

**PREVALENCE AND RISK FACTORS OF ORAL DISEASES: AN
EPIDEMIOLOGICAL STUDY**

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Abstract

This article presents a comprehensive epidemiological analysis of oral disease prevalence and associated risk factors. Oral diseases, particularly dental caries and periodontal diseases, represent major public health challenges affecting billions globally. A cross-sectional population-based study of 1,850 participants aged 6-70 years was conducted in Tashkent, Uzbekistan, examining the prevalence of dental caries, periodontal diseases, oral mucosal lesions, and tooth loss. Standardized WHO criteria were employed for diagnosis, supplemented by comprehensive questionnaires assessing sociodemographic factors, oral hygiene practices, dietary habits, and healthcare utilization. Results revealed dental caries prevalence of 78.4% overall (92.3% in adults), periodontal disease in 64.8% of adults, and edentulism in 12.4% of elderly participants. Significant risk factors included poor oral hygiene (OR=4.2, $p<0.001$), high sugar consumption (OR=3.6, $p<0.001$), smoking (OR=2.8, $p<0.001$), low socioeconomic status (OR=2.4, $p=0.002$), and infrequent dental visits (OR=3.8, $p<0.001$). The discussion emphasizes the multifactorial etiology of oral diseases and the critical need for comprehensive prevention strategies, improved oral health literacy, and equitable access to dental care services.

Keywords

oral health, dental caries, periodontal disease, epidemiology, risk factors, oral hygiene, public health, prevention.

INTRODUCTION

Oral diseases represent a significant global public health burden, affecting an estimated 3.5 billion people worldwide and constituting the most prevalent noncommunicable diseases [1]. Dental caries and periodontal diseases are the most common oral conditions, with untreated dental caries in permanent teeth being the single most prevalent condition globally according to the Global Burden of Disease Study [2]. Despite being largely preventable, oral diseases continue to impose substantial economic costs, diminish quality of life, and contribute to systemic health complications.

Dental caries, characterized by localized destruction of tooth structure due to acid-producing bacteria, affects individuals across all age groups. The prevalence varies considerably by region, socioeconomic status, and access to preventive care, with developing countries experiencing disproportionately high burden [3]. Periodontal diseases, encompassing gingivitis and periodontitis, involve inflammation and destruction of tooth-supporting structures, affecting approximately 20-50% of the global population [4]. Severe periodontitis, resulting in tooth loss and systemic complications, represents a major contributor to oral disease burden.

The etiology of oral diseases is multifactorial, involving complex interactions between microbial factors, host susceptibility, behavioral determinants, and socioeconomic influences [5]. Key risk factors include poor oral hygiene practices, dietary patterns (particularly frequent sugar consumption), tobacco use, alcohol consumption, socioeconomic disadvantage, limited access to dental care, and certain systemic conditions such as diabetes mellitus. Understanding the

distribution and determinants of oral diseases is essential for developing evidence-based prevention strategies and allocating resources effectively.

The oral health situation in Central Asian countries, including Uzbekistan, remains inadequately characterized in international literature. Limited epidemiological data hampers evidence-based policy development and resource allocation for oral health services. Previous studies in the region have suggested high prevalence of dental caries and periodontal diseases, but comprehensive population-based assessments using standardized methodology are scarce [6].

Oral health inequalities persist both within and between countries, with disadvantaged populations experiencing higher disease burden and reduced access to care. The social determinants of oral health, including education, income, occupation, and living conditions, significantly influence disease patterns and treatment-seeking behaviors [7]. Addressing these disparities requires comprehensive approaches targeting both individual risk factors and broader structural determinants.

The aim of this research is to comprehensively assess the prevalence of major oral diseases and identify associated risk factors in the urban population of Tashkent, Uzbekistan. Specific objectives include: determining the prevalence of dental caries across age groups, assessing the prevalence and severity of periodontal diseases in adults, evaluating the extent of tooth loss and edentulism in the elderly population, identifying behavioral, socioeconomic, and health-related risk factors for oral diseases, and examining patterns of dental care utilization and barriers to accessing services.

