Rageh. O. A., Yemeni J Med Sci. 2026; 20(2):17 -23
https://doi.org/10.20428/yjms.v20i2.3461
https://journals.ust.edu/index.php/yjms

OPEN ACCESS Original Article

Awareness and Knowledge of Salivary Gland Disorders among Dentists: A Cross-Sectional Study

Omar Abdullah Rageh[1], Abdulaziz Muffhi[1], Arwa N Alhumaikani[1], Mohammed Alattas[1], Fatima Abdulaziz Al-Kabab[1], Mohammed Al-Gnaidy[1], Asma Murad[1], Dekra bin Taleb[1], Safa Awadh[1], Nagla Kamil[1], Mokhtar Al-Samet[1], Arwa Alsadi[1], Mohammed Munaser[1], Ruba Kamel[1], Sara Abdulsalam[1], Noor Esam[1], Saba Al Sanaani[1], Nosaiba Mohammed[1], Hamzah Al-Malahi[1], Sara A. Fareed[1*]

[1] *Department of Dentistry, Faculty of Medicine and Health Sciences, University of Science and Technology, Aden, Yemen.*

ABSTRACT

Background: As a primary healthcare provider, the dentist is essential for the early identification and management of salivary gland problems. However, due to the disease's complexity and the salivary gland tumor's rarity, the dentist may have challenges with detecting the disease.
Objective: To evaluate Yemeni dentists' knowledge of salivary gland diseases (SGDs) in six domains: risk factors, symptoms, diagnosis, treatment, postoperative care, and common situations.
Methods: A multicenter cross-sectional study was undertaken among 162 dentists from eight Yemeni universities between January and April 2024. Participants completed a validated electronic questionnaire assessing their salivary gland dysfunction (SGD) knowledge. Correct and wrong replies were examined using descriptive statistics. Furthermore, SPSS was used to analyze data.
Results: There were significant knowledge gaps found. Only 32.1% identified SGD risk factors, 12.3% knew diagnostic techniques, and 45.1% appropriately described mumps. Treatment knowledge was stronger (53.9-64.8% accurate). Early-career dentists (<5 years' experience) demonstrated lower results.
Conclusion: The current study showed that there is a knowledge gap in diagnosing SGD. However, dentists showed a good understanding of the treatment and post-treatment aspects, which highlights a need for education, particularly for early-career dentists.

Keywords: Salivary gland disorders, dental education, knowledge assessment, Yemen, cross-sectional study.

**** Corresponding author address:*** *Dr.sarafareed44@gmail.com*

INTRODUCTION

A patient's quality of life may be seriously affected by various disorders, which are related to the diseases of the salivary glands, such as inflammatory, viral, and neoplastic disorders (1). To achieve the best outcome for the patients, a proper treatment of the disease is considered essential (2). The dentist plays a vital part as a basic-health-care physician for the earlier detection and treatment of the disorders of the salivary glands (3). On the other hand, the dentist might face a challenge while diagnosing the disease because the disease is a complex condition, as is the rarity of the salivary gland tumor (4).

Unfortunately, limited research has been conducted concerning the level of understanding and awareness of these conditions amongst dentists (5). From previous research, it has been indicated that certain deficiencies in dental education concerning salivary gland diseases, including their diagnosis and treatment, have been noted (6). This can lead to undue delay, incorrect treatment, and compromised patient care. Accordingly, it has become highly imperative to assess current levels of awareness amongst dentists to identify regions that require additional training and education (7).

The occurrence of such studies within Yemen and the rest of the Arabic-speaking nations is rare (8). Nevertheless, the little data available currently points to the same challenges being posed to dentists within these countries with respect to identifying and treating diseases affecting the salivary glands. For example, a study carried out within Yemen showed that the lack of adequate exposure during educational programs to the treatment and identification of diseases affecting the salivary glands meant that dentistry students and newly qualified dentists tended to lack clinical expertise (8). Furthermore, a study carried out in 2023 pointed to the identification of the clinical signs and the use of appropriate tools within diseases affecting the salivary glands being beyond the capabilities of dentists (9). Salivary cortisol, a reliable, non-invasive measure of stress, has a direct bearing on oral health, with raised levels strongly correlated with periodontal diseases, increased dental caries, and dental anxiety. Stress, a major contributor to raised cortisol levels, causes a cascade of effects, including inflammation and reduced immunity, as well as clinical manifestations of Xerostomia, Bruxism and delayed healing (10).

