



ASSESSING ORAL HEALTH AND ROOT CANAL TREATMENT AWARENESS AMONG HEALTH PROFESSIONALS IN SULAYMANIYAH CITY

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ABSTRACT

Background and Objectives: Oral health (OH) is a critical component of general health, with poor oral hygiene linked to systemic illnesses. This study aimed to assess the OH knowledge and practices among health professionals in Sulaymaniyah City. **Methods:** A cross-sectional study was conducted among 340 health professionals using stratified sampling from public health facilities across Sulaymaniyah. Data were collected via a structured, multilingual, self-administered questionnaire ready questionnaire from another paper just by English language foe evaluating knowledge, attitudes, awareness, and barriers related to OH and root canal treatment (RCT). **Results:** 95.3% recognized brushing as preventive for caries and periodontal disease, and 88.8% correctly defined RCT. However, significant disparities emerged between dentists and physicians. Dentists showed superior knowledge regarding sugar's role in caries ($P \leq 0.011$), plaque as a periodontal risk factor ($P \leq 0.003$), and the technical definition of RCT ($P \leq 0.003$). They also exhibited more favorable attitudes toward twice-daily brushing ($p < 0.001$), RCT recommendation ($P \leq 0.002$), and perceived cost-effectiveness ($P \leq 0.018$). Awareness of bacterial etiology of caries and RCT indications was significantly higher among dentists ($P \leq 0.001$). Despite these gaps, 98.5% of all respondents acknowledged the oral-systemic health link. **Conclusion:** The findings of the present study revealed that although the overall awareness level of health professionals regarding OH and RCT was relatively high, there remained a statistically significant gap in knowledge between general practitioners and dentists. This difference was particularly pronounced in understanding technical aspects of RCT, the importance of post-treatment crowns, and factors influencing dental caries.

Keywords: Attitude to Health, Dental Caries, Dentists, Health Knowledge, Root Canal Therapy

INTRODUCTION

Oral health (OH) is an essential component of overall health and well-being, and there is increasingly convincing evidence about its complex relationships with systemic diseases and quality of life. Oral diseases continue to pose a considerable burden to public health systems around the world and affect billions of individuals in many different populations.¹ In the year 2021, the global age-standardized prevalence of the primary oral conditions (untreated caries, severe periodontitis, edentulousness, and other oral conditions) was 45,900 per 100,000 population, resulting in 3.69 billion (3.40 to 4.00) people affected globally.²

Poor dental health has significant ramifications, impacting chewing, swallowing, nutritional intake, communication, and social interactions.³ Moreover, it has been associated with systemic illnesses including cardiovascular disease and diabetes, underscoring the

interplay between oral and overall health.⁴ Consequently, the incorporation of OH care into standard medical treatment for older persons is essential, including regular dental examinations, appropriate oral hygiene practices, and preventive education programs.³ Therefore, healthcare providers of all specialties should be mindful of their ability to promote OH awareness, early detection of oral disease, and provide proper referrals for treatment.⁵

The knowledge, attitudes, and practices of health care practitioners around OH impact not only patient outcomes, but also the quality of health care delivery.⁶ The literature provides compelling evidence of significant disparity in OH literacy across health care practitioner groups, and knowledge deficits continue to exist even among providers who provide direct patient care.^{7,8} Educational interventions aimed at health care providers hold promise for improving OH knowledge

and clinical practice behaviors. Nevertheless, the effectiveness of these interventions is determined by the delivery methods, target population, and content area.^{9,10}

Literature examining OH knowledge among healthcare professionals reveals substantial gaps requiring urgent attention. For example, the study by Farrukh et al. (2025) demonstrated that only 54.7% of dental professionals in Pakistan were familiar with tuberculosis-related dental care guidelines, highlighting significant knowledge gaps even among dental practitioners.¹¹ Similarly, Asefa et al. (2025) found that merely 44.5% of cancer patients had good OH awareness, with healthcare professionals serving as primary sources of OH information, yet many lacked adequate training to provide comprehensive guidance.¹² These findings underscore the critical need for enhanced OH education and awareness programs targeting healthcare professionals across various disciplines.

