xerostomia, a complex condition characterized by dry mouth, significantly impacts patients' quality of life. Consequently, individuals often seek relief from dental practitioners, who must accurately identify potential etiologies and provide appropriate treatment (6). Despite the prevalence of dry mouth symptoms among patients attending dental clinics, there remains a paucity of research concerning dental practitioners' understanding and management of this condition. This study aimed to evaluate the knowledge and awareness of dental practitioners regarding various critical aspects of xerostomia.

Our descriptive survey revealed that a vast majority of dental practitioners (99.3%) possessed a clear understanding of xerostomia's definition as oral dryness. This high level of foundational knowledge is crucial for facilitating early diagnosis. This finding aligns with a study by Manju et al. (16) conducted among Indian dental practitioners, where all participants (100%) correctly defined xerostomia. Such consistency suggests a robust foundation in dental education and practice, particularly in Tripoli, Libya.

Regarding awareness of standard salivary flow measurement methods, 73.4% (102 out of 139) of participants in this study recognized sialometry as the gold standard method for measuring salivary flow rate. This result is comparable to Manju et al.'s study (16), where approximately 62% of dentists were aware of this measurement technique. Furthermore, Villa et al. (17) emphasized sialometry's role in diagnosing salivary gland hypofunction. These findings indicate a generally good level of awareness among our study's dental practitioners concerning the clinical evaluation of salivary gland function. However, they also underscore the importance of emphasizing diagnostic tools like sialometry in both undergraduate education and continuing professional training to enhance early detection and improve the management of dry mouth conditions.

In the present study, 87.8% (122) of dental practitioners demonstrated an adequate level of clinical knowledge by recognizing common xerostomia symptoms, including difficulty chewing, swallowing, and oral burning sensations. Such recognition is vital for accurate diagnosis and effective management of patients with salivary gland dysfunction. This observation is consistent with Manju et al.'s study (16), where 72% of dental practitioners were aware of all relevant symptoms. Similarly, Alsalhani et al. (18) reported that a majority (69.2%) of dentists exhibited good knowledge of common dry mouth signs and symptoms. Despite this high awareness, our study suggests that continuous education is essential to ensure this knowledge is consistently applied in clinical practice during patient evaluations. Moreover, 74.8% of participants correctly identified medications known to induce xerostomia, such as antihistamines, antipsychotics, and antihypertensives, reflecting a strong understanding of drug-induced dry mouth. This aligns with Mungia et al.'s findings (19), where 100% of dental professionals identified multiple medications as a primary factor for xerostomia. Additionally, Abdulla's study (20) supported these findings by identifying antipsychotics, antihistamines, and antihypertensive medications as common xerogenic drugs among dental patients.

Most dentists (80.6%, 112 participants) in this study were aware of systemic causes of xerostomia, particularly Sjögren's syndrome, an autoimmune disorder frequently associated with chronic oral and ocular dryness. Rihab et al. (21) highlighted the critical role dentists play in diagnosing Sjögren's syndrome and preventing associated oral health complications. Furthermore, 77.8% of participants recognized that xerostomia commonly affects elderly patients, those undergoing radiation therapy, and individuals taking antidepressant medications. This indicates a relatively good understanding among dental practitioners regarding common xerostomia risk factors. Several studies corroborate the link between xerostomia and aging, as well as radiation exposure. For instance, Fisic et al. (22) confirmed that dental care professionals were aware that medications, Sjögren's syndrome, and head and neck radiotherapy are the most common causes of dry mouth.

Our study also revealed that 63.3% (88) of participants possessed good knowledge of clinical signs such as tongue blade adherence and the lipstick sign, which are valuable indicators during clinical examinations. Recognizing these signs is crucial for identifying xerostomia, even when patients do not explicitly report symptoms. Interestingly, this contrasts sharply with Manju et al.'s report (16), where only 2% of dental practitioners were aware of both the tongue blade and lipstick signs, suggesting significant variations in clinical training and continuing education exposure across different samples. The higher awareness observed in our study underscores the importance of integrating clinical sign recognition into routine dental assessments. Importantly, participants demonstrated a strong awareness of dental caries as a major complication of xerostomia, indicating a clear understanding of the clinical consequences of reduced salivary flow. This finding is consistent with Fisic et al. study (22), where 99.8% of dental care professionals recognized the increased caries risk associated with oral dryness. The similarity in findings emphasizes the need to include xerostomia-related problems in undergraduate and continuing dentistry education programs. It is critical for dentists to be up to speed on the oral manifestations of xeostomia in order to provide proper patient treatment and early diagnosis.

