Original Article

A Comparative Study of Oral Health Status and Behaviors among Suburban and Urban Male Adolescents in Zahedan, Iran

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Abstract

Background: Oral health is imperative for holistic well-being, transcending dental considerations. Analyzing hygiene practices in diverse areas facilitates strategic health planning. This study evaluated and compared oral health and behaviors among male students aged 13-15 years old attending both central and suburban high schools in Zahedan, Iran.
Methods: This cross-sectional comparative study was conducted during the 2019-2020 school year on 260 male students aged 13-15 in Zahedan, Iran. The study had 130 students in the suburban (case) group and 130 in the central (control) group. Oral health status was measured using Decay, Missing, Filling, Teeth (DMFT) Index and the Community Periodontal Index (CPI). A questionnaire was used to assess behaviors. Statistical analyses included Independent Samples t-Test, Mann-Whitney U test, and Chi-square test.
Results: The prevalence of dental caries was similar between the groups (P=0.31), but the case group had a significantly higher prevalence of periodontal involvement (P=0.03). The mean DMFT index was higher in the case group (P=0.05), and the distribution of DMFT scores differed significantly between the two groups (P=0.02). There was a significant difference in the CPI index of the two study groups (P=0.0001). Oral health behaviors revealed that the case group had a higher frequency of not brushing teeth and using alternative cleaning methods compared with the control group.
Conclusions: Our findings indicated that students from the suburban area of Zahedan had poorer oral health status and weaker oral health behaviors compared with the students from the central city. These results underscored the importance of considering regional disparities in oral health and hygiene practices when developing targeted health initiatives for the local population.

Keywords: Oral Health, Student, Adolescence, Dental Caries

1. Introduction

According to the definition by the World Health Organization, oral health means not experiencing pain related to oral-facial problems and oral diseases, such as tooth decay, gum infection, periodontal diseases, and oral cancers (1). Most oral problems, especially dental caries and gum and periodontal diseases are caused by poor oral hygiene (2). Globally, there is a high prevalence of gum disease among older children and adolescents, with approximately 50%-100% of 12-year-old children exhibiting signs of gum inflammation (3). These oral health conditions are especially prevalent among marginalized populations and disadvantaged communities (4).

Throughout history, dental caries and periodontal diseases have been recognized as the primary oral health challenges on a global scale. However, the distribution and severity of these oral diseases currently exhibit variation across different regions and even within the same country or region. Numerous epidemiological surveys have highlighted the significant impact of socio-behavioral and environmental factors on oral diseases and oral health in general (5). The behavioral factors include diet, self-care, and using dental services)6). Hygiene behavior is defined as protective, promotive, or preservative of health and preventive activities performed by an individual against diseases. Understanding the habits and hygiene behaviors in different regions can help us plan health interventions for each specific area (7). The objective of the healthcare sector is to ensure the health of all members in the community. However, certain population groups consistently receive special attention and care from decision-makers and health planners. This results from diverse factors, such as a high percentage of the population belonging to a certain group, increased vulnerability, and high effectiveness of early health and medical

interventions for each particular group (8). Based on global and national prioritization, adolescents are considered as one of the most at-risk groups (9). The American Academy of Pediatric Dentistry acknowledges that adolescence necessitates special attention to oral health due to several factors. These factors include a higher risk of tooth decay due to increased consumption of substances that promote cavities, a tendency for inadequate oral hygiene and changes in dietary habits, hormonal changes, an elevated risk of periodontal disease and dental injuries, an augmented desire for aesthetic improvements, and the potential use of tobacco and other drugs (10). The study by Omara and Elamin in Sudan revealed the striking prevalence of dental caries (91.1%) and inadequate periodontal health (96%) among adolescents. The findings highlighted the importance of implementing specific interventions and preventive measures, particularly for high-risk groups, including older individuals, students attending public schools, and those with lower levels of maternal education (11). The study conducted by Olczak and colleagues on the prevalence of dental caries and periodontal status among Polish adolescents demonstrated that the prevalence of dental caries was 94%, while gum discomfort was reported by 34.4% of the participants. Recent research also indicated that rural areas had a higher prevalence of dental caries and gum discomfort (12).

