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ASSESSMENT OF KNOWLEDGE AND PRACTICE AMONG DENTAL PRACTITIONERS REGARDING MOUTHWASH USE IN THE QASSIM REGION, SAUDI ARABIA

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Abstract

Background: Oral health significantly influences overall well-being, with dental caries and periodontal diseases posing global health challenges. Mouthwashes play a critical role in the non-mechanical control of dental plaque, pivotal in preventing these diseases. Despite their importance, the knowledge and practices of dental practitioners concerning mouthwash use, particularly in the Qassim region, Saudi Arabia, vary widely.

Objectives: This study aims to assess the knowledge and practices related to mouthwash use among dental practitioners in the Qassim region, to identify gaps in knowledge, and to explore the influence of demographic factors on these practices.

Methods: A cross-sectional survey was conducted using a standardized online questionnaire distributed to 152 registered dental practitioners in the Qassim region. The survey included multiple-choice, Likert scale, and open-ended questions to evaluate knowledge about mouthwash types, indications, and potential side effects. Data were collected over six months, from January to June 2024, and analyzed using SPSS version 25.0.

Results: The majority of practitioners (46.7%) recommended using mouthwash twice daily, with 71.7% advising its use post-brushing. A significant portion, however, displayed variability in the timing and duration of mouthwash application, with 26.3% recommending pre-brushing usage. About 65.8% of the participants acknowledged the need for more detailed educational programs about mouthwashes. Notably, younger practitioners tended to adhere more strictly to the twice-daily usage guideline, reflecting recent training impacts. Cultural factors such as the use of Siwak also influenced the recommendations.

Conclusion: The findings highlight a broad range of practices and a substantial variability in the knowledge among dental practitioners regarding the optimal use of mouthwashes. This underscores the necessity for enhanced educational initiatives targeted at standardizing practices based on the best available evidence. Such efforts are crucial for improving oral healthcare outcomes and aligning practices with global standards.

Keywords: Mouthwash, Dental Practitioners, Oral Health, Qassim Region, Dental Education, Chlorhexidine, Cultural Practices in Oral Hygiene.

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Introduction

Oral health is a critical component of overall health and well-being, with dental caries and periodontal diseases recognized as the most common global health burdens.[1] Despite advances in dental health education and technology, these diseases remain prevalent, affecting millions worldwide.[2] Mouthwashes, as chemical agents, play a significant role in the non-mechanical control of dental plaque, which is pivotal in preventing these oral diseases.[3]

Recent statistics indicate a rising trend in the global mouthwash market, expected to grow at a CAGR of 5.5% from 2021 to 2028.[4] This growth is driven by increasing awareness of oral hygiene and the effectiveness of mouthwashes in oral care routines (Market Analysis Report, 2021). However, the efficacy of mouthwashes largely depends on the correct knowledge and practices of dental practitioners, who are the primary influencers of patient behaviour.[5]

Studies, such as James et al. (2017), have documented the effectiveness of Chlorhexidine, a gold-standard mouthwash, in reducing dental plaque and gingivitis, yet its application and patient education by dental practitioners vary widely.[6] For instance, a survey conducted by Barnett (2006) highlighted gaps in knowledge among dental professionals regarding the appropriate types and uses of mouthwashes, suggesting a need for improved educational programs.[7]

Moreover, emerging research has begun to explore the potential adverse effects of some mouthwash components, which necessitates a balanced understanding and cautious promotion of these products by dental health professionals (Grover et al., 2021).[8] As the region of Qassim sees a diverse set of dental health challenges and cultural practices, the current study aims to assess the knowledge and practice of Saudi dental practitioners regarding the use of mouthwashes in clinical practice. This understanding will not only bridge the knowledge gap but also enhance the overall oral health outcomes of the population in the region.

Methodology

The study employed a cross-sectional design to assess the knowledge and practices of dental practitioners regarding the use of mouthwashes within the Qassim region, Saudi Arabia. The methodology was structured to capture a comprehensive overview of current practices and understanding among a diverse group of dental professionals, including undergraduate and postgraduate students, general practitioners, and specialists.

A standardized and validated online questionnaire was utilized to collect data. This questionnaire included multiple-choice questions, Likert scale items, and open-ended questions to evaluate practitioners' knowledge about the types of mouthwashes, their ingredients, indications, and potential side effects. The questionnaire also probed the frequency and context of mouthwash recommendations made to patients.

The sampling frame included all registered dental practitioners in the Qassim region. The sample size was determined using G*Power software, which calculated that a total of 152 respondents would be required to achieve an effect size of 0.3 with a power of 80% and a confidence level of 95%. Stratified random sampling was utilized to ensure representation across different levels of education and practice

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settings. Ethical approval for the study was obtained from the Institutional Review Board of Qassim University. All participants provided informed consent before participating in the study.

Data collection was conducted over a period of six months, from January to June 2024. Participants were invited to partake in the study through email invitations, which included a link to the online survey. Participation was voluntary, and confidentiality was maintained by anonymizing personal information. Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 25.0. Descriptive statistics were used to summarize demographic data and responses. Inferential statistics, including chi-square tests, were employed to examine the relationships between practitioners' demographics and their knowledge and practices regarding mouthwashes.

Results

Table 1 presents the sociodemographic characteristics of the participants in a study assessing the knowledge and practice regarding mouthwash use among dental practitioners in the Qassim region, Saudi Arabia. A total of 152 dental practitioners participated, with a dominant age group of 20-25 years, representing 55.9% of the sample (Figure 1). This age distribution indicates a significant representation of younger practitioners or students, as also reflected by the largest subgroup being undergraduate students (36.8%). The sample also included general practitioners and interns, each comprising about 19.7%, which suggests a good representation of those at early stages of their careers or training.