This cross-sectional study aimed to quantify Yemeni dentists' SGD knowledge across six domains (risk factors, diagnostics, symptoms, treatment, postoperative care, and common conditions), to correlate knowledge levels with demographic factors such as experience and training, and to propose targeted educational interventions.

METHODS

Study Design

Aiming to explore the knowledge of dentists regarding the issues of SGD, this cross-sectional study was conducted between January and April 2024 among dentists from eight universities in Yemen.

Population and Sample Size Calculation

The sample size for the study was established through the use of the standard formula for a cross-sectional study design. In this regard, the equation for the sample size for a 95% confidence interval and a 5% margin of error was used as follows:

$$n = \frac{Z^2 P(1-P)}{d^2}$$

Where:

- n: Sample size.
- Z: Statistic for the level of confidence (1.96 for 95% confidence).
- P: Expected prevalence or proportion (typically 0.5 for maximum sample size).
- d: Precision or margin of error (0.05).

A total of 162 dentists from eight universities in Yemen were targeted for the study. The universities included the University of Science and Technology (UST), Aden University, Al-Reyada University, Taiz University, National University, Al-Ganad University, Al-Saeed University, and Al-Arab University.

Data Collection Tool

A comprehensive questionnaire consisting of six topics was adopted to compile data. These topics encompassed knowledge about prevalent diseases affecting the salivary glands, risk factors associated with tumors of the salivary glands, skill levels pertaining to recognition of symptoms, diagnostic approaches, treatment modalities, and post-operative procedures. The survey was adopted online and was anonymous.

Ethical Considerations

It is imperative to note that the study was carried out with strict adherence to ethical issues, with particular attention given to the protection of the rights of the participants through a process that involved the integration of informed consent directly into the electronic questionnaire. The Ethical Approval Committee of the Faculty of Medicine and Health Sciences, University of Science and Technology, Aden, Yemen, has approved the study (MEC/ADA155). Prior to accessing the study items, participants were given an extensive form that clearly outlined the purpose of the study and the voluntary nature of the study. Moreover, to ensure data integrity and privacy, the study was conducted anonymously, which encouraged honest responses without any fear of being professionally exposed. It is evident that by proceeding with the study, participants gave their explicit formal consent to be part of the study data.

Data Analysis

Data analysis was done using SPSS software (Version 26.0). Descriptive statistics were used to summarize demographic and response frequency variables. To assess associations between demographics (gender and experience) and knowledge domains, a Pearson chi-square was used. However, to ensure accuracy for borderline cases, Fisher Exact Tests were used to assess associations. A p-value of < 0.05 was considered statistical significance. Odds ratios (OR) were used to measure association strength.

RESULTS

Demographic data indicated that 92% of participants were between the ages of 20 and 29; 57.4% were females and 42.6% were males; and 85.2% had 0–5 years of clinical experience (Table 1).

Table 1: Demographic Description of the Study Sample, (n=162)

Category	Subcategory	Frequency	Percentage
Age	20 - 29 years	149	92%
	30 - 39 years	9	5.5%
	40 - 49 years	4	2.5%
Gender	Male	69	42.6%
	Female	93	57.4%
Years of Experience	0 - 5 years	138	85.2%
	6 - 10 years	4	2.5%
	11 - 15 years	1	0.6%
	16 - 20 years	8	4.9%
	20+ years	11	6.8%

Of the dentists, only 32.1% correctly identified risk factors for salivary gland tumors. Of all of the respondents, only 45.1% correctly described mumps, which indicates a weak ability to identify clinical manifestations (Table 2).

https://doi.org/10.20428/yjms.v20i2.3461
https://journals.ust.edu/index.php/yjms

Table 2: Hypothesis Testing of Dentists' Knowledge and Clinical Skills in Salivary Gland Diseases (n = 162).

