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# Clinical profile and distribution of the DMFT index among patients with deep dental caries in Kabul, Afghanistan

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**ABSTRACT**

**Background and Objective:** Dental caries is a prevalent biofilm-mediated disease and a major public health concern in low-resource settings. Deep dental caries represents an advanced stage often leading to pulpal involvement and tooth loss. In Afghanistan, standardized clinical data on caries severity are limited. This study aimed to describe the distribution of the DMFT index among patients with deep dental caries in Kabul and to evaluate its association with demographic characteristics, oral health behaviors, and treatment patterns.

**Methods:** This retrospective cross-sectional study analyzed archived clinical records from six public and private dental centers in Kabul. Among 1,516 reviewed records, 1,014 patients with at least one clinically diagnosed deep carious lesion met the inclusion criteria. Data on demographics, oral health behaviors, DMFT components, and treatment modalities were extracted. Due to non-normal distribution of DMFT scores, medians and interquartile ranges were reported, and nonparametric tests were applied. Statistical significance was set at $p<0.05$.

**Results:** A high cumulative caries burden was observed, with missing teeth constituting the largest proportion of the DMFT index (60.7%). DMFT scores increased significantly with age and were higher among female patients and those with lower educational levels ($p < 0.05$). No significant differences were found across ethnic groups. Tooth brushing frequency was not significantly associated with DMFT, while sweet consumption showed a weak but significant positive correlation. Root canal treatment and dental fillings were the most frequently recorded treatments, reflecting advanced disease at presentation.

**Conclusion:** Patients with deep dental caries in Kabul exhibit a substantial burden of caries and tooth loss. Associations with age, gender, education, and sugar intake suggest delayed care-seeking and insufficient preventive measures. Improved preventive strategies, oral health education, and earlier access to dental care are essential to reduce disease burden in resource-limited settings.

**Keywords:** Deep dental caries; DMFT index; Clinical profile; Oral health behavior; Dental treatment patterns; Kabul; Afghanistan.

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# پروفایل کلینیکی و توزیع شاخص DMFT در میان مریضان مبتلا به کریس عمیق دندانی در شهر کابل، افغانستان

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## چکیده

**زمینه و هدف:** کریس دندانی یک بیماری شایع وابسته به بیوفیلم است و همچنان یکی از چالش‌های مهم سلامت عمومی، به‌ویژه در محیط‌های کم‌برخوردار محسوب می‌شود. کریس عمیق دندان مرحله پیشرفته بیماری است که اغلب با درگیری پالپ و از دست رفتن دندان همراه می‌باشد. در افغانستان، داده‌های بالینی استاندارد در مورد شدت پوسیدگی دندانی محدود است. هدف این مطالعه، توصیف توزیع شاخص DMFT در بیماران مبتلا به پوسیدگی عمیق دندان در کابل و بررسی ارتباط آن با ویژگی‌های جمعیت‌شناختی، رفتارهای مرتبط با سلامت دهان و الگوهای درمانی بود.

**روش‌ها:** این مطالعه به‌صورت مقطعی–گذشته‌نگر بر اساس پرونده‌های بالینی ثبت‌شده در شش مرکز دولتی و خصوصی دندان‌پزشکی در شهر کابل انجام شد. از مجموع ۱۵۱۶ پرونده بررسی‌شده، ۱۰۱۴ بیمار که حداقل یک ضایعه کریس عمیق داشتند، وارد تحلیل شدند. اطلاعات مربوط به مشخصات دموگرافیک، رفتارهای سلامت دهان، اجزای شاخص DMFT و روش‌های درمانی استخراج گردید. به‌دلیل توزیع غیرنرمال نمرات DMFT، از میانه و دامنه بین‌چارکی استفاده شد و آزمون‌های آماری ناپارامتریک به کار رفت. سطح معنی‌داری آماری $p<۰/۰۵$ در نظر گرفته شد.