The gender distribution within the study shows a higher proportion of males (65.1%) compared to females (34.9%) (Figure 2). In terms of professional roles, alongside the large proportion of undergraduates, the specialists and other experienced roles such as consultants are less represented, with specialists making up 17.8% and consultants only 0.7% (Figure 3).

Table 1: Sociodemographic Characteristics of the study participants

Variable		Frequency (n)	Percent (%)
Age	<19	1	0.7
	>40	12	7.9
	20-25	85	55.9
	26-30	32	21.1
	31-40	22	14.5
	Total	**152**	**100.0**
Demographic	Female	53	34.9
	Male	99	65.1
	Total	**152**	**100.0**
Types of practice ?	Consultant	1	0.7
	general practitioner	30	19.7
	hygienist	3	2.0
	Intern	30	19.7
	postgraduate student	5	3.3

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	specialist	27	17.8
	Undergraduates student	56	36.8
	Total	**152**	**100.0**

Figure 1: Distribution of Age Groups

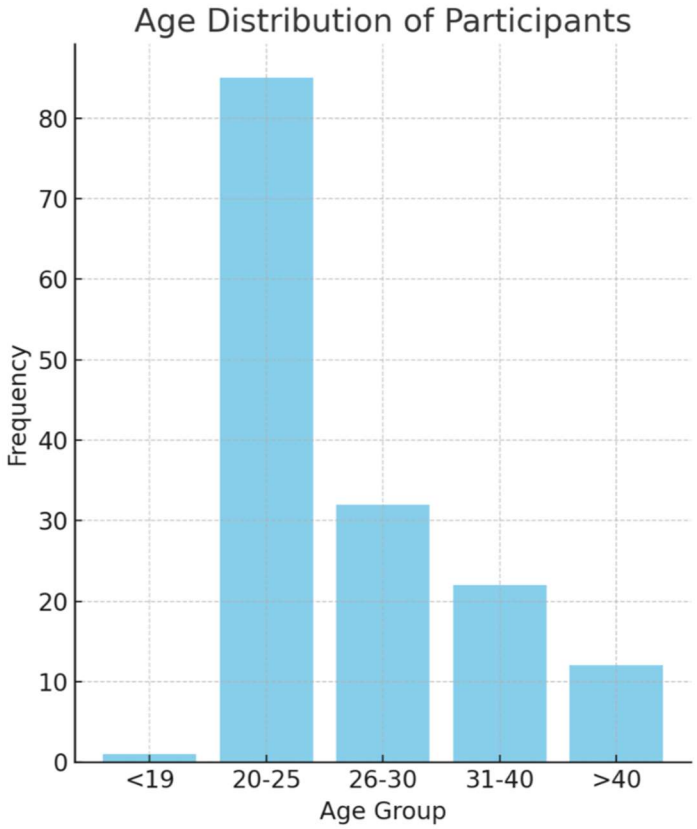

Figure 2: Distribution of gender

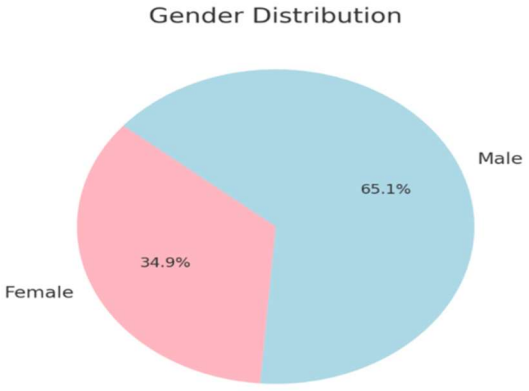

Figure 3: Distribution of Types of Practice

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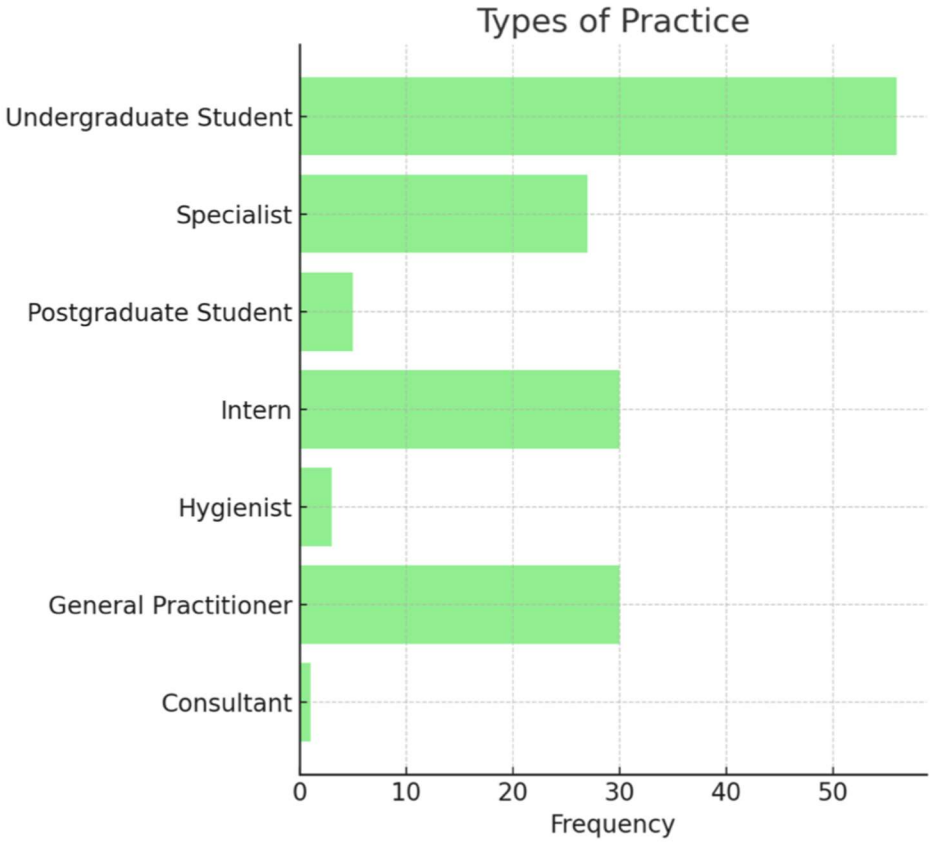

