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# Prevalence of dental caries among school-going children aged 7–13 years in Kabul City

Ahmad Khalid Aalemi<sup>1\*</sup> and Bentulhuda Yaqubi<sup>2</sup>

## Abstract

**Background** Dental caries is a major, multifactorial oral condition that causes the demineralization of tooth enamel and impacts approximately half of the world's child population. This study aimed to determine the prevalence of dental caries among school-going children aged 7 to 13 years in Kabul city.

**Methods** This descriptive cross-sectional study was conducted with 491 students aged 7 to 13 years in Kabul during the first half of 2019. A multistage cluster sampling method was used, in which educational zones, schools, and classes were selected. The data were collected using pre-structured questionnaires through face-to-face interviews and oral examinations of students using dental probes and mouth mirrors while adhering to infection control protocols. The collected data were analyzed using Statistical Package for Social Science version 21.0, and a  $p$ -value  $< 0.005$  was considered as statistically significant.

**Results** The average age of the study participants was  $9.9 \pm 1.8$  years. Boys made up approximately 45% of the participants, while 54.8% were girls. The overall prevalence of dental caries was 78.8%, with 62.1% in deciduous teeth and 42.8% in permanent teeth. Among students who did not brush their teeth, the prevalence of dental caries was 84.8%, compared to 81.7% for those who brushed once daily, 78.7% for those brushing twice daily, and 67.4% for those brushing three times daily ( $p = 0.022$ ). About 10% of students had dental calculus, with a prevalence of 17.0% among those aged eleven and older, 10.0% among students aged nine to ten years, and 5.9% among students aged eight and younger ( $p = 0.006$ ). Poor oral hygiene affected nearly one-third of the students, with 34.2% among boys and 30.9% among girls. Poor oral hygiene was more prevalent in students aged eight and younger (38.8%) compared to those aged eleven and older (25.9%) ( $p = 0.023$ ).

**Conclusions** The prevalence of dental caries among students aged 7 to 13 years in Kabul schools was similar to that in most developing countries. The prevalence of dental calculus was greater among students aged eleven years and older. Over 99% of the students surveyed had not undergone any dental treatment.

**Keywords** Prevalence, Dental Caries, School Children, Kabul City

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## Background

Dental caries is a multifactorial condition that begins with changes in the microbial balance within the complex biofilm. It is influenced by factors such as salivary flow and composition, fluoride exposure, dietary sugar intake, and oral hygiene practices like tooth brushing [1]. It is a preventable disease, and prevention of its progression is possible at any stage [2, 3]. The presence of four main factors, namely, susceptible host, bacteria in dental plaque, carbohydrates, and time, is essential for the occurrence of dental caries. Dental caries is one of the most common dental diseases, affecting almost the entire community, and is recognized as a dental problem in children [4]. Since children are among the most sensitive and vulnerable groups to dental caries, unfortunately, the highest prevalence of dental caries is observed in children, most of whom are students aged 7–13 years. Given that most children in this age group are attending schools, a solution to this problem should be sought in schools, and any preventive measures should be implemented. However, since very limited scientific research has been conducted or published on dental caries in Afghanistan and dental caries directly affects the physical and mental health of individuals, children in this age group are particularly sensitive, as they are in the most critical stage of tooth development, such as the eruption of permanent teeth and the transition from deciduous to mixed dentition. Therefore, research in this area is urgently needed to draw the attention of the health sector and to search for ways to prevent dental caries. Therefore, this study aimed to determine the prevalence of dental caries among school students aged 7 to 13 years in Kabul city.