Hypothesis	Correct Answers (%)	Incorrect Answers (%)	Conclusion
1. Dentists have sufficient understanding of the most common salivary gland diseases	45.1% - 54.3%	45.7% - 56.2%	Rejected: Dentists have limited understanding.
2. Dentists have sufficient understanding of the main risk factors for salivary gland tumors	32.1%	67.9%	Rejected: Dentists have limited understanding.
3. Dentists can accurately identify the common clinical presentations of salivary gland tumors	42.6% - 64.8%	35.2% - 57.4%	Rejected: Dentists cannot accurately identify clinical presentations.
4. Dentists have sufficient understanding of the appropriate use of diagnostic tools	12.3% - 58.6%	41.4% - 87.7%	Rejected: Dentists lack sufficient understanding of diagnostic tools.
5. Dentists have sufficient understanding of the basic treatment options for salivary tumors	43.8% - 64.8%	35.2% - 56.2%	Accepted: Dentists have sufficient understanding of treatment options.
6. Dentists understand the importance of post-surgical care for salivary gland surgery patients	38.3% - 62.3%	37.7% - 61.7%	Accepted: Dentists have sufficient understanding of post-surgical care.

Only 12.3% of respondents knew all the techniques used in the diagnosis of SGD. This shows that knowledge on diagnostic tools was particularly low. A detailed breakdown of correct and incorrect responses per hypothesis is presented in Table 3.

Table 3: Domain-Based Analysis of Dentists' Knowledge and Clinical Competence in Salivary Gland Diseases (n = 162).

Hypothesis / Domain	Average Correct (%)	Critical "Prevalence" Indicator
1. Common SGDs	47.3%	54.9% failed to identify the most common salivary gland problem.
2. Risk Factors	32.1%	This represents the lowest knowledge area; only 1 in 3 dentists could identify malignancy risks.
3.Clinical Presentations	48.3%	While 64.8% knew Sjögren's symptoms, 54.9% could not identify the hallmark of mumps.
4. Diagnostic Tools	35.5%	Only 12.3% knew the full battery of diagnostic techniques required for SGD.
5.Treatment Options	53.9%	Knowledge was high, particularly for benign tumors (64.8%).
6.Post-Surgical Care	52.9%	62.3% prevalence of correct knowledge regarding vital post-op instructions.

Regarding the association between selected demographic variables (gender and professional experience) and different knowledge domains, a statistically significant association was observed between gender and knowledge of treatment options (χ^2 = 3.81, p = 0.0395). Female participants demonstrated higher odds of adequate knowledge compared to males (OR = 1.97, 95% CI: 1.03–3.76), indicating that females were nearly twice as likely to have better knowledge in this domain. Similarly, years of experience showed a significant association with knowledge of clinical presentation (χ^2 = 3.22, p = 0.0490). Participants with ≥6 years of experience were more likely to possess adequate knowledge than those with 0–5 years of experience (OR = 2.57, 95% CI: 1.01–6.55) (Table 4).

In contrast, no statistically significant associations were identified between gender and knowledge of risk factors (χ^2 = 0.10, p = 0.7351; OR = 0.85, 95% CI: 0.44–1.64), nor between experience and knowledge of diagnostic tools (χ^2 = 1.09, p = 0.2422; OR = 1.96, 95% CI: 0.69–5.58). Additionally, knowledge of common SGDs did not differ significantly by gender (χ^2 = 0.00, p = 1.000), with an odds ratio close to unity (OR = 1.04, 95% CI: 0.55–1.95), suggesting no meaningful association.

https://doi.org/10.20428/yjms.v20i2.3461
https://journals.ust.edu/index.php/yjms

Table 4: Association between Demographic Factors and Knowledge Domains using chi-square and logistics analysis, (n=162)

Knowledge Domain	Comparison Factor	χ2 Statistic	Fisher's Exact (p-value)	Odds Ratio (95% CI)	Result
Treatment Options	Gender (Female vs. Male)	3.8086	0.0395*	1.97 (1.03–3.76)	Significant
Clinical Presentation	Experience (6+ vs. 0–5 Years)	3.2224	0.0490*	2.57 (1.01–6.55)	Significant
Risk Factors	Gender (Female vs. Male)	0.0983	0.7351	0.85 (0.44–1.64)	Not Significant
Diagnostic Tools	Experience (6+ vs. 0–5 Years)	1.0898	0.2422	1.96 (0.69–5.58)	Not Significant
Common SGDs	Gender (Female vs. Male)	0.0000	1.0000	1.04 (0.55–1.95)	Not Significant

*Statistically significant at $p < 0.05$.