Table 2 describes the responses of study participants. The majority of dental practitioners advise their patients to use mouthwash twice daily (46.7%), followed by once daily (34.9%). A small percentage does not recommend mouthwash use at all (9.2%), highlighting variability in practice based on patient needs and oral conditions. Most practitioners (71.7%) recommend using mouthwash after brushing teeth, while 26.3% suggest using it before brushing, and a minor 2% recommend it during brushing. This suggests a strong preference for post-brushing use, potentially to maximize the retention of active ingredients in the oral cavity.

About 61.8% of practitioners advise keeping the mouthwash in the mouth for 25-35 seconds, indicating a consensus on the optimal duration for effectiveness. Notably, 19.7% recommend holding it for one minute or more, suggesting a preference for prolonged exposure in some cases. Responses vary with 50.7% recommending daily use, and others prescribing more specific regimens based on the product type (e.g., chlorhexidine) or the therapeutic needs, highlighting personalized patient care.

There's a split in practices regarding dilution: 41.4% recommend dilution always, 30.9% sometimes, and 27.6% never. This variation may reflect differing views on the concentration effectiveness or patient sensitivity. The preferred timing between brushing and using mouthwash is less than one minute for 43.4% of respondents, while 36.8% wait between 5 and 15 minutes. This suggests an emphasis on either immediate or short-delayed use post-brushing to possibly enhance fluoride retention or prevent interaction effects.

Regarding the prescription of chlorhexidine (CHX) mouthwash, practices vary, with 42.8% never altering the concentration, 38.2% doing so sometimes, and 19.1% always tailoring the concentration to

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the patient's needs. A significant majority (65.8%) believe there is a need for more detailed awareness programs about mouthwash usage, indicating a perceived gap in understanding or compliance among patients.

Most practitioners (64.5%) do not prescribe CHX mouthwash without performing oral prophylaxis first, emphasizing the importance of initial professional cleaning. When not choosing CHX, fluoride mouthwash is the most preferred alternative (41.4%), followed by essential oils (23.7%). This diversity shows the consideration of different therapeutic effects and patient preferences.

A majority (52.6%) consider it essential to prescribe CHX as a pre-procedural mouthwash to prevent aerosol contamination, highlighting its perceived importance in infection control. Concerns about CHX include permanent alteration in taste perception (40.1% agree) and the development of antimicrobial resistance (53.3% agree), reflecting awareness of potential adverse effects. The most common procedure after which CHX is prescribed is following scaling and combined procedures involving implants and periodontal surgery (33.6%), indicating its use in complex oral care regimens.

Table 2: Distribution of responses of study participants

Variable		Frequency (n)	Percent (%)
How many times per day do you advise your patient to use the mouthwash?	Once if need it	1	0.7
	According to the oral condition the mouth wash was prescribed for	1	0.7
	None	14	9.2
	Once	53	34.9
	Rarely	1	0.7
	three times or more	11	7.2
	twice	71	46.7
	Total	152	100.0
When do you advise your patient to use a mouthwash?	after brushing	109	71.7
	before brushing	40	26.3
	during brushing	3	2.0
	Total	152	100.0
How long do you advise your patient to keep it in their mouth?	25 -35 seconds	94	61.8
	few seconds	28	18.4
	one min or more	30	19.7
	Total	152	100.0
How frequently do you advise your patient to use mouthwash?	2 weeks if for therapeutic use	1	0.7
	According to the oral condition	1	0.7

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	As recommended by doctor	1	0.7
	daily	77	50.7
	Daily for 2 weeks	1	0.7
	Daily for two weeks if CHX	1	0.7
	If Cosmetic daily, if CHX 2 weeks maximum	1	0.7
	None	8	5.3
	once a week	15	9.9
	Only if needed	1	0.7
	three times a week	25	16.4
	twice a week	20	13.2
	Total	152	100.0
Do you advise your patient to dilute mouthwash?	no	42	27.6
	sometimes	47	30.9
	yes	63	41.4
	Total	152	100.0
What is the time interval you keep between brushing teeth and use of mouthwash?	about 1 hour	27	17.8
	about 2 hours	3	2.0
	between 5 and 15 minutes	56	36.8
	Less than 1 minute	66	43.4
	Total	152	100.0
Do you prescribe different concentrations of CHX mouthwash for different patients?	Always	29	19.1
	never	65	42.8
	sometimes	58	38.2
	Total	152	100.0
The side effects of chlorhexidine mouthwash include?	all the above	85	55.9
	discoloration of teeth	44	28.9
	erosion of oral mucosa	14	9.2
	Parotitis	9	5.9
	Total	152	100.0
What should be the percentage of concentration of solution and dose of (Without dilution) of chlorhexidine mouthwash?	.05	18	11.8
	.09	9	5.9
	.12	65	42.8
	.20	60	39.5

