



Oral Health Status, Knowledge, Attitudes, and Practices Among Adults in Hodeidah, Yemen: A Cross-Sectional Study

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Abstract

Background: Oral diseases are some of the most prevalent non-infectious diseases globally, posing a considerable threat to public health. In fact, caries and periodontal diseases impact the quality of life of people and pose significant health problems. **Objective:** This study aimed to determine the burden of oral diseases and assess oral health-related knowledge, attitudes, and practices and to investigate their association with clinical oral health status measured by the Decayed, Missing, and Filled Teeth (DMFT) index among adults in Hodeidah Governorate, Yemen. **Methodology:** The study was designed in cross-sectional study among 400 adults attending selected dental clinics and health centers in Hodeidah Governorate, Yemen. Data were collected using a structured questionnaire assessing sociodemographic characteristics and oral health-related knowledge, attitudes, and practices (KAP). Clinical oral examinations were performed according to World Health Organization criteria, and oral health status was assessed using the DMFT index. Data were analyzed using SPSS version 26. **Results:** The demographic results indicated that there was a major gender disproportion with female respondents constituting 67.3% of the total sample size ($p < 0.001$). Age-wise, the majority of the sample population (94.25%) belonged to the age group of 18 to 49 years ($p < 0.001$). In terms of clinical findings, the most prevalent disease was dental caries at 86.8%, followed by the requirement of tooth extraction (65%), periodontal diseases (43.8%) and oral ulcers (12.3%). The mean DMFT was 5.47, indicating that there is an accumulation index of 2.16 decayed, 1.68 missing and 1.64 filled teeth. Additionally, the oral hygiene practice was less than ideal; only 37.5% brush their teeth twice a day, 23% do not feel the need to brush twice a day and 31.8% believe that dental caries are inevitable. Substance abuse was common, whereby 52.8% were found to chew khat, 21.5% smoke tobacco, and 7.8% smoke shamma; these variables exhibited a statistically significant association with oral health status ($p < 0.0001$). **Conclusion:** Oral diseases constitute a substantial public health burden among adults in Hodeidah Yemen. The high prevalence of dental caries, periodontal disease, and tooth extraction needs highlights the need for improved oral health education, preventive programs, and access to dental care services.

Keywords: Oral Diseases , Epidemiology , Hodeidah , Yemen

1. Introduction

Oral health is one of the most important components of overall health, and greatly affects one's quality of life. Recent data based on the GBD Study 2021 report that oral diseases are still among the most prevalent health conditions, and affect about 3.69 billion people around the globe. Un-treated dental caries in permanent teeth is still the most prevalent oral disease and constitutes one of the main public health problems due to its consequences for pain, mastication, communication, and psychological well-being [1]. Oral diseases in low and middle-income countries are exacerbated by low levels of access to dental care, lack of preventive activities, lack of oral health knowledge, and socioeconomic disparities [2]. The evaluation of KAP regarding oral health is critical in assessing the behavioral factors contributing to oral diseases and oral hygiene. As seen from previous research, the lack of oral health consciousness along with poor oral hygiene practices have been found to negatively affect oral health status and increase the susceptibility to various dental diseases [3,4]. In the case of Yemen, it was found that there were obvious deficiencies in preventive oral health practices concerning oral cancer despite decent theoretical knowledge [5].

Furthermore, oral health literacy and dental anxiety were found to significantly influence oral health-related quality of life

and dental care utilization [6]. Clinical oral health status is commonly evaluated using the Decayed, Missing, and Filled Teeth (DMFT) index, which remains one of the most widely used epidemiological indicators for assessing dental caries experience [1]. Recent evidence suggests that higher DMFT scores are associated with poor oral hygiene practices, lower socioeconomic status, and limited access to dental care services [7]. In adult populations, the "Missing" component frequently contributes substantially to total DMFT scores, reflecting delayed treatment-seeking behavior and limited restorative dental care [8]. Moreover, untreated oral diseases and unmet dental treatment needs may negatively affect daily functioning, social interaction, and overall quality of life [9].