Root canal treatment (RCT) represents one of the most significant therapeutic interventions in endodontics, designed to preserve natural dentition while eliminating infection and preventing future microbial invasion.¹³ The impact of RCT on health and lifestyle outcomes has been extensively documented, with research consistently demonstrating substantial improvements in patients' OH-related quality of life following successful endodontic therapy.¹⁴ The knowledge and attitudes of healthcare professionals regarding RCT play a crucial role in patient education, treatment acceptance, and overall treatment outcomes, as healthcare professionals often serve as important sources of information and reassurance for patients considering endodontic therapy.¹⁵

Although OH is increasingly recognized and accepted as a key component in overall health care delivery, there exists a substantial gap in the literature regarding holistic assessments of awareness of OH knowledge and awareness of RCT across various health care providers in different settings. This study serves to fill this gap by examining OH knowledge and examining awareness of RCT among health care providers in Sulaymaniyah City as well as identifying knowledge levels, educational needs and barriers to optimal integration of OH practice.

METHODS AND MATERIALS

Study design and setting

This cross-sectional study was executed over the course of one year to assess OH knowledge and awareness of RCT among health professionals within Sulaymaniyah City, located in the Kurdistan Region of Iraq. The researchers administered the study in public health sectors that included a total of 24 hospitals, 24 specialized centers, 23 primary health care centers, and 23 basic health units within and among Sulaymaniyah City.

Participants

The study population comprised health professionals working in public health sectors in Sulaymaniyah City, specifically targeting medical doctors and dentists. The

total population consisted of 3,238 health professionals, including 2,900 medical doctors and 338 dentists.

A stratified sampling approach was employed to ensure proportional representation from both professional groups. The sample size calculation was based on a population of 3,238 health professionals, with a hypothesized outcome frequency of $65\% \pm 5\%$, a desired confidence limit of 5%, and a design effect of 1 for cluster surveys. Using a 95% confidence level, the calculated sample size was determined to be 340 participants. This quasi-stratified sampling method ensured adequate representation from both professional groups while maintaining statistical power for comparative analyses.

The inclusion criteria encompassed all health professionals, specifically medical doctors and dentists, who were actively working in public health sectors within Sulaymaniyah City's healthcare facilities. This broad inclusion approach ensured representation from various specialties and experience levels within the medical and dental professions. The exclusion criteria were specifically designed to maintain data quality and voluntary participation principles. Health professionals who were unwilling to participate in the study were excluded, respecting their autonomy and ensuring that all collected data represented genuine voluntary responses. Additionally, healthcare workers from private sectors were excluded to maintain consistency in the study population and focus on public healthcare delivery systems.

Data Collection

Data collection was conducted using a structured, self-administered questionnaire developed specifically for this study. The questionnaire ready from another paper¹⁶ by English language foe evaluating knowledge, attitudes, awareness, and barriers related to OH and RCT.

The data collection process involved four main components: demographic characteristics assessment, OH knowledge evaluation, attitude assessment toward OH and dental care awareness, and identification of barriers to OH and dental care services. The questionnaire comprised three distinct sections: knowledge assessment with five multiple-choice questions covering topics such as daily brushing benefits, tooth decay factors, tooth structure loss causes, periodontal disease factors, and RCT definition; attitude evaluation through ten questions addressing brushing frequency, mouthwash use, dental visit patterns, treatment preferences, personal experiences with RCT, recommendations to others, treatment success perceptions, cost-effectiveness views, quality of life impacts, and prenatal dental care importance; and awareness assessment using six questions examining dental caries understanding, RCT indications, tooth preservation possibilities, crown requirements post-treatment, oral-systemic health relationships, and system-specific oral manifestations. Data collection was

conducted by trained research personnel who approached eligible participants at their workplace, explained the study purpose, obtained informed consent, and supervised questionnaire completion to ensure data quality and completeness.