Several investigations have been conducted to examine the oral and dental health status of Iranian adolescents (13-18). However, it is worth noting that the majority of studies conducted in Zahedan, Iran have focused on the age group of ≤12 years old (19-21).

The primary objectives of this study were to evaluate and compare oral health status and hygiene behaviors among male students aged 13-15 years attending both central and suburban high schools in Zahedan, Iran. This initiative can provide valuable insights to inform regional policies and deliver appropriate oral health education to this vulnerable student population.

2. Methods

This cross-sectional comparative study was conducted during the 2019-2020 school year on male students aged 13-15 years enrolled in public high schools in Zahedan, the capital city of Sistan and Baluchestan Province, Iran. This study was approved by the Ethics Committee of Zahedan University of Medical Sciences with the code of IR.ZAUMS.REC.1398.365. This study employed a multi-stage cluster sampling method. Initially, all public boys' high schools in the suburban and central areas of Zahedan were considered as clusters. Then, a few schools were randomly selected from each suburban and central cluster using a random number generator. In each of the selected schools, a random sample of 13-15-year-old students was selected to participate in the study. A specific method was employed to randomly select the students within the schools using computer-generated random numbers. A total of 130 students were selected from schools in the suburban area (case group), and 130 students were selected from schools in the central area (control group), resulting in a total sample size of 260 participants.

To determine the sample size, the Power & Sample Size software was used according to the formula:

$$n = \frac{\left(Z_{1-\frac{\alpha}{2}}+Z_{1-\beta}\right)^{2} [P_1(1-P_1)+P_2(1-P_2)]}{(P_1-P_2)^{2}}$$

The study considered an alpha value of 0.05, a power of 80%, P1=10%)The daily use of dental floss in the group with low caries prevalence (, P2=1.2% (The daily use of dental floss in the group with medium to high caries prevalence). This calculation estimated a minimum of 113 adolescents in each group and a total of 226 students. Given the probability of a dropout of 130 students in each group, the investigation was conducted.

The study included boys aged 13-15 years who resided in the city or suburbs of Zahedan and attended public schools. The inclusion criteria required these students to have a healthy systemic condition, sound mental well-being, good oral health, normal dental developmental disorders, and be currently enrolled in school. Those who did not meet at least one of these criteria were excluded from the study.

Informed consent forms were signed by parents/guardians and students. To assess oral health, the guidelines and criteria outlined by the World Health Organization (WHO) were used, specifically the Decayed, Missing, and Filled Teeth (DMFT) and Community Periodontal Index (CPI) (22). Dental examinations were conducted at schools by a

trained dental intern. Prior to initiation of the study, the participating dental intern underwent training and calibration conducted by an experienced examiner from the Faculty of Dentistry at Zahedan University of Medical Sciences in Zahedan, Iran. The training occurred two weeks before the study began. A distinct group of 15 adolescents underwent examination by a dental intern. Following a week, the dental intern independently re-examined the same group of adolescents. The kappa coefficients indicated an intra-examiner reproducibility of 0.96 for the mean DMFT score and 0.92 for the mean CPI score. The examinations were conducted in the medical room of the schools by the assistance of a headlight, as well as disposable dental mirrors and CPI probes. For each participant, the following parameters were recorded:

1. DMFT: The WHO caries-scoring index for permanent dentition was used to describe the dental caries status. This index takes into account the number of decayed, missing, and filled teeth to provide a comprehensive assessment of dental caries (22).

2. CPI: CPI was used to describe the periodontal health status. The CPI scores ranged from 0 to 4, with each score indicating a different level of periodontal health. Score 1 shows the presence of gingival bleeding without any pockets or calculus. Score 2 indicates the presence of gingival calculus without any pockets exceeding 3 mm in depth. Score 3 shows the presence of pockets measuring 4 or 5 mm in depth. Score 4 indicates the presence of pockets exceeding 6 mm in depth (22).