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	Total	152	100.0
Do you think there is a need for more detailed awareness programs about the usage of the Mouthwash?	maybe	31	20.4
	no	21	13.8
	yes	100	65.8
	Total	152	100.0
Do you prescribe CHX mouthwash to the patients without performing oral prophylaxis?	maybe	22	14.5
	no	98	64.5
	yes	32	21.1
	Total	152	100.0
What is the other alternative mouthwash you prefer over chlorhexidine?	essential oils	36	23.7
	fluoride mouthwash	63	41.4
	herbal mouthwash	21	13.8
	IDK	1	0.7
	Normal Saline	1	0.7
	Povidone iodine	23	15.1
	Saline	1	0.7
	Salt	1	0.7
	Salt and water	1	0.7
	Salted water	1	0.7
	Warm saline	1	0.7
	Warm water and salt	1	0.7
	Water and Salt	1	0.7
	Total	152	100.0
Is it essential to prescribe chlorhexidine as a pre-procedural mouthwash to prevent aerosol contamination?	maybe	40	26.3
	no	32	21.1
	yes	80	52.6
	Total	152	100.0
Can chlorhexidine gluconate oral rinse cause Permanent alteration in taste perception?	maybe	52	34.2
	no	39	25.7
	yes	61	40.1
	Total	152	100.0
Can persistent use of chlorhexidine mouthwash causes anti-microbial resistance?	maybe	48	31.6
	no	23	15.1
	yes	81	53.3
	Total	152	100.0
What are the procedures for which you prescribe CHX	after dental implant	4	2.6
	after extraction	6	3.9

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mouthwash?	after extraction; after dental implant	1	0.7
	after periodontal surgery	9	5.9
	after periodontal surgery; after dental implant	4	2.6
	after periodontal surgery; after extraction	1	0.7
	after periodontal surgery; after extraction; after dental implant	6	3.9
	After scaling	35	23.0
	After scaling; after dental implant	1	0.7
	After scaling; after extraction	1	0.7
	After scaling; after extraction; after dental implant	1	0.7
	After scaling; after periodontal surgery	21	13.8
	After scaling; after periodontal surgery; after dental implant	8	5.3
	After scaling; after periodontal surgery; after extraction	3	2.0
	After scaling; after periodontal surgery; after extraction; after dental implant	51	33.6
	Total	152	100.0

Table 3 presents a comparative analysis between the responses of dental practitioners regarding mouthwash use and their age groups. Older practitioners (above 40) seem to recommend mouthwash twice daily more frequently than their younger counterparts. The youngest practitioners (under 19) show minimal involvement in prescribing specific frequencies, likely due to their limited clinical experience. A large majority across all age groups recommend using mouthwash after brushing, with this practice being most prevalent among the 20-25 age group. The consistency across ages in this recommendation highlights a standard practice in dental care.

While most age groups agree on retaining mouthwash for 25-35 seconds, there is a near-significant

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variation (p=0.051) in how long practitioners advise patients to keep mouthwash in their mouth, suggesting some disagreement or variability in understanding of best practices. The significance (p=0.034) observed here may indicate differing opinions on how often mouthwash should be used, with varying recommendations based on therapeutic needs or patient conditions, particularly differing between younger and older practitioners.

There's no significant age-related trend in advising on dilution, indicating a consistent approach across different ages. Responses vary, but no significant age-based differences are noted, suggesting that practitioners generally agree regardless of age. There is a range of responses with some degree of variability, but not reaching statistical significance, indicating that while practices vary, they do not significantly differ by age group.

There is a significant need (p=0.041) recognized across age groups for more detailed awareness programs about mouthwash usage, especially noted among the 20-25 age group. Significantly (p=0.028), younger practitioners (particularly those in the 20-25 age group) prefer alternatives like fluoride and essential oils over chlorhexidine, indicating a shift towards less aggressive treatments among younger dental professionals. There is significant variability (p=0.044) in the belief of its necessity to prevent aerosol contamination, with older practitioners more likely to consider it essential. Significant concern (p=0.044) exists about persistent use of chlorhexidine causing antimicrobial resistance, with this concern being more prevalent among the younger age groups.

Table 3: Comparative analysis between responses and age group of study participants

Variable		Age						
		<19	**>40**	**20-25**	**26-30**	**31-40**	**Total**	**Significance**
How many times per day do you advise your patient to use the mouthwash?	Once if need it	0	0	1	0	0	1	
	According to the oral condition the mouth wash was prescribed for	0	1	0	0	0	1	
	None	0	2	7	1	4	14	
	Once	0	1	33	11	8	53	
	Rarely	0	0	0	1	0	1	
	three times or more	0	1	6	2	2	11	
	twice	1	7	38	17	8	71	0.377a,b
When do you advise your patient to use a mouthwash?	after brushing	1	10	56	25	17	109	
	before brushing	0	2	28	6	4	40	
	during brushing	0	0	1	1	1	3	0.663a,b