Statistical Analysis

Statistical evaluation and analysis were undertaken using the SPSS program version 28.0 (IBM Corporation, Armonk, NY). Descriptive statistics comprised frequency counts for categorical data (e.g., professional type and facility type), and measures of central tendency (mean, median and mode) and dispersion (range, variance and standard deviation) for continuous variables (e.g. years of experience). Comparative analyses were performed for independent samples of medical doctors and dentists using independent t-tests of means as well as chi-square tests of independence across categorical variables (e.g., profession and facility type).

The alpha level for all statistical tests was $p < 0.05$ to indicate statistical significance, where applicable.

RESULTS

The mean $\pm$ SD of health professionals age and years of professional experience were 37.98 ± 7.654 and 13.89 ± 7.457 years, respectively. A total of 122 (35.9%) health professionals had <10 years of experience, while 218 (64.1%) had ≥ 10 years. Regarding sex of health professionals, 125 (36.8%) were male and 215 (63.2%) were female. Based on specialty, 252 (74.1%) were physicians and 88 (25.9%) were dentists.

Concerning educational degree of health professionals, 122 (35.9%) held a Bachelor's degree, 42 (12.4%) a High Diploma, 64 (18.8%) an MSc, and 103 (30.3%) a PhD, while 9 (2.6%) did not specify their degree. According to the place of work, 62 (18.2%) were in category primary health center, 140 (41.2%) in category hospital, 101 (29.7%) in category specialized center. (Table 1).

Table 1. Demographic characteristics of Health Professionals

Demographic characteristics of Health Professionals		No. (%)
Age (year)		$37.98 \pm 7.654^*$
Years of employment (year)		13.89 ± 7.457
Category of years of employment (year)	< 10	122 (35.9%)**
	≥ 10	218 (64.1%)
Sex of Health Professionals	Male	125 (36.8%)
	Female	215 (63.2%)
Specialty of Health Professionals	Doctor	252 (74.1%)
	Dentist	88 (25.9%)
Degree of Health Professionals	Bachelor's degree	122 (35.9%)
	High diploma	42 (12.4%)
	MSc	64 (18.8%)
	PhD	103 (30.3%)
	Unknowns	9 (2.6%)
Place of work of Health Professionals	Primary Health Center	95 (18.2%)
	Hospital	143 (41.2%)
	Specialized center	102 (29.7%)

*Mean $\pm$ SD, ** Frequency (Percent)

The data regarding health professionals' knowledge are presented in Table 2. Regarding daily brushing, 324 health professionals (95.3%) reported that it prevents both tooth decay and periodontal disease, while 8 (2.4%) indicated that daily brushing prevents proclination of the teeth. When asked about the main factors contributing to tooth decay, 242 respondents (71.2%) identified the consumption of sugar-containing foods as a primary cause. Additionally, 44 (12.9%) cited carbonated beverages and 34 (10.0%) considered smoking as significant etiological factors. For factors associated with the loss of tooth structure, 121 health professionals (35.6%) believed that alcohol consumption leads to

dental caries, whereas 107 (31.5%) attributed it to vigorous toothbrushing and 100 (29.4%) to gastroesophageal reflux disorder or hiatal hernia. Concerning the etiology of gingival and periodontal diseases, a majority ($n=211$, 62.1%) identified dental plaque and calculus, while 96 (28.2%) and 17 (5.0%) considered dental caries and inflammation of the tongue, respectively, as causative factors. With respect to root canal treatment (RCT), 302 participants (88.8%) defined it as the removal of the nerves and vessels of a tooth, 33 (9.7%) as the filling of teeth, and 5 (1.5%) as the extraction of a tooth.

Table 2. knowledge of OH.