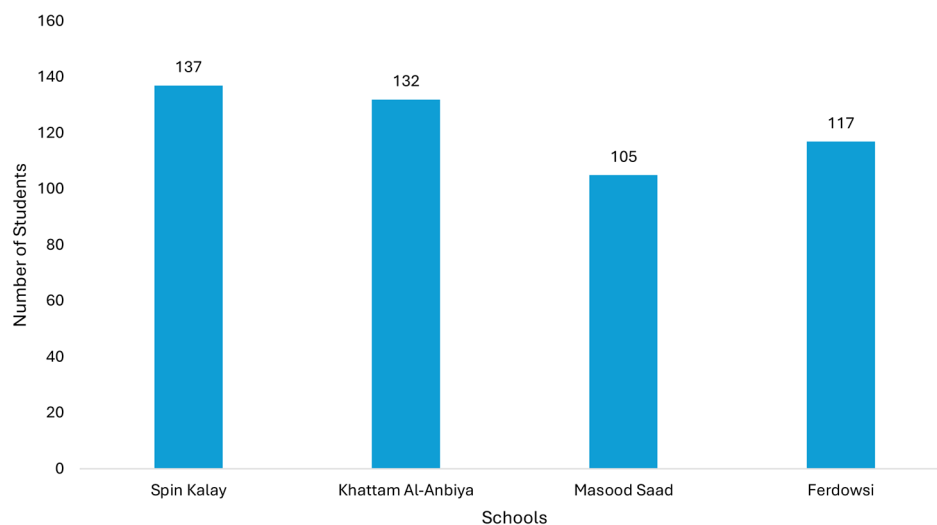
## Methods

This descriptive cross-sectional study was conducted on students aged 7 to 13 years in schools in Kabul city in the first half of 2019. The sample size in this study was calculated using the following formula, considering the following figures:

$$n = \frac{Z_{(1-\frac{\alpha}{2})}^2 P(1-P)}{d^2} = \frac{1.96^2 0.5(1-0.5)}{0.05^2} = 385$$

where  $P=50\%$ ,  $d=5\%$ , and the confidence interval=97%. Therefore, the sample size was 385 individuals. An additional 10% was added for nonrespondents, resulting in a total sample size of 424 individuals. Sampling in this study was carried out using a multistage cluster sampling method. Initially, four districts were randomly selected among the sixteen educational districts of Kabul city. Then, one school from each educational district, containing primary school students, was randomly selected, and from the selected school, three to four classes from grades one to six were randomly selected according to the number of students in the respective grades (Fig. 1). All selected students aged 7–13 years from the classes were included in the study, and their oral examination was conducted.

The major variables in this study included age, sex, parents' education level, parents' occupation, tooth brushing frequency, dental floss usage, and oral hygiene maintenance. In this study, dental caries was defined as the condition in which at least one tooth surface (enamel) decayed. Good oral hygiene was defined as having clean teeth, absence of dental and gingival diseases, and no bad breath. Dental calculus refers to a hard deposit formed by the accumulation of calcium and other mineral salts



**Fig. 1** Distribution of selected students by schools ( $n=491$ )

on bacterial plaque in the mouth. As one of the outcome variables, we incorporated DMFT scores, which involve quantifying the occurrence of decayed, missing, and filled teeth.

Ethical approval was obtained from the institutional review board of Kabul University of Medical Sciences and the Ministry of Higher Education. Informed consent was obtained from the parents and students before participation. To ensure the students' safety during oral examination, single-use instruments and equipment were used, and examinations were conducted under appropriate sanitary conditions to avoid endangering the students' health.

The data were collected through a pre-structured questionnaire and administered as an interview by three people who were trained in questionnaire administration. The examination of the students' oral cavity was conducted by a dentist using a dental probe and mouth mirror.

Statistical analysis was performed using Statistical Package for Social Sciences version 21.0. Descriptive

characteristics were summarized using mean ( $\pm$ SD) and proportions as appropriate. The Pearson Chi-square test was used for comparison of percentages, and Student's t-test for comparison of means.  $P$  value  $< 0.005$  was considered statistically significant.