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How long do you advise your patient to keep it in their mouth?	25 -35 seconds	0	6	57	18	13	94	
	few seconds	0	0	14	8	6	28	
	one min or more	1	6	14	6	3	30	0.051a,b
How frequently do you advise your patient to use mouthwash?	2 weeks if for therapeutic use	0	1	0	0	0	1	
	According to the oral condition	0	1	0	0	0	1	
	As recommended by doctor	0	0	0	0	1	1	
	daily	0	7	49	17	4	77	
	Daily for 2 weeks	0	0	0	1	0	1	
	Daily for two weeks if CHX	0	0	0	1	0	1	
	If Cosmetic daily, if CHX 2 weeks maximum	0	0	1	0	0	1	
	None	0	0	5	2	1	8	
	once a week	0	1	7	2	5	15	
	Only if needed	0	0	1	0	0	1	
	three times a week	1	0	15	3	6	25	
	twice a week	0	2	7	6	5	20	0.034a,b,*
Do you advise your patient to dilute mouthwash?	no	0	4	19	8	11	42	
	sometimes	0	5	30	9	3	47	
	yes	1	3	36	15	8	63	0.212a,b
What is the time interval you keep between brushing teeth and use of	about 1 hour	0	4	14	4	5	27	
	about 2 hours	0	0	1	0	2	3	
	between 5 and 15 minutes	0	4	35	11	6	56	
	Less than 1 minute	1	4	35	17	9	66	0.384a,b

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mouthwash?								
Do you prescribe different concentrations of CHX mouthwash for different patients?	Always	0	3	17	5	4	29	0.295a,b
	never	0	1	41	14	9	65	
	sometimes	1	8	27	13	9	58	
The side effects of chlorhexidine mouthwash include?	all the above	1	5	50	18	11	85	0.713a,b
	discoloration of teeth	0	4	21	9	10	44	
	erosion of oral mucosa	0	2	10	2	0	14	
	Parotitis	0	1	4	3	1	9	
Do you think there is a need for more detailed awareness programs about the usage of the Mouthwash?	maybe	1	6	15	4	5	31	0.041a,b,*
	no	0	1	16	3	1	21	
	yes	0	5	54	25	16	100	
Do you prescribe CHX mouthwash to the patients without performing oral prophylaxis?	maybe	1	4	9	7	1	22	0.089a,b
	no	0	6	58	18	16	98	
	yes	0	2	18	7	5	32	
What is the other alternative mouthwash you prefer over chlorhexidine	essential oils	0	1	25	7	3	36	0.028a,b,*
	fluoride mouthwash	1	1	35	14	12	63	
	herbal mouthwash	0	2	13	5	1	21	
	IDK	0	0	0	1	0	1	
	Normal Saline	0	1	0	0	0	1	

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?	Povidone iodine	0	7	9	5	2	23	
	Saline	0	0	1	0	0	1	
	Salt	0	0	0	0	1	1	
	Salt and water	0	0	0	0	1	1	
	Salted water	0	0	0	0	1	1	
	Warm saline	0	0	1	0	0	1	
	Warm water and salt	0	0	0	0	1	1	
	Water and Salt	0	0	1	0	0	1	
Is it essential to prescribe chlorhexidine as a pre-procedural mouthwash to prevent aerosol contaminatio n?	maybe	1	2	24	9	4	40	0.044a,b,*
	no	0	7	15	4	6	32	
	yes	0	3	46	19	12	80	
Can chlorhexidine gluconate oral rinse cause Permanent alteration in taste perception?	maybe	1	4	26	14	7	52	0.336a,b
	no	0	5	18	8	8	39	
	yes	0	3	41	10	7	61	
Can persistent use of chlorhexidine mouthwash causes anti-microbial resistance?	maybe	0	4	25	11	8	48	0.044a,b,*
	no	1	5	13	2	2	23	
	yes	0	3	47	19	12	81	
What are the procedures for which you	after dental implant	0	2	2	0	0	4	0.309a,b
	after extraction	0	0	4	1	1	6	

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prescribe CHX mouthwash?	after extraction; after dental implant	0	0	0	0	1	1	
	after periodontal surgery	0	1	4	2	2	9	
	after periodontal surgery; after dental implant	0	0	2	1	1	4	
	after periodontal surgery; after extraction	0	0	0	0	1	1	
	after periodontal surgery; after extraction; after dental implant	0	1	2	1	2	6	
	After scaling	0	4	18	10	3	35	
	After scaling; after dental implant	0	1	0	0	0	1	
	After scaling; after extraction	0	0	1	0	0	1	
	After scaling; after extraction; after dental implant	0	0	1	0	0	1	
	After scaling; after periodontal surgery	1	1	12	3	4	21	
	After scaling; after periodontal surgery; after	0	2	4	1	1	8	

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	dental implant							
	After scaling; after periodontal surgery; after extraction	0	0	3	0	0	3	
	After scaling; after periodontal surgery; after extraction; after dental implant	0	0	32	13	6	51	

Results are based on nonempty rows and columns in each innermost subtable.
*. The Chi-square statistic is significant at the .05 level.
a. More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.
b. The minimum expected cell count in this subtable is less than one. Chi-square results may be invalid.
Table 4 offers a comparative analysis based on gender of dental practitioners and their responses regarding mouthwash usage. Both male and female practitioners display a similar pattern in advising the frequency of mouthwash use, with the majority recommending its use twice daily. There are no significant gender-based differences in prescribing behaviours according to the data. There is a predominant recommendation among both genders to use mouthwash after brushing, accounting for 71% of males and a slightly lower percentage of females.
Responses are similar across genders with the majority advising that mouthwash be retained in the mouth for 25-35 seconds. No significant gender differences are found in how often practitioners advise mouthwash usage. Both genders show a strong preference for daily usage, demonstrating a general agreement on the regular incorporation of mouthwash into oral hygiene routines. There is no significant difference between genders in advising patients whether to dilute mouthwash, with roughly equal proportions across the responses.
Both male and female practitioners generally agree on the timing between brushing and using mouthwash, with no significant gender differences noted. Although there are some variations in the responses, there is no significant difference between genders. This suggests that both male and female practitioners are similarly likely to tailor CHX concentrations to individual patient needs.
A significant difference ($p=0.048$) is noted in the perception of the need for more detailed awareness programs about mouthwash usage. Female practitioners are more likely than males to see the need for enhanced educational efforts, which may reflect a greater sensitivity towards patient education. No significant differences are observed in the preferences for alternative mouthwashes over chlorhexidine,

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with both genders showing similar patterns in their choices.