Beyond their clinical manifestations, oral diseases may also have psychosocial consequences. Dental problems such as visible caries, periodontal disease, and tooth loss can negatively influence self-confidence, emotional well-being, and social relationships, particularly among young adults [10]. Previous studies have also demonstrated significant associations between periodontal health status and oral health-related quality of life [11].

Additionally, mental health and socioeconomic status were recently identified as important predictors of oral health outcomes and oral health-related quality of life [12]. Despite the increasing

number of oral health studies conducted in Yemen, limited evidence is available regarding the combined assessment of oral health-related knowledge, attitudes, practices, and their association with clinical oral health status using the DMFT index among adults in Hodeidah Governorate.. Therefore, this study aimed to: (1) assess the oral health status using the DMFT index, (2) look into oral health-related knowledge, attitudes, and practices, and (3) explore how these factors are connected among adults in Hodeidah, Yemen

2. Methodology

2.1. Study Area and Setting

This study was performed in Hodeidah Governorate situated on the western coast of Yemen bordering the Red Sea. Hodeidah is one of the biggest governorates of Yemen consisting of urban and rural populations with different socioeconomic and health backgrounds. This research was conducted in some chosen governmental and private dental clinics and health centers which provide oral health care to the residents of the area. This governorate was chosen for this study due to the prevalence of oral diseases and the shortage of epidemiological information about oral health and risk factors of adult residents.

2.2. Study Design and Period

The cross-sectional research design was adopted to investigate the burden of oral disease and its risk factors among adults in the Governorate of Hodeidah, Yemen. The research was carried out during a six-month period from January 2026 to May 2026. This research design was thought to be proper to investigate the prevalence of oral disease and related knowledge, attitudes, and behaviors in relation to the clinical oral status of the DMFT index.

2.3. Study Population

Study subjects were adult individuals seen at the chosen dental facilities in Hodeidah Governorate. The study involved adults aged 18 years and above. Hodeidah Governorate residents. Participants who accepted their involvement and gave informed consent. Exclusion criteria: Individuals with systemic illnesses making it impossible for them to participate. Those that could not undergo questionnaire administration and clinical examination.

2.4. Sample Size

The sample size for this study was 400 participants. The sample size was determined using the single population proportion formula for cross-sectional studies. A randomly sampling technique was used to recruit eligible participants attending selected dental clinics and health centers during the study period.

2.5. Questionnaire and Data Collection

Data collection was done through a structured questionnaire derived from other publications regarding oral health. The questionnaire was formulated in English language and translated into Arabic to ensure clarity. The sections included in the questionnaire are as follows:

1. Sociodemographic characteristics: Age, sex, residency, educational level, and occupation.
2. Oral health-related knowledge and attitudes: Questions related to awareness of oral hygiene, prevention of dental caries, and the importance of regular dental visits.
3. Oral health practices: Tooth brushing frequency, use of toothpaste, smoking, khat chewing, shamma use, and dental attendance behavior.
4. Clinical oral examination: Participants underwent oral examination by trained dental professionals using sterilized dental instruments under adequate lighting conditions. Dental caries experience was assessed using the Decayed, Missing, and Filled Teeth (DMFT) index according to World Health Organization (WHO) criteria. Other oral conditions such as periodontal disease, oral ulcers, and treatment needs were also recorded. Before data collection, the questionnaire was pretested on

a small sample outside the study population to ensure validity and reliability. Necessary modifications were made accordingly [8]

4. The outcomes included (1) dental carries, (2) Periodontal disease, (3) extraction needs, and (4) oral ulcers lack

2.6. Data Analysis

Data analysis was done by entering data in SPSS version 26. Descriptive statistics such as frequency, percentage, mean, and standard deviation were used to present information about the demographics of the population and oral health status. Association among categorical variables was tested using the chi-square test , p -value of <0.05 was taken to be statistically significant.

2.7. Ethical Consideration

Request for permission to conduct the scientific research on “Oral Health Status, Knowledge, Attitudes and Practices Among Adults in Hodeidah, Yemen” was presented by the Epidemiology Program – Oral Epidemiology Team. Permission was also acquired from CTMES-HU. Proper information regarding the nature and significance of the research was provided to the participants. Written consent was acquired from the study participants and their personal information was maintained confidential. After completion of the clinical examination all the patients were subjected to treatment as per prescription of the dentist.