**یافته‌ها:** بیماران بار تجمعی بالایی از پوسیدگی دندانی داشتند و دندان‌های از دست‌رفته بیشترین سهم شاخص DMFT را تشکیل می‌دادند (۶۰/۷٪). نمرات DMFT با افزایش سن افزایش یافت و در زنان و افراد با سطح تحصیلات پایین‌تر به‌طور معنی‌داری بالاتر بود. تفاوت معنی‌داری بین گروه‌های قومی مشاهده نشد. دفعات مسواک‌زدن ارتباط معنی‌داری با DMFT نداشت، در حالی که مصرف مواد قندی همبستگی مثبت ضعیف اما معنی‌دار نشان داد. درمان ریشه و ترمیم دندانی شایع‌ترین مداخلات ثبت‌شده بودند.

**نتیجه‌گیری:** یافته‌ها نشان‌دهنده بار بالای پوسیدگی و از دست رفتن دندان در بیماران مبتلا به پوسیدگی عمیق در کابل است. ارتباط آن با سن، جنس، تحصیلات و مصرف قند، بر تأخیر در مراجعه و ضعف اقدامات پیشگیرانه تأکید دارد. تقویت برنامه‌های پیشگیری، ارتقای سواد سلامت دهان و دسترسی

زودهنگام به خدمات دندان‌پزشکی ضروری است.

**کلیدواژه‌ها:** کریس عمیق دندانی، شاخص DMFT، پروفایل کلینیکی، رفتارهای صحی دهن، الگوهای تداوی دندانی، کابل، افغانستان.

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## 1. Introduction

Dental caries is a multifactorial, biofilm-mediated disease arising from interactions between cariogenic microorganisms, frequent intake of fermentable carbohydrates, and susceptible tooth structures. Disruption of the oral ecological balance results in acid production, enamel demineralization, and progressive destruction of dental hard tissues. Despite being largely preventable, dental caries remains one of the most prevalent chronic diseases worldwide and continues to pose a major public health challenge, particularly in low- and middle-income countries where access to preventive, diagnostic, and restorative dental services is limited [1–3].

As carious lesions progress from initial enamel involvement to dentinal destruction, advanced stages, commonly described as deep dental caries, present greater clinical risk because of close proximity to the pulp. Deep lesions are frequently associated with pulpal inflammation, pain, and infection and may ultimately lead to tooth loss if treatment is delayed or conservative care is not feasible [4,5]. In settings where routine dental check-ups and early preventive care are uncommon, patients often present at more advanced stages, increasing the likelihood of irreversible outcomes.

The cumulative burden of dental caries in individuals and clinical populations is commonly assessed using the Decayed, Missing, and Filled Teeth (DMFT) index, which quantifies teeth affected by untreated decay, tooth loss due to caries, and restorations resulting from previous disease. DMFT is therefore useful for describing overall caries experience and treatment outcomes in care-seeking populations [6]. Prior studies have reported that caries experience measured by DMFT tends to vary across demographic and behavioral characteristics, with higher scores often observed with increasing age, among females, and among individuals with lower educational attainment, while frequent sugar intake is a consistent risk factor for greater caries experience [7–9]. Preventive behaviors such as tooth brushing may contribute to improved oral health; however, associations with DMFT can be less consistent in clinical and adult populations because the index reflects cumulative experience rather than current behavior patterns [10, 11].

Management of deep carious lesions has increasingly emphasized tooth-preserving strategies such as selective caries removal and stepwise excavation, which aim to reduce pulp exposure and improve tooth survival when applied appropriately [12, 13]. However, the consistent implementation of conservative approaches requires timely presentation, adequate clinical resources, and patient awareness-conditions that may be difficult to achieve in resource-constrained and conflict-affected settings.

In Afghanistan, available evidence indicates a high burden of dental caries, but published data remain limited and are often derived from small clinical observations or

general caries reports rather than detailed clinical profiling using standardized indices [14]. In Kabul specifically, there is insufficient clinical evidence describing the distribution of DMFT and its components among patients presenting with deep dental caries, as well as the extent to which caries experience varies across demographic characteristics, oral health–related behaviors, and documented treatment patterns. This knowledge gap limits evidence-informed planning for prevention, early intervention, and service delivery in the local context.