There is an equal distribution of opinions on the essential nature of prescribing CHX as a pre-procedural mouthwash to prevent aerosol contamination, indicating a shared understanding of its benefits in infection control. Both genders show concern about the potential for permanent alteration in taste perception and antimicrobial resistance due to CHX use, with no significant gender differences in these concerns. A significant difference (p=0.006) is found in the procedures for which CHX is prescribed, with female practitioners more likely to prescribe CHX after scaling and combined procedures involving implants and periodontal surgery. This may indicate a gender difference in clinical focus or patient management strategies.

Table 4: Comparative analysis between responses and gender of study participants

Variable		Gender Distribution			
		Female	**Male**	**Total**	**Significance**
How many times per day do you advise your patient to use the mouthwash?	Once if need it	0	1	1	0.345a,b
	According to the oral condition the mouth wash was prescribed for	1	0	1	
	None	4	10	14	
	Once	16	37	53	
	Rarely	0	1	1	
	three times or more	2	9	11	
	twice	30	41	71	
When do you advise your patient to use a mouthwash?	after brushing	38	71	109	0.421a
	before brushing	15	25	40	
	during brushing	0	3	3	
How long do you advise your patient to keep it in their mouth?	25 -35 seconds	32	62	94	0.86
	few seconds	11	17	28	
	one min or more	10	20	30	
How frequently do you advise your patient to use mouthwash?	2 weeks if for therapeutic use	1	0	1	0.315a,b
	According to the oral condition	1	0	1	
	As recommended by doctor	0	1	1	
	daily	33	44	77	
	Daily for 2 weeks	0	1	1	
	Daily for two weeks if CHX	0	1	1	

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	If Cosmetic daily, if CHX 2 weeks maximum	0	1	1	
	None	1	7	8	
	once a week	3	12	15	
	Only if needed	0	1	1	
	three times a week	9	16	25	
	twice a week	5	15	20	
Do you advise your patient to dilute mouthwash?	no	13	29	42	0.61
	sometimes	19	28	47	
	yes	21	42	63	
What is the time interval you keep between brushing teeth and use of mouthwash?	about 1 hour	8	19	27	0.151a
	about 2 hours	1	2	3	
	between 5 and 15 minutes	26	30	56	
	Less than 1 minute	18	48	66	
Do you prescribe different concentrations of CHX mouthwash for different patients?	Always	7	22	29	0.082
	never	29	36	65	
	sometimes	17	41	58	
The side effects of chlorhexidine mouthwash include?	all the above	35	50	85	0.323a
	discoloration of teeth	12	32	44	
	erosion of oral mucosa	4	10	14	
	Parotitis	2	7	9	
Do you think there is a need for more detailed awareness programs about the usage of the Mouthwash?	maybe	15	16	31	0.048*
	no	10	11	21	
	yes	28	72	100	
Do you prescribe CHX mouthwash to the patients without performing oral prophylaxis?	maybe	7	15	22	0.579
	no	37	61	98	
	yes	9	23	32	
What is the other alternative mouthwash you prefer over chlorhexidine?	essential oils	18	18	36	0.450a,b
	fluoride mouthwash	19	44	63	
	herbal mouthwash	7	14	21	
	IDK	0	1	1	
	Normal Saline	1	0	1	
	Povidone iodine	7	16	23	

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	Saline	0	1	1	
	Salt	0	1	1	
	Salt and water	0	1	1	
	Salted water	0	1	1	
	Warm saline	0	1	1	
	Warm water and salt	1	0	1	
	Water and Salt	0	1	1	
Is it essential to prescribe chlorhexidine as a pre-procedural mouthwash to prevent aerosol contamination?	maybe	14	26	40	0.99
	no	11	21	32	
	yes	28	52	80	
Can chlorhexidine gluconate oral rinse cause Permanent alteration in taste perception?	maybe	17	35	52	0.2
	no	10	29	39	
	yes	26	35	61	
Can persistent use of chlorhexidine mouthwash causes anti-microbial resistance?	maybe	16	32	48	0.36
	no	11	12	23	
	yes	26	55	81	
What are the procedures for which you prescribe CHX mouthwash?	after dental implant	4	0	4	0.006a,b,*
	after extraction	2	4	6	
	after extraction; after dental implant	1	0	1	
	after periodontal surgery	1	8	9	
	after periodontal surgery; after dental implant	3	1	4	
	after periodontal surgery; after extraction	0	1	1	
	after periodontal surgery; after extraction; after dental implant	2	4	6	
	After scaling	6	29	35	
	After scaling; after dental implant	1	0	1	

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	After scaling; after extraction	1	0	1	
	After scaling; after extraction; after dental implant	1	0	1	
	After scaling; after periodontal surgery	4	17	21	
	After scaling; after periodontal surgery; after dental implant	3	5	8	
	After scaling; after periodontal surgery; after extraction	2	1	3	
	After scaling; after periodontal surgery; after extraction; after dental implant	22	29	51	

Results are based on nonempty rows and columns in each innermost subtable.
*. The Chi-square statistic is significant at the .05 level.
a. More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.
b. The minimum expected cell count in this subtable is less than one. Chi-square results may be invalid.