Following the interviews, practical and essential oral hygiene instructions were provided during examinations to enhance the students' understanding and knowledge of oral care. Also, the students completed questionnaires under the guidance of a dental intern. The questionnaire was based on a study by Tahani and Moosavi, and its face and content validity have been confirmed (23). This questionnaire, written in Persian, included demographic information (age and place of study: State high school for boys, located in the city center or suburb), oral health behaviors such as tooth brushing frequency, type of tooth-cleaning instrument used, frequency of daily sweet consumption, dominant type of sweet consumed. Data analysis was performed using SPSS version 26. To compare mean DMFT in the two groups, an

Independent Samples t-Test was used. Moreover, to compare the distributions of DMFT and CPI in the two groups, a non-parametric test called Mann-Whitney U test was employed. The Chi-squares test was applied to examine qualitative variables, such as the prevalence of caries, CPI, and oral health behaviors in two groups. The significance level of $P \leq 0.05$ was considered.

3. Results

In this study, a total of 260 male students aged 13-15 years, enrolled in public high schools in Zahedan, Iran, were examined. Among them, 130 students were studying in the central city schools (control group), while the remaining 130 students were studying in the suburban schools of Zahedan (case group). The mean age of the participants in the case group was 14.2±0.8 years, and 14.1±0.7 years in the control group. Statistical analysis revealed no significant difference between the two groups in terms of age (P>0.05). The prevalence of dental caries between the case and control groups was 87.70% and 91.50%, respectively, with no statistically significant difference (P>0.05). However, the case group had a significantly higher prevalence of periodontal involvement, with 97.70% compared with 91.50% in the control group (P=0.03) (Table 1).

Based on our study findings, it was observed that the mean DMFT index in the control group was 3.58 with a standard deviation of 2.41. In contrast, the mean DMFT index in the case group was 4.19 with a standard deviation of 2.67. The difference in mean DMFT scores between the two group was statistically significant, indicating that students in the case group had a significantly higher prevalence of dental caries compared with those in the control group (P=0.05).

The distribution of DMFT in the two groups is compared in Figure 1. In the control group, the majority of students had DMFT scores of 3 (14.6%) and 4 (9.6%), while in the case group, the majority of students had DMFT scores of 6 (10%) and 4 (8.8%). The differences were found to be statistically significant based on the Mann-Whitney U test (P=0.02).

The periodontal involvement based on the CPI index is shown in Figure 2. The highest percentage of involvement in the control group was related to code 2, while in the case group, it was code 3.

Table 1: Prevalence of caries and periodontal disease in the case and control groups

DMFT		N (%)	P value*	CPI	N (%)	P value*
City center	Caries free (DMFT=0)	11 (8.50)	0.31	Healthy (CPI=0)	11 (8.50)	0.03
	Caries (DMFT=1-12)	119 (91.50)		Periodontal disease (CPI=1-3)	119 (91.50)	
Suburb of the city	Caries free (DMFT=0)	16 (12.30)		Healthy (CPI=0)	3 (2.30)	
	Caries (DMFT=1-12)	114 (87.70)		Periodontal disease (CPI=1-3)	127 (97.70)	
Total	Caries free (DMFT=0)	27 (10.40)		Healthy (CPI=0)	14 (5.40)	
	Caries (DMFT=1-12)	233 (89.60		Periodontal disease (CPI=1-3)	246 (94.6)	

*Pearson Chi-Square; DMFT: Decay, Missing, Filling, Teeth; CPI: Community Periodontal Index

Table 2: Comparison of behaviors related to oral health in the case and control groups