## Results

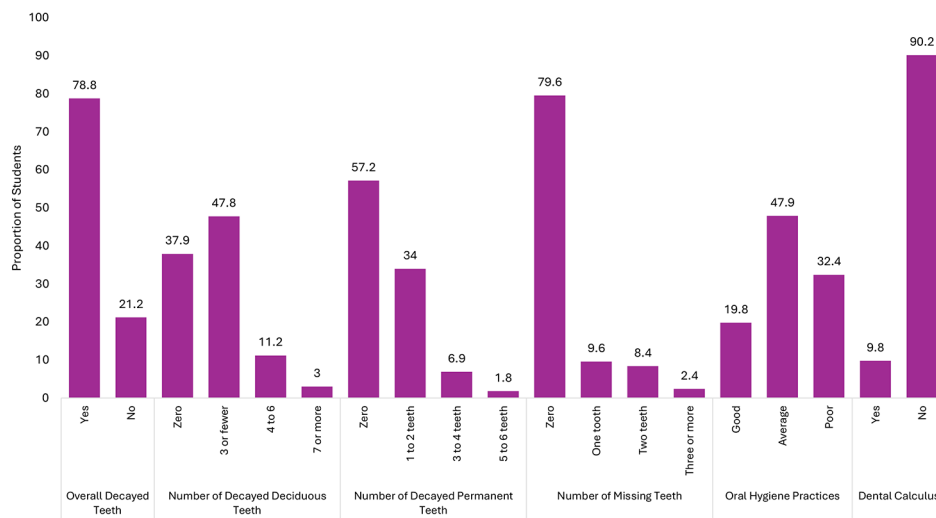
This study included 491 school students in Kabul city. The average age of the study participants was  $9.09 \pm 1.8$  years. Boys constituted 45.2% of the participants, while girls constituted 54.8%. Among the participants, 44.8% were 8 years old or younger, 32.6% were between 9 and 10 years old, and 22.8% were 11 years old or older. More than half of the students stated that their mother was illiterate (54.5%), and one-quarter of them stated that their father was illiterate (25.1%). Nine out of ten students (90.6%) stated that they brushed their teeth. More than half of them (51.1%) said they brushed their teeth once a day, 22.0% twice a day, 17.5% three times a day, and 9.4% did not brush their teeth at all. Additionally, 18.7% of the students used dental floss, and 46.6% of them used toothpicks (Table 1).

Almost two-thirds (62.1%) of the schoolchildren had at least one decayed deciduous tooth, and 14.2% of them had at least four decayed deciduous teeth. Nearly half of the schoolchildren (42.8%) had one decayed permanent tooth, and 8.7% of these school children had at least three decayed permanent teeth. One fifth (20.4%) of the students had lost at least one tooth, and 2.4% of them had lost three or more teeth. Of these 491 students, only two had undergone tooth restoration. One-fifth (19.8%) of the students had good oral hygiene, 47.9% had medium oral hygiene, and 32.4% had poor oral hygiene. The overall prevalence of dental caries among the students aged 7–13 years in Kabul city was 78.8%, while 21.2% were caries free (Fig. 2). The average DMFT was  $3.46 \pm 3.36$ . It was higher among girls and those who were aged  $< 9$  years (Table 2).

The prevalence of dental caries was similar among boys and girls. It was higher among students aged 8 years or younger (82.6%) compared to those older than 8, though the difference was not statistically significant. Students with literate mothers and fathers had a slightly lower prevalence of dental caries (77.6% and 78.5%, respectively) than those with illiterate parents (79.8% and 79.7%, respectively), but this difference was also not statistically significant. Caries was more common among children who did not brush their teeth (84.8%) compared to those who did (78.2%). Additionally, students who brushed their teeth once a day had a higher prevalence of caries (81.7%) than those who brushed two or three times daily. A higher percentage of students with dental caries (81.8%) lived in the Fifth and Thirteenth Districts compared to those in the Ninth and Tenth Districts (Table 3).

**Table 1** Sociodemographic characteristics of schoolchildren aged 7–13 years in Kabul city

	<i>n</i>	%
Sex		
Boys	222	45.2
Girls	269	54.8
Age years		
8 and younger	219	44.6
9 to 10	160	32.6
11 and older	112	22.8
Maternal literacy		
Literate	223	45.5
Illiterate	267	54.5
Paternal literacy		
Literate	367	74.9
Illiterate	123	25.1
Tooth Brushing Habits		
Brushing	445	90.6%
Not Brushing	46	9.4%
Brushing frequency		
Once a Day	251	56.4%
Twice a Day	108	24.3%
Three Times a Day	86	16.7%
Dental cleaning tools		
Use dental floss	92	18.7
Do not use dental floss	170	34.6
Use dental picks	229	46.6
Residence area		
Fifth District	137	27.9
Ninth District	118	24.0
Tenth District	104	21.2
Thirteenth District	132	26.9
Total	491	100.0



**Fig. 2** Distribution of dental problems among schoolchildren aged 7 to 13 years in Kabul city

**Table 2** Distribution of DMFTs by age and sex

	Boy	Girl	< 9 years	≥ 9 years	Overall
Mean	3.18	3.69	3.86	3.13	3.46
SD	2.95	3.64	3.39	3.30	3.36
<i>p</i> value	0.046		0.009		

Table 4 shows the dental calculus and oral hygiene status of the study participants stratified by sex and age. The prevalence of dental calculus was greater among boys (10.4%) than among girls (9.3%), but the difference was not statistically significant. The prevalence of dental calculus increased with age; it was 5.9% for those aged 8 and younger, while it was 17.0% for those aged 11 and older. More than 20% of the girls had good oral hygiene (21.2%), while this percentage was 18.0% for boys. Oral hygiene status was better among those aged 9 and older; 21.9% had good oral hygiene, 27.2% had poor oral hygiene, while these percentages for those aged 8 and younger were 17.4% and 38.8%, respectively.