3. Results

3.1. Demographic data and Prevalence

In this study, a total of 400 cases were analyzed to evaluate oral health status and risk factors in Hodeidah, Yemen. Among the clinical findings, 86.8% of cases were diagnosed with dental caries, 43.8% with periodontal disease, and 65% required tooth extraction. Additionally, 12.3% of the participants presented with oral ulcers (Figure 1). Oral health conditions were found in 32.8% of males and 67.3% of females (Table 1). However, significant (p -value < 0.001 this gender difference was highly statistically). According to Table 1, 94.25 % fell between the ages of 19 and 49, 5.0% were aged 50 to 65, and just 0.75 % were over 65. The age difference in oral health condition distribution was highly statistically significant (p -value < 0.001). The mean age of the sample was 31.89 ± 10.18 years, ranging from 18 to 71 years. In addition, 38 % of participants resided in rural areas and 62% in urban areas (Table 1), The difference in residency distribution was statistically significant ($p < 0.001$).

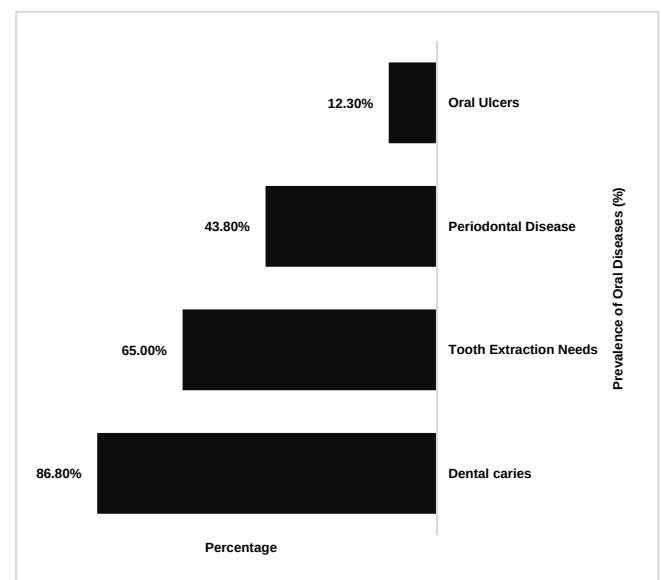


Figure 1. Prevalence of Oral Diseases in Hodeidah , Yemen

Table (1): Demographic data and risk factors of oral health in Hodeidah , Yemen: 2026 (n: 400)

Variables	(n)	(%)	p-value
Sex			
Males	131	32.8	< 0.001
Females	269	67.3	
Age			
18 – 49	377	94.25	< 0.001
50 – 65	20	5	
> 65	3	0.75	
Residency			
Urban	248	62	< 0.001
Rural	152	38	

*: p – value (significant < 0.05)

3.2. Substances Abuse

Regarding substance use and risk factors, 52.8% of participants were khat chewers, 21.5% were tobacco smokers, and 7.8% used shamma (smokeless tobacco) (Table 2). These results indicated a highly statistically significant difference between exposure to substance abuse and non-exposure (p -value < 0.0001) (Table 2).

Table 2. Oral Health Statutes and Substance Abuse

Variables	(n)	(%)	p-value
Substance Abuse			
Khat Chewing	211	52.8	<0.0001
Shamma Users	31	7.8	
Tobacco Smokers	86	21.5	
Betel Nut Use	6	1.5	
Not Used	66	16.5	

*: p – value (significant < 0.05)

3.3. Knowledge , Attitude and Practices

Oral health knowledge and practices: It shows that 23% of participants do not believe daily tooth brushing is necessary, and 31.8% do not believe dental caries are preventable. Regarding practices, 5.8% never brush their teeth, 27.8% sometimes, while 28.7% brush once daily and 37.5% twice daily. The mean number of Decayed teeth (D) was 2.16, Missing teeth (M) was 1.68, and Filled teeth (F) was 1.64. The total mean DMFT index was 5.47.