Oral health behaviors		Control group	Case group	P value*	Total
		N (%)	N (%)		N (%)
Frequency of cleaning teeth	Does not clean	5 (3.80)	48 (36.90)	<0.001	53 (20.40)
	1 to 2 times a week	46 (35.40)	37 (28.50)		83 (31.90)
	3 to 5 times a week	17 (13.10)	6 (4.60)		23 (8.80)
	Every day	62 (47.70)	39 (30.00)		101 (38.80)
Teeth cleaning tools	Toothbrush with toothpaste	107 (82.30)	82 (63.10)	0.001	189 (72.70)
	Toothbrush without toothpaste	1 (0.80)	1 (0.80)		2 (0.80)
	Brine	17 (13.10)	24 (18.50)		41 (15.80)
	Other methods	5 (3.80)	23 (17.70)		28 (10.80)
Frequency of daily consumption of sweet substances	No consumption	3 (2.30)	14 (10.80)		17 (6.50)
	Once	14 (10.80)	47 (36.20)		61 (23.50)
	Twice	76 (58.50)	17 (13.10)		93 (35.80)
	Three times or more	37 (28.50)	52 (40.00)		89 (34.20)
Dominant sweet ingredient	Honey	28 (21.50)	16 (12.30)	0.001	44 (16.90)
	Date	8 (6.20)	31 (23.80)		39 (15.00)
	Sugar	82 (63.10)	73 (56.20)		155 (59.60)
	Cake	12 (9.20)	10 (7.70)		22 (8.50)
Time of last dental visit	Last 3 to 6 months	64 (49.20)	40 (30.80)	<0.00 1	104 (40.00)
	1 year ago	41 (31.50)	37 (28.50)		78 (30.00)
	More than 1 year	12 (9.20)	35 (26.90)		47 (18.10)
	Non-referral	13 (10.00)	18 (13.80)		31 (11.90)

*Pearson Chi-Square

According to the Mann-Whitney U test, there was a significant difference in terms of the CPI index between the suburban and central city areas (P=0.0001).

The oral health behaviors in the two groups are compared in Table 2. According to the results, there were significant differences in behaviors between the central city and suburban areas.

The analysis of the oral health behavior questionnaire demonstrated a significant difference between the case and control groups. A higher percentage of students in the control group (47.70%) as opposed to 39.30% in the study group would clean their teeth every day. Additionally, 82.30% of students in the control group compared with 63.10% in the case group would use toothpaste along with a toothbrush for cleaning. In terms of sweet consumption, students in the control group (40.00%) as opposed to 28.50% in the case group would consume sweet substances three times or more.