MATERIALS AND METHODS

Study design and sampling. This cross-sectional population-based epidemiological study was conducted in Tashkent, Uzbekistan, from March 2022 to November 2024. Multi-stage cluster sampling was employed to ensure representative population coverage. The city was divided into 11 administrative districts, from which 4 districts were randomly selected. Within each selected district, residential areas were randomly chosen, and households were systematically sampled. One eligible individual per household was included using Kish method for random selection. The total sample comprised 1,850 participants aged 6-70 years, stratified into four age groups: children (6-12 years, n=420), adolescents (13-19 years, n=380), adults (20-59 years, n=850), and elderly (≥ 60 years, n=200). Sample size was calculated to detect a 5% difference in disease prevalence with 95% confidence and 80% power. Exclusion criteria included inability to provide informed consent, current orthodontic treatment, and acute systemic illness. The study protocol received approval from the National Medical Ethics Committee (Protocol #2022-124), and written informed consent was obtained from all adult participants and parents/guardians of minors.

Clinical examination. Standardized oral examinations were conducted by four calibrated dentists following WHO Oral Health Surveys Basic Methods (5th edition) [8]. Examiner calibration was performed through training sessions and field testing, achieving inter-examiner kappa coefficients >0.85 for all diagnostic criteria. Examinations were performed under natural light using dental mirrors, WHO periodontal probes, and explorers. No radiographs were taken. Dental caries experience was assessed using the DMFT index (Decayed, Missing, Filled Teeth) for permanent dentition and dmft for primary dentition. Active cavitated lesions were recorded as decayed teeth. Periodontal status was evaluated using the Community Periodontal Index (CPI), examining index teeth and recording bleeding on probing, calculus, and pocket depth. Tooth loss was documented, and edentulism (complete tooth loss) was recorded in elderly participants.

Questionnaire survey. Structured questionnaires were administered via face-to-face interviews to collect information on sociodemographic characteristics (age, gender, education, occupation, monthly household income), oral hygiene practices (brushing frequency, use of fluoride toothpaste, flossing, mouthwash use), dietary habits (frequency of sugar consumption, soft drink intake, fruit and vegetable consumption), tobacco and alcohol use, dental care utilization (last dental visit, reason for visit, frequency of preventive visits), self-perceived oral health status, and presence of chronic systemic diseases (diabetes mellitus, cardiovascular disease, hypertension). Questionnaires were pilot-tested and refined before field implementation.

Operational definitions. Dental caries was defined as presence of cavitated lesions in tooth structure. Caries experience included current and past disease (decayed, missing due to caries, and filled teeth). Good oral hygiene was defined as brushing teeth twice daily with fluoride toothpaste. High sugar consumption was defined as consuming sugary foods/drinks ≥ 4 times daily. Periodontal disease included gingivitis (bleeding on probing) and periodontitis (pocket depth ≥ 4 mm). Current smoking was defined as daily or occasional tobacco use. Low socioeconomic status was defined as monthly household income below the national poverty line or primary education only .

Statistical analysis. Data were analyzed using STATA version 16.0. Descriptive statistics included frequencies, percentages, means, and standard deviations. Chi-square test evaluated associations between categorical variables. Independent t-test and ANOVA compared continuous variables across groups. Multivariable logistic regression identified independent risk factors for dental caries and periodontal disease, calculating adjusted odds ratios (AOR) with 95% confidence intervals. Variables with $p < 0.20$ in univariate analysis were included in multivariable models. The Hosmer-Lemeshow test assessed model fit. Statistical significance was set at $p < 0.05$. Sampling weights were applied to account for the complex survey design.

RESULTS

Participant characteristics. The study enrolled 1,850 participants with a response rate of 89.2%. The cohort comprised 898 males (48.5%) and 952 females (51.5%), with a mean age of 32.6 ± 18.4 years. Educational attainment varied: 18.2% had primary education, 42.6% secondary education, 28.4% higher education, and 10.8% vocational training. Employment status showed 56.4% employed, 22.8% students, 14.6% homemakers, and 6.2% unemployed. Approximately 34.6% of households were classified as low socioeconomic status. Only 38.4% reported brushing teeth twice daily, and merely 12.6% used dental floss regularly. High sugar consumption was reported by 46.8% of participants. Current smoking prevalence was 28.4% among adults, predominantly males (52.6% vs 4.2% females, $p < 0.001$).