Table 4 presents the dental calculus and oral hygiene status of the study participants, categorized by sex and age. Boys had a slightly higher prevalence of dental calculus (10.4%) compared to girls (9.3%), though the difference was not statistically significant. The prevalence of dental calculus increased with age, from 5.9% among children aged 8 and younger to 17.0% among those aged 11 and older. Over one-fifth of the girls had good oral hygiene (21.2%), while 18.0% of boys did. Oral hygiene improved with age: among participants aged 9 and older, 21.9% had good oral hygiene and 27.2% had poor oral hygiene, whereas among those aged 8 and younger, the corresponding figures were 17.4% and 38.8%, respectively.

**Table 3** Distribution of dental caries by sociodemographic characteristics and oral hygiene practices among schoolchildren aged 7 to 13 years in Kabul city

	Dental Caries				<i>p</i> value
	Yes		No		
	<i>n</i>	%	<i>n</i>	%	
Sex					0.996
Boys	175	78.8	47	21.2	
Girls	212	78.8	57	21.2	
Age (years)					0.176
8 and younger	181	82.6	38	17.4	
9 to 10	121	75.6	39	24.4	
11 and older	85	75.9	27	24.1	
Maternal literacy					0.554
Literate	173	77.6	50	22.4	
Illiterate	213	79.8	54	20.2	
Paternal literacy					0.778
Literate	288	78.5	79	21.5	
Illiterate	98	79.7	25	20.3	
Tooth Brushing Habits					0.298
Brushing	348	78.2	97	21.8	
Not Brushing	39	84.8	7	15.2	
Brushing frequency					0.022
Once a Day	205	81.7	46	18.3	
Twice a Day	85	78.7	23	21.3	
Three Times a Day	58	67.4	28	32.6	
Dental cleaning tools					0.569
Use dental floss	23	25.0	69	75.0	
Do not use dental floss	33	19.4	137	80.6	
Use dental picks	48	21.0	181	79.0	
Residence area					0.362
Fifth District	112	18.2	25	81.8	
Ninth District	88	25.4	30	74.6	
Tenth District	79	24.0	25	76.0	
Thirteenth District	108	18.2	24	81.8	
Total	387	78.8	104	21.2	

**Table 4** Distribution of dental calculus and oral hygiene status by sex and age among schoolchildren aged 7 to 13 years in Kabul city

	Dental Calculus				Oral Hygiene Status					
	Yes		No		Good		Average		Poor	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Sex	<i>p</i> value = 0.692				<i>p</i> value = 0.627					
Male	23	10.4	199	89.6	40	18.0	106	47.7	76	34.2
Female	25	9.3	244	90.7	57	21.2	129	48.0	83	30.9
Age	<i>p</i> value = 0.006				<i>p</i> value = 0.023					
8 or younger	13	5.9	206	94.1	38	17.4	96	43.8	85	38.8
9 to 10	16	10.0	144	90.0	59	21.7	139	51.1	74	27.2
11 or older	19	17.0	93	83.0						
Total	48	9.8	443	90.2	97	19.8	235	47.9	159	32.4

## Discussion

The findings indicate that the prevalence of dental caries among students was 78.8%, with similar rates observed for both male and female students. However, the mean DMFT score was higher for girls compared to boys, suggesting that girls experience more dental problems. This result aligns with existing literature, which has reported a higher prevalence of dental caries among girls compared to boys [5, 6]. The prevalence in deciduous teeth was 62.1%, while in permanent teeth, it was 42.8%. Caries was more common among students aged 8 years and younger (82.6%). Additionally, the mean DMFT score was greater among those under 9 years of age. This observed trends may be due to the higher susceptibility of less mineralized deciduous teeth, underdeveloped brushing skills, frequent consumption of sugary foods, and potentially lower fluoride exposure.