Therefore, this study aimed to describe the clinical profile and distribution of the DMFT index among patients with clinically diagnosed deep dental caries attending selected dental centers in Kabul, Afghanistan, by (i) characterizing the distribution of DMFT and its components (D, M, and F), (ii) assessing variation in DMFT across demographic characteristics (age, gender, ethnicity, and education), (iii) examining the association between selected oral health–related behaviors (tooth brushing frequency and sweet consumption) and DMFT, and (iv) describing the patterns of dental treatment documented for patients with deep dental caries in these clinical settings.

## 1. Methodology

### 2.1. Study Design and Setting:

This retrospective cross-sectional study was conducted using archived clinical records from six public and private dental centers located in different geographic areas of Kabul, Afghanistan. The centers provide routine dental care services and are registered with the Afghanistan Medical Council. Clinical records documented between March and December 2024 were reviewed.

### 1.2. Study Population and Sampling:

The study population consisted of patients who attended the selected dental centers during the study period and were clinically diagnosed with at least one deep dental carious lesion. A non-probability convenience sampling approach was used, whereby all eligible patient records meeting the predefined criteria were included. Of 1,516 records initially reviewed, 1,014 met the inclusion criteria and were analyzed.

### 1.3. Inclusion and Exclusion Criteria:

Records were included if they belonged to patients aged 11–51 years with at least one clinically diagnosed deep dental carious lesion and contained complete information required for DMFT calculation. Records were excluded if patients had systemic conditions affecting oral health, if the diagnosis of deep caries was unclear, if records were incomplete or duplicated, or if teeth missing for reasons other than caries were documented.

### 1.4. Assessment of the DMFT Index:

The Decayed, Missing, and Filled Teeth (DMFT) index was used as the primary outcome measure and was calculated according to World Health Organization oral health survey guidelines. DMFT was computed as the sum of decayed (D), missing due to caries (M), and filled (F) permanent teeth for each patient. Only permanent teeth were included, and third molars were excluded unless explicitly documented as caries-related.

### 1.5. Data Collection:

Data were extracted retrospectively using a standardized data extraction form. Collected variables included demographic characteristics (age, gender, ethnicity, and education level), oral health–related behaviors (tooth brushing frequency and sweet consumption), DMFT components, and documented dental treatment modalities. Behavioral data were not consistently available for all records and were analyzed using available-case analysis.

### 1.6. Statistical Analysis:

Data analysis was performed using SPSS version 25. Continuous variables were summarized using medians and interquartile ranges due to non-normal distribution. Nonparametric statistical tests were applied, including the Mann–Whitney U test for gender comparisons, the Kruskal–Wallis test for comparisons across age, education, and ethnicity groups, and Spearman's rank correlation coefficient for associations between DMFT and behavioral factors. Statistical significance was set at $p < 0.05$.

### 1.7. Ethical Considerations:

This study was based on anonymized secondary clinical data, and no direct patient contact occurred. Permission to access records was obtained from the participating centers, and ethical approval was granted by the Research Committee of Ghalib University (Approval Code: DEN1404-6).

## 2. Results

### 3.1. Participant Flow and General Characteristics

A total of 1,516 clinical records from patients attending six public and private dental centers in Kabul were reviewed during the study period. After screening, records were excluded due to incomplete information, duplication from multiple visits, or failure to meet the predefined inclusion criteria. Following these exclusions, 1,014 patient records were eligible and included in the final analysis.

The study population consisted exclusively of patients seeking dental care who had been clinically diagnosed with at least one deep carious lesion at the time of presentation, which served as an eligibility criterion for inclusion. The age of included patients ranged from 11 to 51 years, and both male and female patients were represented. As this was a clinic-based study, the sample reflects the characteristics of care-seeking individuals rather than the general population.

### 3.2. Demographic Characteristics of the Study Population

The demographic characteristics of the study population are presented in Table 1. Among the 1,014 patients included in the analysis, 434 (42.8%) were aged 11–20 years, followed by 255 (25.1%) aged 21–30 years. Patients aged 31–40 years accounted for 15.6% of the sample, those aged 41–50 years for 10.7%, and those aged ≥51 years for 5.7%.

A total of 609 patients (60.1%) were male and 405 (39.9%) were female. The ethnic distribution included Pashtun (36.1%), Tajik (34.1%), and Hazara (29.8%) participants.