DISCUSSION

The results of this study, which used a cross-sectional approach, offer a comprehensive overview of the state of knowledge regarding salivary gland disorders (SGDs) among Yemeni dentists. Although the participants demonstrated a functional knowledge of treatment protocols and post-operative care, knowledge gaps were also identified regarding risk factors and the use of diagnostic tools.

The fact that only 32.1% of dentists correctly identified risk factors for salivary gland tumors, and only 12.3% knew all of the diagnostic techniques, is a major area of concern. This is in agreement with (11,12), who showed that undergraduate dental students experience difficulties in identifying oral lesions during their clinical practice due to a lack of specific training. This is further complicated by the complexity of the disease, as explained by Bowers, Vissink, and Brennan (7) in Burket's Oral Medicine, whereby the rarity of salivary gland tumors often makes it difficult for primary healthcare workers, who do not often come across such cases in their daily practice, to diagnose the condition.

One of the important results from this research was the significant relationship between years of experience and the ability to recognize clinical presentations, where p=0.0490. Dentists with over five years of experience were 2.57 times more likely to recognize clinical presentations correctly than young professionals in the field. This supports the idea that diagnostic intuition for SGDs is a skill that develops with longitudinal patient experience, as in the study by Rageh et al. (13) in Yemen, which surveyed multiple institutions, noting that while knowledge may be possessed, confidence in oral cancer and pathology screening in young professionals tends to be lacking upon graduation (13).

Interestingly, clinical experiences were not found to significantly enhance knowledge about diagnostic tools. This, in a way, indicates a kind of 'stagnation' in technical knowledge, where a reliance on visual knowledge might be present, though knowledge about contemporary diagnostic tools, as discussed in recent literature such as Carlson and Ord (14), might be lacking.

It was observed that the female dentists had significantly higher chances of correctly identifying the treatment options (p = 0.0395, OR = 1.97). Although the reason for this difference is unknown, it does suggest that the female dentists in this group may be more familiar with therapeutic guidelines. This is important in terms of the need for training programs that are inclusive of the requirements of all demographic groups in the Yemeni dental profession. A vast majority of our sample, i.e., 85.2%, were dentists in their first five years of practice. This demographic represents a critical window for intervention. Integrating advanced diagnostic training and salivary markers research.

Limitations

Although this study provides valuable insights regarding the knowledge base of Yemeni dentists about salivary gland disorders (SGDs), some limitations should be considered:

1. Sample Demographics: The majority of the study population (85.2%) were early-career professionals with a professional experience range of 0-5 years, with a majority (92%) aged between 20 and 29 years. Even though this study reflects the current workforce in the study regions, the underrepresentation of experienced practitioners may limit the study's ability to generalize the findings to the entire dental workforce in Yemen.

2. Study Design: This study design is a snapshot in time; therefore, it is impossible to establish a cause-and-effect relationship between the educational curriculum and the knowledge gaps.

3. Geographic Scope: Even though this study included eight universities, it should be noted that the study's findings may not reflect the experiences of dentists in other geographic areas in Yemen.

4. Self-Reported Data: Even though this study employed an electronic questionnaire that is considered more objective than a paper questionnaire, the self-reported data may also have some limitations, such as participation bias where respondents with a greater interest in the study may have a greater likelihood of participating in the study.

CONCLUSION

The present study reveals a significant need for improving the diagnostic competence of Yemeni dental practitioners in salivary gland disorders (SGDs), as indicated by substantial knowledge gaps in risk factors and diagnostic techniques among all demographic groups. Statistical analysis also reveals that, though diagnostic intuition in clinical presentations significantly improves with over five years of experience, and female dental practitioners are found to be highly proficient in treatment protocols, these are not reflected in the knowledge of contemporary diagnostic methods or risk factors. As the majority of the workforce comprises early-career dental professionals, a significant need for a paradigm shift in dental curricula from conventional teaching methods, such as case-based learning and Objective Structured Clinical Examinations (OSCEs), is urgently felt in Yemen, in order to address these systemic knowledge gaps and thereby prevent diagnostic delays in the country.