4. Discussion

The aim of the study was to determine the frequency of common oral diseases in adult people living in Hodeidah Governorate in Yemen. Special emphasis was put on dental caries, periodontal disease, tooth loss (as evidenced by the need for extraction), and oral ulcers. Besides that, the study was concerned with evaluating the state of oral health through the Decayed, Missing, and Filled Teeth Index (DMFT), as well as with analyzing the associations between oral health outcomes and such factors as sociodemographic characteristics, substance abuse (such as khat chewing, smoking, and shamma), and oral health knowledge and practices. The high prevalence of oral diseases found among the population demonstrates the substantial burden of oral health in Hodeidah Governorate.

From the results of the current study, a dental caries prevalence of 86.8% was noted among the surveyed adults. This suggests that there is a considerable amount of dental caries in the population studied. However, such findings are supported by recent global evidence, where dental caries is considered the most common oral disease that affects billions of people and causes a considerable public health problem in different regions of the world [13]. The high prevalence of dental caries in Hodeidah can be explained by a poor level of oral hygiene, lack of access to dental services, and dietary habits. For example, a recent study on university students' attitudes toward oral health and oral behaviors proved that a lack of awareness and inappropriate oral habits have a negative impact on oral health status [14].

A total of 43.8% of the participants had periodontal disease, indicating a significant impact on their oral health status. Chewing khat has been associated with reduced oral health-related

quality of life [16]. Apart from its effects on periodontal tissue, khat chewing has been implicated in oral dryness and change in taste perceptions [17]. This clearly indicates that its negative impacts go beyond just periodontal tissue to affect overall oral health and well-being. Since severe periodontal disease is one of the major causes of tooth loss, this association carries a lot of weight in terms of oral health consequences [18]. In the current research, it is important to note that along with the high rate of periodontal diseases, significant percentages of khat chewing (52.8%), smoking (21.5%), and shamma usage (7.8%) were identified among the studied subjects. Taking into account the fact that severe periodontitis is one of the most prevalent diseases worldwide, such a reduction would greatly benefit oral health [19].

The high number of teeth missing (65%) shows the burden of untreated oral diseases and unmet needs for dental care. Other researches have found out that unmet dental care needs are linked to poor oral health-related quality of life and may show delays in seeking proper dental care [20]. This finding mirrors patterns in other low-resource settings where limited access to timely and comprehensive dental care often leads to advanced oral conditions requiring more invasive interventions, including tooth extraction [21]. The large number of patients requiring tooth extraction in this study also serves to underline the heavy burden of advanced dental disease. This is consistent with the findings from research conducted worldwide that has shown that tooth loss continues to be a serious problem, with the age-standardized prevalence of edentulism being 4.11% according to the GBD 2021 study [22]. Oral ulcers were observed in 12.3% of the participants. While these lesions can stem from various causes, including trauma, infections, and systemic conditions, their occurrence in this study may also be linked to local habits. Specifically, khat chewing has been associated with oral mucosal irritation and the development of various oral lesions among Yemeni users, potentially contributing to the observed prevalence of oral ulcers [23]. A study in Aden City, Yemen reported that 43.9% of participants experienced oral ulcers, suggesting that these lesions represent a relatively common oral health problem in the local population [24]. Additionally, recent studies assessing oral hygiene practices and dental health status indicate that inadequate oral hygiene behaviors remain prevalent and may further contribute to poor oral health outcomes in affected communities [25].

Although this study did not directly investigate oral cancer, it is crucial to acknowledge that oral tumors, including malignant lesions such as oral squamous cell carcinoma, represent a relevant public health concern in Yemen. A retrospective hospital-based study in Sana'a City reported that malignant oral tumors constitute a notable proportion of cases, highlighting the persistent clinical burden of these lesions in the Yemeni population [26]. These conditions are frequently associated with traditional practices like khat chewing and tobacco use [27]. The proposed National Cancer Control Plan for Yemen (2023–2027) has identified head and neck cancers, including oral cavity cancers, as a significant health concern, particularly among lower socioeconomic populations [28]. Several factors, such as the use of smokeless tobacco and khat chewing—especially when khat is exposed to chemicals and pesticides during cultivation—may elevate the risk of oral cancer [29]. While oral cancer was beyond the scope of the present study, the widespread use of khat and tobacco among participants underscores the importance of future investigations into their potential implications for oral malignancies in this setting. This finding further emphasizes the need for additional research in Hodeidah, as well as public health initiatives focused on promoting early detection and preventive measures.