A similar study conducted in Herat Province, Afghanistan, reported a mean DMFT score of 4.39 for children aged 5–18 years, and only 1.8% of the participants received dental treatment [7]. Another study from Herat Province, Afghanistan, reported a mean DMFT score of 4.88 for children aged 6–7 years and 2.57 for children aged 12 years [8]. In our study, the mean DMFT score was 3.46, which is lower than these studies and might be due to differences in age of participants between the studies. In the current study, we found that only two of the children received dental treatments, which might have originated from their age. Regular dental checkups for children are uncommon in Afghanistan. They only go to the dentist when they have severe toothache.

A study from the Philippines by Yabao et al. showed that 92.35% of students aged 6–12 years had dental caries [9]. Similarly, Najma Sito et al. reported that 90.0% of students aged 8 to 12 years in Pakistan experienced dental caries [10]. Research by Asdagh et al. in Iran revealed a prevalence of 79.7% among students aged 6 to 12 years, with 71.1% for permanent teeth and 88.3% for deciduous teeth [11]. Study by Hiremath in India revealed that 78.9% of students aged 6 to 11 years had dental caries

[12], while another Indian study reported a prevalence of 78.0% among students aged 5 to 13 years [13].

In Pakistan, a different study reported a prevalence of dental caries of 72.4% [14]. Farooqi et al. in Saudi Arabia observed a 73.0% prevalence of dental caries among students aged 6 to 12 years, with 78.0% for those aged 6 to 9 years and 68.0% for those aged 10 to 12 years [15]. Another study from Saudi Arabia indicated a prevalence of 71.3% among students aged 10 to 13 years [16]. Rodan et al. in Jordan found a prevalence of 70.6% for deciduous teeth and 28.0% for permanent teeth among students aged 6 to 11 years [17]. Another study in India reported a prevalence of 68.8% among students aged 6 to 14 years [18]. In contrast, A study conducted in Albania reported a lower prevalence of dental caries (42.3%) among students aged 7 to 15 years [19]. In China [20], Spain [21], Costa Rica [22], Brazil [23, 24], and Italy [25, 26], the prevalence of dental caries in similar age groups was reported to be below 40%. A systematic review and meta-analysis by Kazemian indicated that 52.6% (95% CI: 46.7–58.5) of children living in Asia have dental caries, though this study included children from various age groups [4].

Our findings were consistent with those of most studies conducted in Asian countries, but there were some discrepancies compared to studies in developed countries. These differences could be attributed to variations in socioeconomic status and demographics among the study participants.

The limitation of this study could be that the children were in a younger age range and may not have provided accurate responses to certain questions, particularly regarding tooth brushing frequency. This could introduce potential bias and measurement error, as responses might be influenced by a tendency to overreport desirable behaviors or by external factors, such as discomfort in admitting to less frequent brushing. However, a notable strength of this study is that it is the first investigation on dental caries among children in Kabul, Afghanistan.

## Conclusions

The findings of this study offer valuable insights into the oral health status of children in Kabul, Afghanistan, revealing a high prevalence of dental caries at 78.8%. This highlights the urgent need for comprehensive oral health interventions, particularly for younger children who have a notably higher prevalence of caries. The study also identifies specific areas within Kabul, such as the fifth and thirteenth districts, where prevalence rates are higher, emphasizing the need for targeted interventions. Collaborative efforts involving local health authorities, schools, parents, and oral health professionals are crucial. Key initiatives should include school-based programs to educate students on proper brushing techniques and healthy eating habits, expanding fluoride varnish and sealant programs, increasing access to dental care through mobile clinics and affordable services, promoting fluoride toothpaste use, and conducting regular dental screenings in schools for early detection and prevention.

Future research should focus on longitudinal studies to track changes in caries prevalence and evaluate the impact of interventions. Assessing the effectiveness of various oral health approaches, such as school-based programs and fluoride treatments, is crucial. Additionally, exploring barriers to dental care and examining cultural and socioeconomic influences will help in developing more targeted and effective interventions.

## Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12903-024-04897-0>.

Supplementary Material 1

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## Author contributions

Conceptualization: AKA; data collection: AKA; research: AKA, BY; methodology: AKA; statistical analysis: AKA, BY; writing-original draft: AKA (lead), BY (supporting); writing-review and editing: all authors.

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## Data availability

The datasets used or analyzed during the current study are available from the corresponding author upon reasonable request.

## Declarations

### Ethics approval and consent to participate

Ethical approval was obtained from the institutional review board of Kabul University of Medical Sciences (Reg No: 324/16-11-2017). Informed consent was obtained from the parents and students before participation.

### Consent for publication

Not applicable.

## Competing interests

The authors declare no competing interests.

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