Author's Contributions

Omar Abdullah Rageh contributed to conceptualization, methodology, and drafting of the original manuscript. Mokhtar Al-Samet was responsible for data collection and formal analysis. Arwa Alsadi contributed to manuscript review and editing and provided supervision. Sara A. Fareed contributed to manuscript review and editing. All remaining co-authors participated in data collection. All authors have read and approved the final version of the manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest.

REFERENCES

1. Carlson ER, Ord RA. *Salivary Gland Pathology: Diagnosis and Management*. 3rd ed. John Wiley & Sons; 2021.
2. Preston P, Esebua M, Layfield LJ. Diagnosis of salivary gland tumors: Does the triple diagnosis method have value? *Diagnostic Cytopathology*. 2023;51(9):527-531.
3. Pusztaszeri M, Deschler D, Faquin MD P, William C. The 2021 ASCO guideline on the management of salivary gland malignancy endorses FNA biopsy and the risk stratification scheme proposed by the Milan System for Reporting Salivary Gland Cytopathology. *Cancer Cytopathology*. 2023;131(2):83-89.
4. Mandel L. *Clinical Management of Salivary Gland Disorders*. Springer; 2024.
5. Bowers LM, Vissink A, Brennan MT. Salivary gland diseases. In: *Burket's Oral Medicine*. 2021:281-347.
6. Ekström J. Saliva and fetal life. *Journal of Pediatric and Neonatal Individualized Medicine (JPNIM).* 2025;14(1):e140112.
7. Wiles AB, Gabrielson M, Baloch ZW, Faquin WC, Jo VY, Callegari F, et al. Secretory carcinoma of the salivary gland, a rare entity: an international multi-institutional study. *Cancer Cytopathology*. 2022;130(9):684-694.
8. Al-Buriahy KT, Al-Ghllabi KT, Al-Zamzami SA, Abdulmajeed OA, Farhan AH, Al-Amery KS, et al. Association between Salivary Cortisol Levels and Temporomandibular Joint Disorders: A prospective Clinical Cohort Study. *Yemeni Journal for Medical Sciences.* 2026;20(1).
9. Rageh OA, Ateeq SA, Ali W, Mshtaq R, Ra'ood HB, Al-Sanaani S. Shaping the Future of Oral Cancer Prevention in Yemen: Knowledge and Attitudes of Dental Students. *Yemeni Journal for Medical Sciences*. 2025;19(6).
10. Shamala A, Halboub E, Al-Maweri SA, Al-Sharani H, Al-Hadi M, Ali R, et al. Oral cancer knowledge, attitudes, and practices among senior dental students in Yemen: a multi-institution study. *BMC Oral Health*. 2023;23(1):435.
11. McNutt DE, Wells MH, DeSchepper EJ, Scarbecz M. Dental students and recent dental graduates'

perceptions of preparedness in treating pediatric patients. *Journal of Dental Education*. 2023;87(4):548-561.
12. Mandasari M, Rahmayanti F, Derbi H, Wimardhani YS. Special care dentistry perception among dentists in Jakarta: An online survey study. *PLoS One.* 2021;16(4):e0249727.
13. Poelman MR, Brand HS, Asadi M, Remmelzwaal S, Jager DHJ, de Visscher JG. Knowledge of diagnosis and management of selected oral mucosal lesions among dentists in The Netherlands. *Medicina Oral, Patología Oral y Cirugía Bucal*. 2023;28(4):e362.
14. Antoranz-Pereda A, de Pedro M, Navarrete N, Vizoso-Noval B, Cidoncha-Cabrerizo G, Pérez R, et al. Evaluation of the diagnostic ability of oral lesions on clinical images among undergraduate dental students. *European Journal of Dental Education*. 2023;27(4):1109-1116.