Questionnaire regarding the knowledge of oral health		No. (%)
Brushing teeth daily prevents	Oral cancer	6 (1.8%)*
	Oral ulcer	2 (0.6%)
	Tooth decay and periodontal disease	324 (95.3%)

Important factors causing tooth decay	Proclination of teeth	8 (2.4%)
	Brushing once daily	13 (3.8%)
	Using tooth powder	7 (2.1%)
	Sugar-contained foods consumed per day	242 (71.2%)
	Smoking	34 (10%)
Factors causing loss of tooth structure	Carbonated drinks	44 (12.9%)
	Vigorously toothbrushing	107 (31.5%)
	Gastroesophageal reflux disorder/hiatal hernia	100 (29.4%)
	Oral prophylaxis/scaling	12 (3.5%)
	Alcohol	121 (35.6%)
Factors responsible for gingival/periodontal disease	Dental caries	96 (28.2%)
	Plaque and calculus	211 (62.1%)
	Teeth with fractured restoration	16 (4.7%)
	Inflammation of the tongue	17 (5%)
	Removal of teeth	5 (1.5%)
What is root canal treatment (RCT)	Is filling of teeth	33 (9.7%)
	Is removal of the nerves and vessels of the tooth	302 (88.8%)

* Frequency (Percent)

The results concerning attitude showed that 206 (60.6%) of health professionals reported brushing twice daily. Moreover, 315 (92.6%) stated that mouthwash cannot substitute for toothbrushing. A total of 295 (86.8%) expressed that individual should visit a dentist at least once every six months. Additionally, 300 (88.2%) indicated they would seek RCT when experiencing dental pain. Among respondents, 198 (58.2%) reported

having previously undergone RCT, and 298 (87.7%) stated that they would recommend RCT to their friends. Furthermore, 311 (91.5%) considered RCT a successful treatment modality, while 213 (62.6%) believed that the fee they paid for RCT was justified. Most respondents (320; 94.1%) agreed that dental treatments improve quality of life, and 336 (98.8%) asserted that pregnant women require dental examinations (Table 3).

Table 3. Attitude of OH.

Questionnaire regarding the attitude of oral health		No. (%)
What should be the frequency of brushing?	Once daily	20 (5.9%)
	Twice daily	206 (60.6%)
	After every meal	114 (33.5%)
Rinsing with mouthwash can substitute brushing?	Yes	25 (7.4%)
	No	315 (92.6%)
In how much duration should you visit the dentist?	At least once in 6 months	295 (86.8%)
	Once in 2 months	32 (9.45%)
	Only if in pain	9 (2.6%)
	Once in every 2–5 years	4 (1.2%)
When the tooth is aching and you visit the dentist, you would prefer?	A RCT	300 (88.2%)
	An extraction	13 (3.8%)
	Extraction and dental implant	27 (7.9%)
Have you had any RCT done before?	1	198 (58.2%)
	2	80 (23.5%)
	3	62 (18.2%)
Would you recommend your friend to undergo a RCT?	Yes	298 (87.7%)
	No	42 (12.4%)
Do you think RCT is successful procedure?	Yes	311 (91.5%)
	No	29 (8.5%)
Do you think the price you were charged for root canal was worth it (Had free treatment)	Yes	213 (62.6%)
	No	127 (37.4%)
Do dental treatments improve quality of life?	Yes	320 (94.1%)
	No	20 (5.9%)
Do pregnant women need dental check-up?	Yes	
	No	4 (1.2%)

The results concerning awareness are presented in Table 4. A total of 254 (74.7%) respondents identified dental
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caries as a bacterial process, while 246 (72.4%) stated that RCT should be performed when the dental pulp is Furthermore, 258 (75.9%) believed that a severely decayed tooth can be preserved through RCT, and 241 (70.9%) indicated the necessity of placing a crown after RCT in posterior teeth. A strong majority, 335 (98.5%),

Table 4. Awareness of OH.