General practitioners and specialists tend to recommend mouthwash use more frequently, with a considerable number suggesting twice daily use. This may reflect a more routine integration of mouthwash in general and specialized dental care settings compared to educational environments where undergraduates and postgraduates may have limited patient interaction. The recommendation to use mouthwash after brushing is prevalent across all types of practices, indicating a consensus on this practice. However, there's no significant statistical difference, suggesting a universal standard being taught and practiced regardless of the dental role. Specialists and consultants show a similar trend in recommending the retention of mouthwash for 25-35 seconds, aligning with general dental practice guidelines.
Significant differences are noted in how frequently practitioners from different backgrounds advise mouthwash use. For example, daily usage is more commonly recommended by general practitioners and specialists, which might be due to their closer and more frequent engagement with patients' long-term oral care compared to, say, hygienists or interns.
There's a significant variation ($p=0.041$) in responses regarding whether to dilute mouthwash, particularly between general practitioners and specialists versus students. This may reflect differing educational emphases or clinical experiences. Most practitioners across types tend to recommend a short

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interval between brushing and using mouthwash, but with no significant differences, suggesting a general agreement on this practice.

While responses vary, there's no significant difference across practice types, indicating that decisions on CHX concentration might be more influenced by individual patient needs rather than practitioner's type of practice. There is a significant need (p=0.005) for more detailed awareness programs about mouthwash usage, particularly noted among specialists and undergraduate students. This suggests a recognition of gaps in knowledge or practice that could be impacting patient care.

Preferences for alternative mouthwashes over chlorhexidine do not significantly differ by practice type, indicating similar considerations across different dental roles regarding efficacy, patient preference, and side effects. The necessity to prescribe chlorhexidine as a pre-procedural mouthwash to prevent aerosol contamination shows significant differences (p=0.001), with general practitioners and specialists more likely to prescribe it, possibly due to higher exposure to procedures requiring stringent infection control measures.

There are variations in the specific dental procedures after which practitioners prescribe CHX mouthwash, with more experienced practitioners (consultants, specialists) likely prescribing it across a broader range of procedures, reflecting a deeper engagement with complex dental care scenarios.

Table 5: Comparative analysis between responses and type of practice of study participants

Variable		Types of practice?								
		Consultant	**General practitioner**	**Hygienist**	**Intern**	**Postgraduate student**	**Specialist**	**Undergraduates student**	**Total**	**Significance**
How many times per day do you advise your patient to use the mouthwash?	Once if need it	0	0	0	1	0	0	0	1	
	According to the oral condition the mouth wash was prescribed for	0	0	0	0	0	1	0	1	
	None	1	3	0	2	0	5	3	14	
	Once	0	8	1	7	4	8	25	53	
	Rarely	0	0	0	1	0	0	0	1	
	three times or more	0	3	0	3	0	2	3	11	0.435a, b

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	twice	0	16	2	16	1	11	25	71	
When do you advise your patient to use a mouthwash?	after brushing	1	23	1	18	4	23	39	##	0.404a, b
	before brushing	0	6	2	10	1	4	17	40	
	during brushing	0	1	0	2	0	0	0	3	
How long do you advise your patient to keep it in their mouth?	25 -35 seconds	0	17	1	19	3	17	37	94	0.197a, b
	few seconds	0	11	1	4	1	3	8	28	
	one min or more	1	2	1	7	1	7	11	30	
How frequently do you advise your patient to use mouthwash?	2 weeks if for therapeutic use	0	0	0	0	0	1	0	1	0.005a, b,*
	According to the oral condition	0	0	0	0	0	1	0	1	
	As recommended by doctor	0	0	0	0	0	1	0	1	
	daily	0	15	3	15	1	10	33	77	
	Daily for 2 weeks	0	0	0	1	0	0	0	1	
	Daily for two weeks if CHX	0	0	0	0	1	0	0	1	

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	If Cosmetic daily, if CHX 2 weeks maximum	0	0	0	0	0	0	1	1	
	None	1	3	0	4	0	0	0	8	
	once a week	0	3	0	5	0	5	2	15	
	Only if needed	0	0	0	0	0	0	1	1	
	three times a week	0	5	0	1	1	4	14	25	
	twice a week	0	4	0	4	2	5	5	20	
Do you advise your patient to dilute mouthwash?	no	1	7	0	11	2	13	8	42	
	sometimes	0	8	0	7	2	7	23	47	
	yes	0	15	3	12	1	7	25	63	0.041a, b,*
What is the time interval you keep between brushing teeth and use of mouthwash?	about 1 hour	1	4	0	5	2	5	10	27	
	about 2 hours	0	0	0	1	0	2	0	3	
	between 5 and 15 minutes	0	8	2	11	1	8	26	56	
	Less than 1 minute	0	18	1	13	2	12	20	66	0.357a, b
Do you prescribe different	Always	0	6	1	5	1	7	9	29	
	never	1	13	2	11	2	7	29	65	
	sometimes	0	11	0	14	2	13	18	58	0.686a, b

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concentrations of CHX mouthwash for different patients?										
The side effects of chlorhexidine mouthwash include?	all the above	0	16	2	18	2	13	34	85	0.325a, b
	discoloration of teeth	1	10	1	3	2	11	16	44	
	erosion of oral mucosa	0	3	0	4	0	2	5	14	
	Parotitis	0	1	0	5	1	1	1	9	
Do you think there is a need for more detailed awareness programs about the usage of the Mouthwash?	maybe	1	5	0	0	1	10	14	31	0.005a, b,*
	no	0	2	1	10	1	1	6	21	
	yes	0	23	2	20	3	16	36	##	
Do you prescribe CHX mouthwash to the patients without performi	maybe	1	6	0	4	1	4	6	22	0.528a, b
	no	0	18	3	18	4	18	37	98	
	yes	0	6	0	8	0	5	13	32	