4. Discussion

The present study aimed to investigate and compare the oral health status and oral health behaviors among male adolescent students residing
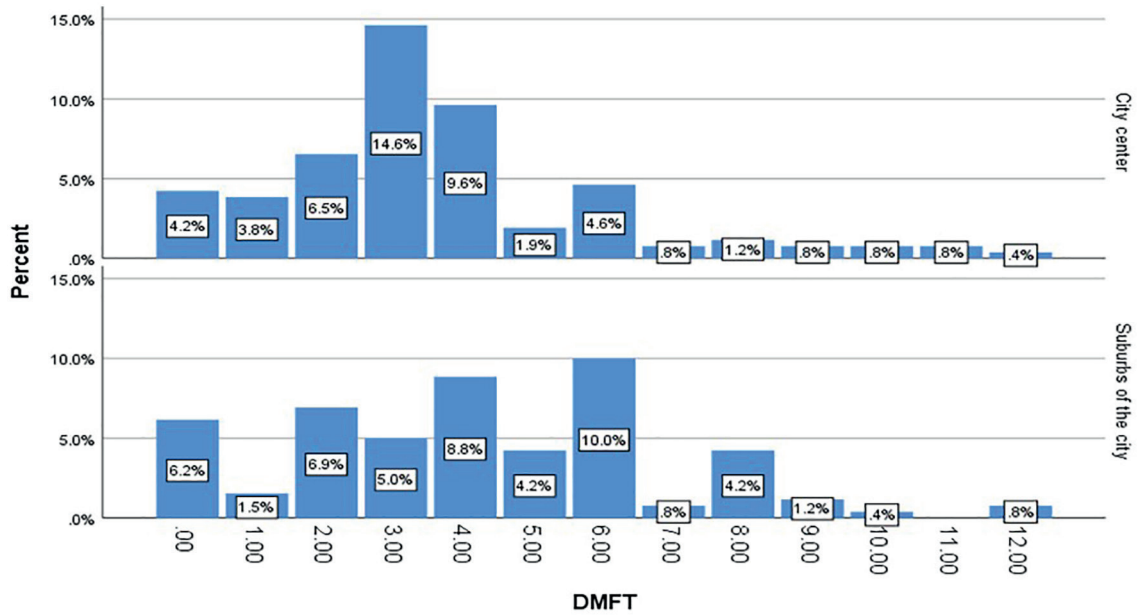
Figure 1: The figure shows the distribution of DMFT score in the case (center) and control (suburbs of the city) group. DMFT: Decay, Missing, Filling, Teet
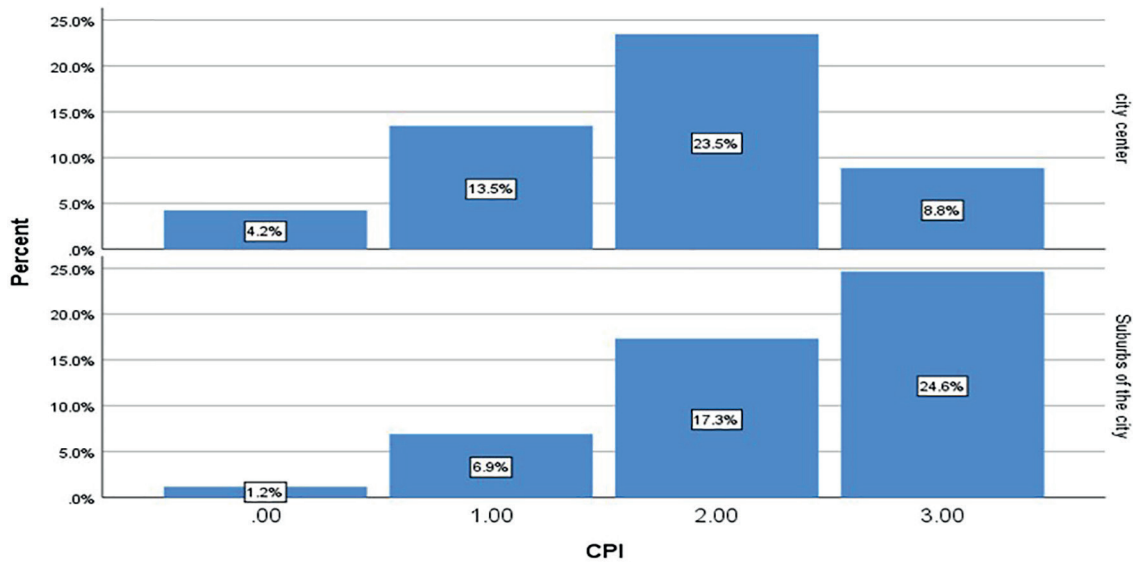

Figure 2: The figure shows the CPI score in the case (center) and control (suburbs of the city) group. CPI: Community Periodontal Index.

in suburban and central areas of Zahedan, Iran. The key findings indicated that students from the suburban areas exhibited poorer oral health status and weaker oral health behaviors compared with their counterparts from the central city. Specifically, the suburban group exhibited significantly higher mean scores for DMFT and CPI compared with the central city group, indicating a higher burden of dental caries and periodontal disease in this population. These results suggested that adolescents from suburban, potentially more deprived areas, tend to have poorer oral health outcomes compared with their urban peers. Possible explanations for these disparities could include differences in access to

dental care, health literacy, and adoption of optimal oral hygiene practices between the two groups.

These findings were consistent with previous research, which suggested that adolescents from deprived or rural areas have poorer oral health outcomes compared with their urban counterparts (12, 24).

In contrast to our study, Boneta and colleagues conducted a study examining the prevalence of gingivitis among 12-year-old children in Puerto Rico, considering the type of school (socioeconomic status) and gender. The findings of their study

showed a higher prevalence of gingivitis in urban school students compared with rural schools, which contradicts the results of our study. Several factors may contribute to this disparity. Firstly, differences in the characteristics of the studied communities may have influenced the divergent outcomes. Additionally, variations in the methodologies employed in the two studies could have impacted the results. Furthermore, the sample size and the specific population under investigation might have also served as influential factors (25).