Questionnaire regarding the awareness of dental health		No. (%)
What are dental caries?	Bacterial process	254 (74.7%)
	Small worms stick on the teeth	38 (11.2%)
	Deposits and stains on teeth	48 (14.1%)
When is RCT done	Every time the tooth pains	39 (11.5%)
	When the tooth has cavity	41 (12.1%)
	When the pulp of the tooth is infected	246 (72.4%)
	Trauma to the teeth leading to pulp exposure	14 (4.1%)
Can a tooth with large cavity be saved by RCT?	Yes	258 (75.9%)
	No	82 (24.1%)
Is crown required after RCT of posterior teeth	Yes	241 (70.9%)
	No	99 (29.1%)
Is there any relationship between oral and general health	Yes	335 (98.5%)
	No	5 (1.5%)
Which system is commonly affected resulting in oral manifestations?	Gastrointestinal	186 (54.7%)
	Respiratory	60 (17.6%)
	Cardiovascular	61 (17.9%)
	Renal	33 (9.7%)

Figure 1. presents a comparison of OH knowledge between physicians and dentists. The results demonstrated statistically significant differences between the two groups regarding the role of dietary sugar in caries formation, plaque and calculus in

infected.

acknowledged a relationship between oral and general health, whereas 186 (54.7%) reported that systemic conditions are often influenced by gastrointestinal factors leading to clinical manifestations.

periodontal disease, and the purpose of RCT in removing dental nerves and vessels. Dentists were more likely to agree with these statements than physicians ($P \leq 0.011$, $P \leq 0.003$, and $P \leq 0.003$, respectively), indicating a higher level of OH knowledge among dentists.

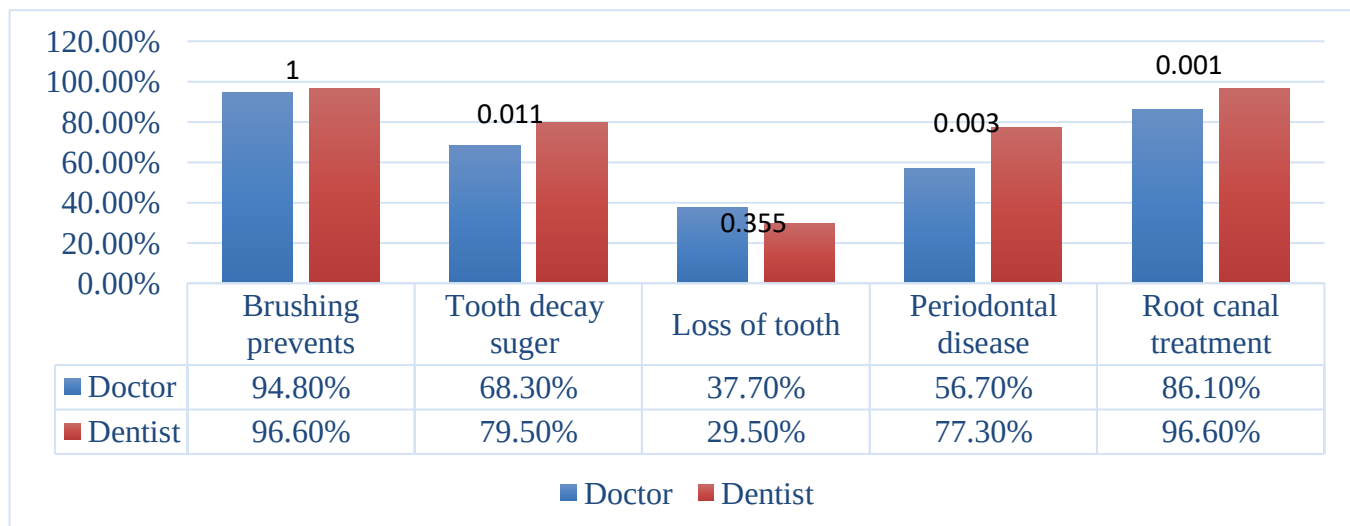


Figure 1. knowledge of OH.

Figure 2. illustrates differences in attitudes toward OH among physicians and dentists. Several statistically significant differences ($P \leq 0.05$) were observed between the groups in the following areas: frequency of toothbrushing, timing to visit the dentist, desire for dental treatment when having oral pain, prior RCT,

recommendation of RCT to a friend, perception of RCT being successful, and perception of value of RCT. The dentists were more likely than physicians to agree with optimal brushing frequency being twice a day, optimal frequency for a dentist visit being at least every 6 months, that a tooth is worthy of RCT when one is in

pain, and would recommend RCT at least to their colleagues. The dentists were also more likely to

perceive RCT as successful and felt it was worth the cost which indicates a more positive attitude toward OH.