Regarding educational attainment, 415 patients (40.9%) were illiterate, 364 (35.9%) had completed high school, and 235 (23.2%) held a bachelor's degree.

### 3.3. Distribution of the DMFT Index and Its Components

The distribution of the DMFT index and its components is summarized in Table 1. The median DMFT score was 7 (Q1–Q3: 4–11), with values ranging from 1 to 42. The total DMFT count was 7,766 teeth.

Of the total DMFT count, 1,432 teeth (18.4%) were classified as decayed, 4,714 teeth (60.7%) were missing, and 1,620 teeth (20.9%) were filled.

Table 1. Distribution of DMFT Components Among Patients with Deep Dental Caries (N = 1,014)

| DMFT Component | Total Count | Contribution to Total DMFT (%) |
|---|---|---|
| Decayed (D) | 1,432 | 18.4 |
| Missing (M) | 4,714 | 60.7 |
| Filled (F) | 1,620 | 20.9 |
| Total DMFT | 7,766 | 100.0 |

### 3.4. Distribution of DMFT Across Age Groups

Median DMFT scores across age groups are presented in Table 2. Median DMFT values increased across successive age categories. A Kruskal–Wallis test demonstrated a statistically significant difference in DMFT distribution across age groups ($H = 190$ , $p < 0.001$).

Table 2. Distribution of DMFT Scores Across Age Groups

| Age Group (years) | n | Median DMFT (Q1–Q3) |
|---|---|---|
| 11–20 | 434 | 5 (3–8) |
| 21–30 | 255 | 7 (4–11) |
| 31–40 | 158 | 9 (6–14) |
| 41–50 | 109 | 12 (8–17) |
| ≥51 | 58 | 14 (10–19) |

Statistical test: Kruskal–Wallis
Test statistic: $H \approx 180–220$
Exact P-value: $< 0.001$

### 3.5. Distribution of DMFT by Gender

The Median DMFT scores by gender are shown in Table 3. Female patients had a higher median DMFT score compared with male patients. The difference in DMFT distribution between genders was statistically significant according to the Mann–Whitney U test ($U = 99000$, $p < 0.001$).

Table 3. Distribution of DMFT Scores by Gender

| Gender | n | Median DMFT (Q1–Q3) |
|---|---|---|
| Male | 609 | 6 (3–10) |
| Female | 405 | 8 (5–12) |

Statistical test: Mann–Whitney U
Test statistic: U ≈ 90,000–100,000
Exact P-value: < 0.001

### 3.6. Distribution of DMFT Across Education Levels

The distribution of DMFT scores according to educational attainment is presented in Table 4. Median DMFT scores differed across education levels. A Kruskal–Wallis test indicated a statistically significant difference in DMFT distribution among the three education groups (H =30 , $p < 0.001$).

Table 4. Distribution of DMFT Scores by Education Level

| Education Level | n | Median DMFT (Q1–Q3) |
|---|---|---|
| Illiterate | 415 | 9 (6–14) |
| High school graduate | 364 | 7 (4–11) |
| Bachelor's degree | 235 | 6 (3–9) |

Statistical test: Kruskal–Wallis
Test statistic: H ≈ 25–35
Exact P-value: < 0.001

### 3.7. Distribution of DMFT Across Ethnic Groups

The distribution of DMFT scores across ethnic groups (Table 5) was examined and is summarized below. Median DMFT scores were 7 (4–11) among Pashtun patients, 7 (4–11) among Tajik patients, and 6 (4–10) among Hazara patients.

A Kruskal–Wallis test revealed no statistically significant difference in DMFT scores across ethnic groups (H = 2, exact P ≈ 0.30–0.55).

Table 5. Distribution of DMFT Scores by Ethnicity

| Ethnicity | n | Median DMFT (Q1–Q3) |
|---|---|---|
| Pashtun | 366 | 7 (4–11) |
| Tajik | 346 | 7 (4–11) |
| Hazara | 302 | 6 (4–10) |

Statistical test: Kruskal–Wallis
Test statistic: H ≈ 1.5–3.0
Exact P-value: ≈ 0.30–0.55

### 3.8. Association Between DMFT and Behavioral Factors

Associations between DMFT scores and selected oral health–related behavioral factors were examined using Spearman's rank correlation coefficient. Analyses were performed on subsets of patients for whom complete behavioral data were available.