Studies conducted on the oral health of Iranian adolescents include the study by Pakpour and co-workers, which reported average DMFT and CPI scores of 2.19±2.32 and 1.62±1.11, respectively (14). In the study by Bakhtiar and colleagues (15) in Kerman, the DMFT rate among adolescents was reported to be 1.76±2.4. Both of these studies showed better oral health indicators compared with the present study. The difference in results between our study and the studies by Pakpour and co-workers (14) and Bakhtiar and colleagues (15) can be attributed to the geographical region under investigation. The present study was conducted in Zahedan, which is the center of one of the economically and culturally disadvantaged provinces in Southeastern Iran. The present study indicated that geographical, economic, and social differences among different regions lead to variations in oral health status and study outcomes.

Based on the results of our study, students from the suburban group reported lower tooth brushing frequency, higher use of alternative cleaning methods (such as saltwater rinses), and increased consumption of sweet foods and beverages. These behavioral findings aligned with studies that associate lower socioeconomic status with suboptimal oral health practices and an increased risk of dental caries (12, 24, 26, 27). The limited use of preventive dental services observed in the suburban group further exacerbates oral health disparities.

In contrast, students from the central city showed better oral health behaviors, which may contribute to their relatively better oral health status. However, it is important to note that even in the control group, overall oral health indicators were concerning, with high rates of dental caries and periodontal involvement. This highlights the presence of oral health challenges among a broader population of Zahedan adolescents and underscores the need for comprehensive and targeted interventions.

The differences in oral health status and behaviors between the suburban and central groups underscore the importance of considering regional variations when developing public health initiatives. It highlights the need for strategies that specifically address the unique social, economic, cultural, and environmental factors influencing oral health in suburban communities. Tailoring interventions to improve the oral health outcomes of this vulnerable population is crucial.

In the present study, the oral health status and hygiene behaviors of students in the suburbs of the city were examined, while most previous studies focused on urban and rural children and adolescents. This study is the first to be conducted specifically on adolescent students in the central and suburban areas of Zahedan. Information about the oral health status and hygiene behaviors of suburban adolescents was not available. Therefore, this study was necessary for regional policymaking. In Zahedan, dental services are provided by a combination of public and private providers, with an unequal distribution between the central and suburban areas. The lack of regular preventive programs based on schools and population registration systems has created challenges in understanding the oral health status and related factors to provide necessary foundations for effective interventions in the field of oral health. In Zahedan, oral diseases have been overlooked and not prioritized by health planners, which may be reflected in the overall oral health status of the population.

4.1. Limitations

One of the limitations of this study was that potential confounding factors such as socioeconomic status and access to dental services were not assessed. These factors can potentially influence oral health outcomes and behaviors. Additionally, it is worth mentioning that in the present study, gender, different age groups, and school type (public and private) were not assessed. Therefore, it is recommended that future research includes a comprehensive evaluation of these factors to provide a more accurate assessment of the impact of socioeconomic status, access to dental services, and other demographic factors on

oral health outcomes among students.

5. Conclusions

The findings of this study emphasized significant differences in oral health status and behaviors between adolescent students in the suburban and central areas of Zahedan, Iran. These results underscored the need for targeted and evidence-based interventions that address the unique challenges faced by suburban communities in order to improve equitable oral health outcomes. Continuous research and political efforts are necessary to address these regional inequalities and improve the overall oral health of the local population.

Authors' Contribution

Forough Amirabadi: Contributions to the design and conception of the study, data analysis and interpretation, drafting the manuscript and reviewing it critically. Seyed Sajjad Mosavi Pour: Contributions to the design and conception of the study, data collection, reviewing the manuscript critically. All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work, such that the questions related to the accuracy or integrity of any part of the work.

Ethical Approval

The Ethics Review Board of Zahedan University of Medical Sciences approved the present study with the code of IR.ZAUMS.REC.1398.365. Also, written informed consent was obtained from the participants.

Conflict of Interest: None declared.

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