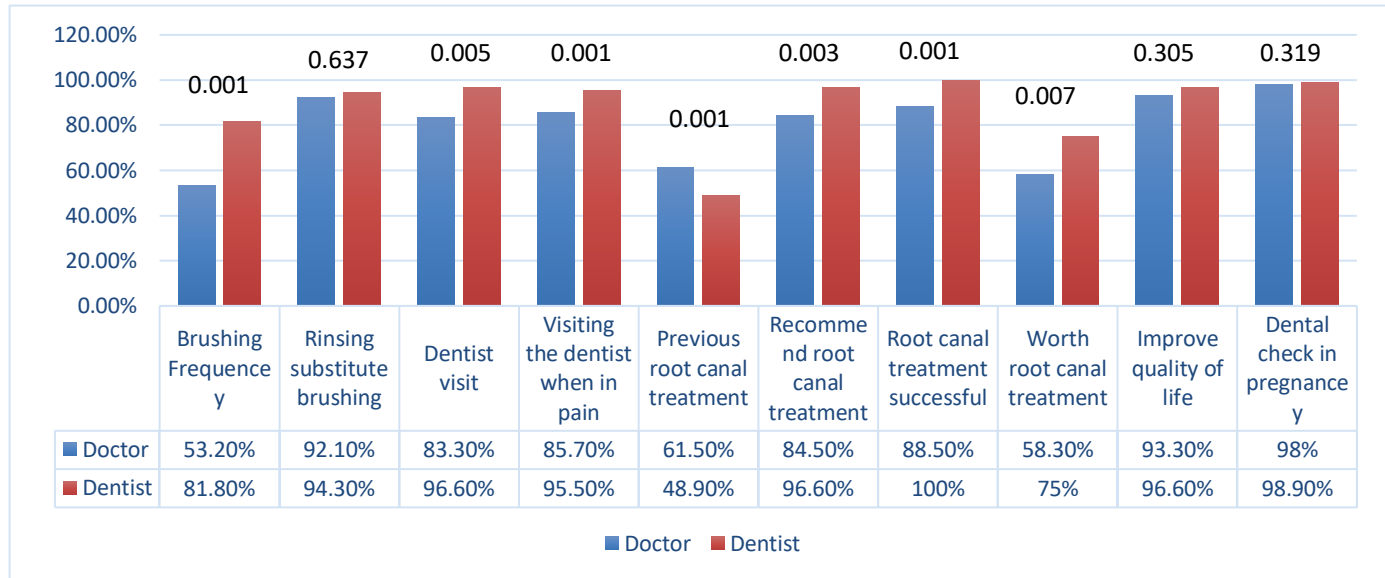


Figure 2. Attitude of OH.

Figure 3 illustrates the results of OH awareness of physicians compared to dentists. There were statistically significant differences ($P \leq 0.05$) related to dental caries etiology, RCT indication for infected dental pulp, and RCT as a means of saving severely decayed teeth. Dentists were more likely to recognize dental caries as a

bacterial process, endorse RCT for infected pulp, and agree that in some cases RCT can save extensively decayed teeth. The awareness findings suggest that dentists may have a higher awareness of OH and endodontic treatment compared to physicians