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ng oral prophylaxis?										
What is the other alternative mouthwash you prefer over chlorhexidine?	essential oils	1	8	2	7	0	1	17	36	
	fluoride mouthwash	0	13	1	7	3	12	27	63	
	herbal mouthwash	0	4	0	10	0	2	5	21	
	IDK	0	1	0	0	0	0	0	1	
	Normal Saline	0	0	0	0	0	1	0	1	
	Povidone iodine	0	3	0	6	2	8	4	23	
	Saline	0	0	0	0	0	0	1	1	
	Salt	0	0	0	0	0	1	0	1	
	Salt and water	0	0	0	0	0	1	0	1	
	Salted water	0	0	0	0	0	1	0	1	
	Warm saline	0	0	0	0	0	0	1	1	
	Warm water and salt	0	1	0	0	0	0	0	1	
	Water and Salt	0	0	0	0	0	0	1	1	0.595a, b
Is it essential to prescribe chlorhexidine as a pre-procedural mouthw	maybe	1	10	0	5	2	5	17	40	
	no	0	1	3	5	0	12	11	32	
	yes	0	19	0	20	3	10	28	80	0.001a, b,*

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ash to prevent aerosol contamination?										
Can chlorhexidine gluconate oral rinse cause Permanent alteration in taste perception?	maybe	0	14	0	7	2	10	19	52	0.348a, b
	no	1	5	1	7	2	10	13	39	
	yes	0	11	2	16	1	7	24	61	
Can persistent use of chlorhexidine mouthwash causes anti-microbial resistance?	maybe	0	11	1	9	2	10	15	48	0.497a, b
	no	0	2	1	2	2	6	10	23	
	yes	1	17	1	19	1	11	31	81	
What are the procedures for which you prescribe CHX mouthw	after dental implant	0	0	0	0	0	2	2	4	0.435a, b
	after extraction	0	1	0	1	0	1	3	6	
	after extraction;after	0	0	0	0	0	1	0	1	

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ash?	dental implant									
	after periodontal surgery	0	2	0	1	1	3	2	9	
	after periodontal surgery; after dental implant	0	0	0	2	0	0	2	4	
	after periodontal surgery; after extraction	0	0	0	0	0	1	0	1	
	after periodontal surgery; after extraction;after dental implant	1	2	0	0	0	2	1	6	
	After scaling	0	7	0	4	4	6	14	35	
	After scaling; after dental implant	0	0	0	0	0	1	0	1	
	After scaling; after extractio	0	0	0	1	0	0	0	1	

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	n								
	After scaling; after extraction;after dental implant	0	0	0	0	0	0	1	1
	After scaling; after periodontal surgery	0	6	0	4	0	4	7	21
	After scaling; after periodontal surgery; after dental implant	0	2	0	1	0	2	3	8
	After scaling; after periodontal surgery; after extraction	0	0	0	1	0	0	2	3
	After scaling; after periodontal surgery; after	0	10	3	15	0	4	19	51

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	extraction;after dental implant									

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Discussion

The findings from the present study align well with the existing body of research on mouthwash use among dental professionals, notably echoing the effectiveness of Chlorhexidine in managing oral health issues such as dental plaque and gingivitis as reported by James et al. (2017).[6] The present study confirms the widespread recognition of Chlorhexidine's benefits, reinforcing its role as a staple in oral hygiene regimens recommended by dental practitioners.

Similar to the study conducted by Barnett (2006), the present study identifies notable gaps in the knowledge and practices regarding the types and uses of mouthwashes among practitioners in the Qassim region.[7] This variability highlights an ongoing issue within the dental community, where misconceptions or outdated information may influence the advice given to patients. The necessity for enhanced educational initiatives, similar to the concerns raised by Grover et al. (2021), is evident, particularly in promoting a balanced understanding of the benefits versus potential adverse effects of mouthwash ingredients.[8]

The study also sheds light on the significant discrepancies in the recommendations for the timing and duration of mouthwash use.[9] The advice to use mouthwash after brushing, supported by a majority of the respondents, aligns with standard dental practices aimed at maximizing the contact time of active ingredients with oral tissues. However, the varied recommendations on timing—some suggesting use before or even during brushing—point to a lack of consensus that could confuse patients or lead to suboptimal outcomes.[10]

Interestingly, demographic factors such as age and experience level of practitioners appear to influence mouthwash use recommendations. Younger practitioners or those recently trained are more likely to adhere to standardized guidelines, likely reflecting the most current educational curricula.[11] In contrast, seasoned practitioners may draw on a broader range of experiences, potentially leading to a diversity of opinions and practices. The cultural context of the Qassim region, including the traditional use of Siwak for oral hygiene, might further influence the perceived necessity and recommendations for mouthwash use. Understanding these cultural influences is crucial for tailoring health messages and interventions that resonate with local practices and beliefs.[12]

While the present study provides a thorough analysis of current practices, its limitations include the potential lack of representativeness of the wider dental practitioner population in the region.[13] Future

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research could extend beyond the Qassim region to encompass a broader demographic and practice setting spectrum, enhancing the generalizability of the findings. Longitudinal studies would also be valuable in tracking changes in practice recommendations over time, particularly as new evidence and products emerge in the field of oral hygiene.[14]

Conclusion

This study highlights the critical role of continuous professional education in ensuring that dental practitioners in the Qassim region can provide evidence-based recommendations for mouthwash use. Addressing the educational gaps identified could help standardize practices and improve patient outcomes in oral health. As the field continues to evolve, ongoing research and updated training programs will be essential in keeping practitioners at the forefront of effective oral health care practices.

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