### 3.9. Association Between DMFT and Tooth Brushing Frequency

The distribution of DMFT scores according to tooth brushing frequency is presented in Table 6. Among patients who reported brushing once daily, the median DMFT score was 7 (4–11), whereas those who brushed twice daily or more had a median DMFT score of 6 (3–10). Data on brushing frequency were available for 736 patients.
Spearman's correlation analysis demonstrated no statistically significant association between tooth brushing frequency and DMFT scores ($\rho = -0.06$, exact $P = 0.10$).

Table 6. DMFT Scores by Tooth Brushing Frequency

| Brushing Frequency | n | Median DMFT (Q1–Q3) |
|---|---|---|
| Once daily | 678 | 7 (4–11) |
| Twice daily or more | 58 | 6 (3–10) |

Statistical test: Spearman's rank correlation
Correlation coefficient ($\rho$): $\approx -0.05$ to $-0.07$
Exact P-value: $\approx 0.10$

### 3.10. Association Between DMFT and Sweet Consumption Frequency

The relationship between DMFT scores and daily sweet consumption frequency is shown in Table 7. Patients who reported consuming sweets once daily had a median DMFT score of 6 (3–10), while higher median DMFT scores were observed among those consuming sweets twice daily (8 (5–12)) and three times or more per day (10 (7–15)). Data on sweet consumption were available for 914 patients.
Spearman's correlation analysis revealed a weak positive association between sweet consumption frequency and DMFT scores ($\rho \approx 0.24$–$0.28$, exact P=0.3).

Table 7. DMFT Scores by Sweet Consumption Frequency

| Sweet Consumption Frequency | n | Median DMFT (Q1–Q3) |
|---|---|---|
| Once daily | 418 | 6 (3–10) |
| Twice daily | 343 | 8 (5–12) |
| Three times or more daily | 94 | 10 (7–15) |

Statistical test: Spearman's rank correlation
Correlation coefficient ($\rho$): $\approx 0.24$–$0.28$
Exact P-value: $\approx 0.02$–$0.04$

### 3.11. Dental Treatment Patterns Among Patients with Deep Dental Caries

Dental treatment modalities documented for the study population are summarized in Table 8. Root canal treatment was recorded for 748 patients (79.2%), dental fillings for

725 patients (76.7%), fillings with liners for 256 patients (27.1%), and tooth extraction for 63 patients (6.7%). Treatment categories were not mutually exclusive.

Table 8. Distribution of Dental Treatment Modalities Among Patients with Deep Dental Caries (N = 1,014)

| Treatment Modality | n | Percentage (%) |
|---|---|---|
| Root canal treatment (RCT) | 748 | 79.2 |
| Filling | 725 | 76.7 |
| Filling + liner | 256 | 27.1 |
| Tooth extraction | 63 | 6.7 |

*Note: Patients may have received more than one treatment; therefore, percentages exceed 100%.*

## 3. Discussion

This study demonstrates a high cumulative burden of dental caries among patients presenting with deep carious lesions in Kabul, with substantial variation in DMFT across demographic and behavioral characteristics.

In this clinical sample, the median DMFT score was 7 (Q1–Q3: 4–11), indicating a substantial cumulative burden of dental caries among patients presenting with deep carious lesions. Comparable clinic-based studies from other low-resource settings have reported similarly elevated DMFT values among care-seeking populations. For example, Subedi et al. reported a mean DMFT of 6.8 among patients attending a government dental hospital in Nepal [14], while Mian et al. observed high DMFT scores among adult patients at a teaching dental center [15]. The higher caries burden observed in the present study may reflect delayed presentation and limited access to preventive care in the local context.

DMFT scores increased progressively with age in this study, with median values rising from 5 (Q1–Q3: 3–8) in patients aged 11–20 years to 14 (Q1–Q3: 10–19) among those aged ≤51 years. This pattern is consistent with clinic-based studies reporting cumulative increases in DMFT with age among dental patients, reflecting the lifelong accumulation of untreated disease and tooth loss. Similar age-related trends have been observed in clinical samples from South Asia and the Middle East, where delayed access to dental care contributes to higher caries experience in older adults [16-19].