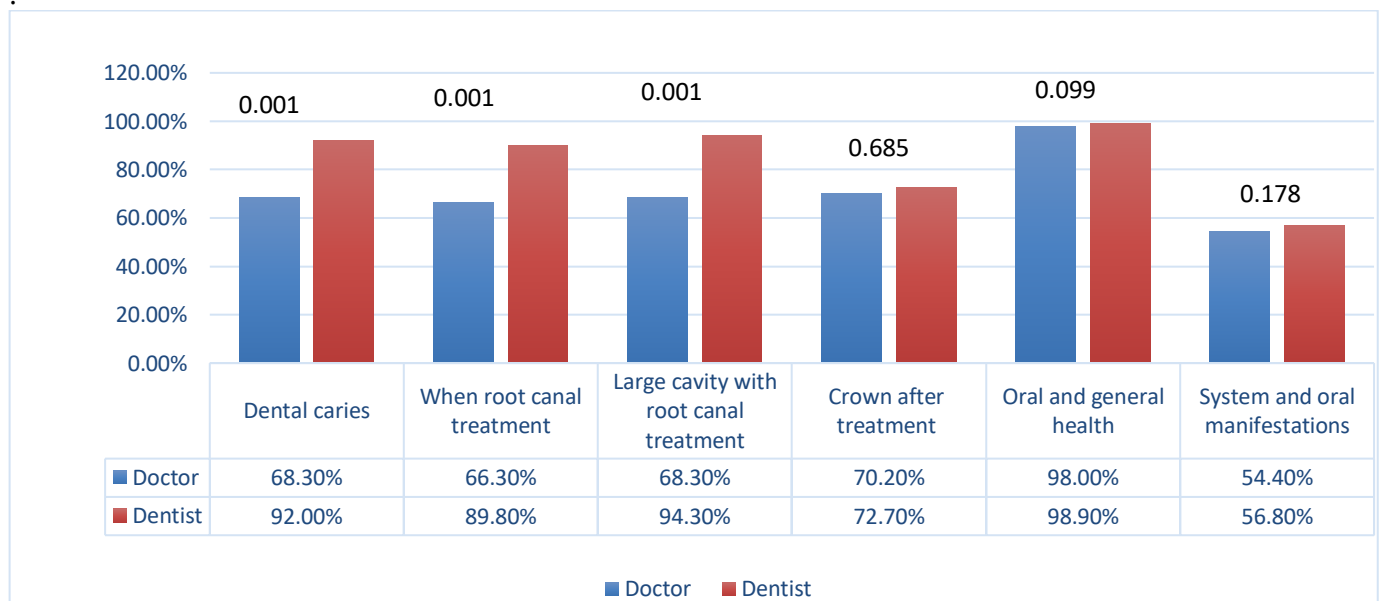


Figure 3. Awareness of OH.

DISCUSSION

The current study aimed to assess the knowledge, attitudes, and awareness of health professionals in Sulaymaniyah about OH and RCT. The results indicated that participants demonstrated relatively high knowledge, attitudes, and awareness with respect to oral and dental health. Moreover, some differences emerged between the responses provided by physicians and

dentists. The study population was moderately experience based on the age and number of years' experience. More than 95 % of the health professionals recognized the importance of tooth brushing in the prevention of dental caries and periodontal disease and almost 89 % correctly noted that RCT was the removal of the pulp tissue from the tooth, including the nerve and

blood vessels. Attitude wise, over 90 % indicated that brushing twice a day was important, denied that a mouthwash could replace brushing, and endorsed regular dental visits. Finally, nearly all participants (over 98 %) believed there was a strong correlation between OH and systemic or general health. The levels of awareness components were also good. Over 75% agreed that dental cavities are a bacterial process, and almost all respondents (99%) acknowledged that dental visits during pregnancy are necessary. Although in general the groups demonstrated a high level of knowledge, large statistically significant differences were observed between both professions in most knowledge domains. Dentists were more knowledgeable regarding the factors that cause cavities, the impact dental plaque and calculus have on periodontal disease, and when to complete RCT if the pulp is infected.

A major highlight of the findings of this study is the overall positive attitude towards RCT, as more than 91% of the study participants rated RCT as a good therapeutic procedure, and over 87% of participants would recommend it to others. Moreover, these favorable attitudes were also present among non-dental physicians, indicating an evolving paradigm in these practitioners' perspectives. RCT is being more recognized as a tooth-preserving type of intervention, rather than simply a procedure that reduces discomfort.¹⁷ This observation conforms well to the findings of Baig et al. whereby non-dental physicians were more likely to recommend RCT over extraction when they have been sufficiently informed.¹⁸

The results of the current research indicated that health professionals have a higher degree of awareness of OH and RCT. The majority of respondents were aware of the link between OH and systemic health as well as understanding the definition of RCT. In contrast, a study conducted by Alshathri et al.¹⁹ in Riyadh reported that general practitioners possessed poor knowledge about this issue and that few reported trainings in OH during their formal education. Nonetheless, both studies point to a clear knowledge gap between non-dental physicians and dentists and emphasize the urgent need to integrate OH content into medical education.