Significant gaps in oral health knowledge and practices were identified in this study. A substantial portion of participants (23%) did not deem daily tooth brushing necessary, and nearly one-third (31.8%) did not believe dental caries were preventable. Furthermore, only 37.5% reported brushing their teeth twice daily. These results highlight the need for effective oral health education programs to enhance awareness and encourage proper oral hygiene practices, consistent with recent evidence from similar settings [30]. Low levels of awareness and bad practices of oral health care

have been found to be associated with adverse outcomes for oral health, along with increased prevalence of dental diseases, indicating the need to promote preventive behaviors related to oral health from a very young age [31]. The findings of this study reveal the inadequacy of oral health education programs currently in place at the community level. Culture-sensitive and socially appropriate education efforts can help reduce the incidence of preventable oral diseases.

DMFT Index and associated factors was discussed in several key points :

1. Mean DMFT Score: The mean DMFT score is 5.47 (D=2.16, M=1.68, F=1.64). This reflects the presence of a high cumulative level of dental caries with decaying and missing teeth having an important impact. High levels of "M" component reflect a heavy load of tooth loss in the past due to caries and periodontal diseases. [32].
2. Comparison with Previous Research: Such results have also been observed previously in studies in which negative social circumstances and difficulty in obtaining dental care have been linked to poor oral health outcomes, such as tooth loss [33].
3. Age and Oral Health: The relationship between age and oral health problems revealed that the older individuals (aged 18-49) had a greater level of oral diseases. This is consistent with other studies which found that there were differences in the oral health of different age groups [34].
4. Gender Association: In this current research, gender was found to be significantly associated with oral health problems. Previous literature had reported different oral health knowledge and practices among men and women. Therefore, it could be assumed that social and cultural settings might affect these disparities in different ways [35].

Limitations and Recommendations

The present study has several limitations, such as a cross-sectional study design that hinders establishing causality [36]. In addition, the use of self-reported behavioral variables like khat chewing and hygiene behaviors could introduce recall bias. Nonetheless, it is clear from the findings presented above that there is need to include screening for oral problems in general medicine practices and conduct public health campaigns targeting local behavior-related risks.

5. Conclusion

The finding of this research have proved the high prevalence of oral disorders among the adult population of Hodeidah, Yemen. Dental caries is the most common oral disorder and affects 86.8 % of participants in this study. This condition is followed by the requirement for tooth extraction in 65% of the participants and periodontal diseases in 43.8% of the patients. The average DMFT value of 5.47 indicates the high prevalence of dental diseases among the study participants. Despite different knowledge and practice regarding oral health, gaps in the understanding of the possibility of prevention of dental caries and the necessity of proper hygiene were found among the participants. Moreover, some behavioral factors, like khat chewing (52.8%), tobacco smoking (21.5%), and shamma use (7.8%), can influence the oral health of the participants negatively. Finally , our finding prove the necessity to perform several steps: (1) develop targeted education on oral health to fill the knowledge gaps; (2) implement preventive programs for communities, which will promote daily oral hygiene ; (3) improve access to dental care services.

Authors' contributions

S.A. Al - Sakkaf : Supervision and writing-review and editing; **K.A. Alesary**: Methodology, formal analysis, software, writing-original draft; **N.A. Obadi** : Conceptualization, Methodology, formal analysis, software, writing-original draft; **S.A. AL-Surabi**: Methodology : Writing-review and discussion; **G.A. Haij**: Investigation, validation. All authors reviewed and approved the final manuscript.

Data Availability

The data that support this study are available from the corresponding author upon reasonable request

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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