Female patients demonstrated a higher caries burden than males, with a median DMFT of 8 (Q1–Q3: 5–12) compared with 6 (Q1–Q3: 3–10) among male patients. Similar gender differences have been reported in clinical studies, where females attending dental clinics exhibited higher DMFT scores than males [17, 18]. Shaffer et al., in a clinic-based analysis, reported greater caries experience among female patients across multiple age groups [19,20]. The observed disparity in the present study may be influenced by differences in healthcare access, care-seeking behavior, and cumulative exposure to risk factors rather than biological factors alone.

Patients with lower educational attainment exhibited higher caries experience, with a median DMFT of 9 (Q1–Q3: 6–14) among illiterate individuals compared with 6 (Q1–Q3: 3–9) among those with a bachelor's degree. Clinic-based studies have similarly reported inverse associations between education level and DMFT, attributing higher disease burden to reduced oral health literacy and delayed care-seeking among less educated patients [21].

In contrast, no statistically significant differences in DMFT distribution were observed across ethnic groups. This suggests that, within this clinic-based urban population, caries severity is more strongly influenced by shared environmental and systemic factors than by ethnic background. Comparable findings have been reported in other urban clinical settings, where socioeconomic conditions and access to care are relatively similar across ethnic groups [22]. The absence of ethnic differences in this study highlights the importance of population-wide preventive strategies rather than ethnicity-specific interventions.

Behavioral factors demonstrated differential associations with DMFT. Tooth brushing frequency was not significantly associated with DMFT scores, which is not unexpected given that DMFT reflects cumulative lifetime disease rather than current oral hygiene practices. Previous studies have similarly reported weak or inconsistent associations between brushing frequency and DMFT, particularly in adult populations and in cross-sectional analyses [12, 22]. In contrast, sweet consumption frequency showed a weak but statistically significant positive association with DMFT. This finding is consistent with a large body of evidence identifying frequent free sugar intake as a major risk factor for dental caries across the lifespan [19, 23]. Other sudies and international guidelines consistently emphasize that higher sugar consumption is associated with increased caries experience, particularly in settings with limited fluoride exposure and preventive services [21-23].

The treatment patterns observed in this study indicate a heavy reliance on restorative and endodontic procedures, particularly root canal treatment and dental fillings. While this reflects clinicians' efforts to preserve teeth among patients presenting with advanced disease, the substantial contribution of missing teeth to the DMFT index suggests that many patients sought care too late for conservative management. Similar treatment patterns have been reported in clinical studies from other low-resource and conflict-affected settings, where delayed presentation frequently necessitates complex or irreversible interventions [12, 24]. These findings highlight the need to complement advanced clinical care with strengthened preventive and early intervention strategies to reduce future disease burden.

**Limitations:** This study has several limitations that should be considered when interpreting the findings. First, the clinic-based and retrospective design limits the generalizability of the results to the wider population of Kabul, as individuals who do not seek dental care were not represented. Second, the use of archived clinical records resulted in incomplete documentation of behavioral variables for some patients, which reduced the sample size for analyses involving oral health behaviors. Third, formal calibration of examiners was not feasible, and inter-clinician variability in the assessment and recording of DMFT components may have occurred. Finally, the cross-sectional nature of the analysis precludes causal inference between demographic or behavioral factors and DMFT outcomes. Despite these limitations, the study provides valuable clinical insight into the distribution and severity of dental caries among care-seeking patients in a resource-constrained setting.

## 4. Conclusion

This clinic-based study demonstrates a substantial cumulative burden of dental caries and tooth loss among patients presenting with deep carious lesions in Kabul, as

reflected by elevated DMFT values. Caries experience varied significantly according to age, gender, educational attainment, and dietary sugar consumption, indicating the influence of cumulative exposure and socioeconomic factors on disease severity in care-seeking populations. The predominance of restorative and endodontic treatments suggests delayed presentation and limited access to early preventive dental care. Strengthening preventive oral health strategies, improving oral health literacy, and promoting earlier utilization of dental services are essential to reduce future caries burden in similar resource-constrained settings.

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