Overall, dry mouth management treatments emphasize supportive treatment to reduce symptoms and prevent associated problems with oral health. A significant proportion of respondents (83.5%, 116 participants) were familiar with conventional xerostomia treatment modalities, including increased hydration, artificial saliva, and dietary modifications. Similar findings were reported by Manju et al. (16), where most dental practitioners were familiar with common management strategies for xerostomia. Crucially,

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if a patient's xerostomia is medication-induced, dentists can suggest alternative therapies. In the present study, only 33.8% (47 participants) were aware of adjuvant therapies such as acupuncture and TENS, while 66.2% (92 participants) were unaware. This limited knowledge mirrors Manju et al.'s findings (16), where only 28% of dental practitioners were aware of adjuvant xerostomia therapies. This disparity may stem from the infrequent inclusion of these therapies in standard dental education. Conversely, Alsalhani et al. (18) reported that approximately half of their participants recommended acupuncture as a xerostomia treatment, though the specific patient populations (cancer vs. non-cancer) were not clarified. These findings suggest that while dental practitioners possess sound knowledge of standard xerostomia treatments, there is a clear need to enhance awareness of alternative therapies through continuing education programs for all dentists. Furthermore, larger studies are warranted to confirm these results.

Our study also demonstrated a significant impact of education level on knowledge scores (P = 0.004). Dentists holding only a Bachelor of Dental Surgery (BDS) degree generally exhibited lower knowledge scores compared to those with postgraduate qualifications, such as a MDS or PhD. Additionally, clinical experience correlated with higher knowledge scores among dentists with more years in practice; however, this correlation did not reach statistical significance. This suggests that while experience may contribute to knowledge, other factors such as continuing education, individual interest, and clinical exposure also influence the understanding of xerostomia. These findings are consistent with studies by Alsalhani et al. (18) and Abdelghany et al. (23), which highlighted the significant positive impact of advanced education on dental practitioners' knowledge, intentions, and confidence in managing dry mouth patients. Our results emphasize the importance of ongoing educational lectures and workshops on dry mouth and its treatment.

Finally, the average age of participants in our study was 38.04 ± 7.05 years. The data revealed a statistically significant, albeit relatively weak, positive correlation between age and knowledge scores ($r = 0.242$, $p = 0.004$). This indicates a slight tendency for older dentists to possess better knowledge regarding xerostomia. The weak correlation suggests that while age may play a role, other factors like education, experience, or continuous training are more influential in shaping their understanding. Similarly, a study by Sabaghzadegan et al. (24) in Yazd city, Iran, also found a statistically significant relationship was found between knowledge scores and age, with older dentists demonstrating greater knowledge of dry mouth. Overall, these findings suggest that while age might contribute to improved knowledge, it is not a standalone factor. This reinforces the necessity of organizing regular lectures and workshops on dry mouth, encouraging participation from dental practitioners of all ages to ensure comprehensive recognition and proper management of xerostomia.

Limitations

One of the main limitations of our study was the small sample size. Due to the time-consuming nature of the study and a lack of cooperation from participants, we were unable to include a larger sample. Therefore, future studies are recommended to conduct research with larger sample sizes. Also, the study relied on a self-administered hard copy questionnaire, which may be subject to response bias, as participants might inaccurately report their experiences with xerostomia. Despite these limitations, the study gives valuable insight into the knowledge of dentists about xerostomia.

Conclusion

This study highlights a generally moderate to high level of knowledge about xerostomia among dental practitioners. Most participants demonstrated an acceptable understanding of the condition’s definition, common symptoms, causes, and basic principles of management. However, treatment options such as acupuncture and TENS. Knowledge scores were positively associated with higher educational qualifications and greater clinical experience, and a weak but statistically significant correlation was observed between age and knowledge levels. These findings underscore the need for ongoing professional development and targeted educational interventions to enhance awareness of diagnostic techniques and comprehensive management strategies for xerostomia in dental practice.

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Conflicts of Interest

There are no financial, personal, or professional conflicts of interest to declare.

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