Correspondingly, the study by Shahid et al. in Pakistan demonstrated that medical and pharmacy students possessed limited knowledge in this domain. Only 68.6% of medical students identified bacterial activity as the primary cause of dental caries. However, both studies underlined a significant disparity in knowledge between dental and non-dental professionals. In both cohorts, dental students exhibited superior performance across all knowledge, attitude, and behavioral dimensions compared with their medical counterparts. Furthermore, both investigations suggested that theoretical knowledge does not automatically translate into clinical or preventive behavior.²⁰ For instance, in the present study, 60.6% of participants reported brushing twice daily,

whereas only 57.1% of medical students did so in the Pakistani study. These similarities and discrepancies may stem from differences in methodology, population characteristics, or educational context.

The present study also revealed that the overall awareness of health professionals in Sulaymaniyah regarding OH and RCT was higher than that reported by Chugh et al. in India. A larger proportion of participants in the current setting accurately defined RCT, compared with only 57% in the Indian study. Furthermore, 98.5% of respondents in Sulaymaniyah affirmed a relationship between oral and general health, in contrast to 83% in the Indian context. Nevertheless, both investigations demonstrated a significant knowledge gap between general physicians and dentists and indicated that understanding of technical aspects of RCT, such as the necessity of post-endodontic crowns, remains limited. The positive attitude toward tooth preservation was evident in both populations, but in the present study, confidence and willingness to recommend RCT were more pronounced.¹⁶ These differences may be attributed to participants' higher educational attainment or the influence of targeted local educational programs.

The implications of these findings are critical in light of the current needs of the regional healthcare system. Knowledge deficiencies in oral and dental health among non-dental professionals may represent a substantial barrier to the prevention and optimal management of oral diseases.^{10, 21} This limitation not only hampers the delivery of preventive dental services but also disrupts the integrity of interprofessional referral systems. When general health professionals, such as physicians and nurses, lack foundational knowledge of the relationship between oral status and systemic health, comprehensive patient management is compromised.^{7, 22} The absence of an integrated interprofessional paradigm may lead to the neglect of early oral symptoms, which often serve as significant indicators of systemic conditions.

CONCLUSIONS

The results of the present investigation indicate that overall health professionals were somewhat aware of OH and OH issues related to RCT; however, there were statistically significant differences between the awareness of general physicians and dentists. These discrepancies were notably identified in the understanding of physiologic and technical aspects of RCT; for instance, the need to restore a tooth following treatment and the causes of dental caries. The results highlight that further incorporation of OH training for both undergraduate education and continuous professional development among non-dental physicians is warranted. Nonetheless, the positive attitude towards preserving a tooth, the correlation between oral and systemic health, and expressed willingness to refer patients for RCT demonstrates the beginning of an important shift in the medical profession's viewpoint.

Doctors, as the first line of contact with the patient, play a critical role in promoting prevention, early diagnosis, and appropriate referral to dental professionals; therefore, strengthening their knowledge of OH has the potential to provide a more seamless and multidisciplinary approach to health care.

DECLARATIONS

Ethical Considerations: Ethical approval of the research protocol was granted by the Kurdistan Board of Medical Specialties Research Protocol Ethics Committee for this study. Written informed consent was obtained from participants after information was provided about the study's aims, methods, risks, and benefits. Participants were explicitly told they could decline to participate and withdraw from the study without negative consequences. Anonymity and confidentiality were assured to participants throughout data collection and analysis.

Informed Consent: Not applicable.

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Data availability: The study data may be acquired from the relevant author upon a reasonable request.

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