Dental caries prevalence and severity. Overall dental caries prevalence was 78.4%, with significant variation across age groups: children 56.4%, adolescents 74.2%, adults 92.3%, and elderly 88.6% ($p < 0.001$). Among children, mean dmft was 4.2 ± 3.6 , with the decayed component (dt) accounting for 72% of the index (3.0 ± 2.8). For adolescents and adults, mean DMFT was 6.8 ± 4.2 and 12.4 ± 6.8 respectively. The elderly group demonstrated mean DMFT of 18.6 ± 8.4 , with the missing component (MT) predominating (14.2 ± 7.6), reflecting extensive tooth loss. Untreated dental caries (decayed teeth) was present in 58.6% of the total population, indicating substantial unmet treatment need . Only 24.8% of caries experience was addressed through fillings (FT component), suggesting limited access to restorative care.

Periodontal disease prevalence. Among adults ($n=850$), 64.8% exhibited some form of periodontal disease. Gingivitis (bleeding on probing without pockets) affected 42.4% of adults.

Moderate periodontitis (pockets 4-5mm) was present in 18.6%, and severe periodontitis (pockets ≥ 6 mm) in 3.8%. Periodontal disease prevalence increased significantly with age: 38.2% in 20-29 years, 62.4% in 30-39 years, 74.8% in 40-49 years, and 84.6% in ≥ 50 years ($p < 0.001$). Calculus was detected in 68.4% of adults. Among elderly participants, 76.2% had periodontal disease, with 28.4% showing severe periodontitis. Males demonstrated higher periodontal disease prevalence than females (72.6% vs 57.2%, $p < 0.001$), likely reflecting higher smoking rates and poorer oral hygiene practices .

Tooth loss and edentulism. Tooth loss increased substantially with age. Adults aged 20-39 years had lost an average of 1.4 ± 2.2 teeth, increasing to 4.8 ± 4.6 in ages 40-59 years and 12.8 ± 8.2 in elderly participants. Complete edentulism affected 12.4% of elderly participants (≥ 60 years), predominantly females (16.8% vs 8.2% males, $p = 0.008$). Among edentulous individuals, only 48.6% had received prosthodontic rehabilitation with complete dentures. Partial edentulism (loss of some but not all teeth) affected 68.4% of elderly and 42.6% of middle-aged adults (40-59 years). The primary causes of tooth loss were dental caries (62.4%), periodontal disease (28.6%), and trauma (9.0%).

Dental care utilization. Only 32.4% of participants had visited a dentist within the past 12 months. The majority (64.8%) sought dental care only when experiencing pain or problems (emergency-driven), while merely 18.6% attended for preventive check-ups, and 16.6% had never visited a dentist. Regular dental attendance (annual preventive visits) was significantly associated with higher education (OR=3.8, $p < 0.001$) and higher socioeconomic status (OR=4.2, $p < 0.001$). Reported barriers to dental care included cost (58.6%), fear/anxiety (28.4%), lack of perceived need (24.8%), distance to facilities (18.2%), and time constraints (16.4%). Self-perceived oral health was rated as good by only 28.6% of participants, fair by 46.8%, and poor by 24.6% .

Risk factors for dental caries. Multivariable logistic regression identified several independent risk factors for dental caries. Poor oral hygiene (brushing < 2 times daily) was the strongest predictor (AOR=4.2, 95% CI: 3.2-5.5, $p < 0.001$). High sugar consumption conferred 3.6-fold increased odds (AOR=3.6, 95% CI: 2.8-4.6, $p < 0.001$). Low socioeconomic status was significantly associated with caries (AOR=2.4, 95% CI: 1.8-3.2, $p = 0.002$). Infrequent dental visits (> 1 year since last visit) increased caries risk (AOR=3.8, 95% CI: 2.9-5.0, $p < 0.001$). Absence of fluoride exposure, either through water fluoridation or fluoride toothpaste use, significantly elevated risk (AOR=2.6, 95% CI: 1.9-3.5, $p < 0.001$). Protective factors included higher education (AOR=0.48, $p = 0.004$) and regular preventive dental care (AOR=0.38, $p < 0.001$) .

Risk factors for periodontal disease. For periodontal disease in adults, smoking emerged as the strongest risk factor (AOR=2.8, 95% CI: 2.1-3.7, $p < 0.001$), with current smokers demonstrating 2.8-fold increased odds compared to non-smokers. Poor oral hygiene significantly increased periodontal disease risk (AOR=3.4, 95% CI: 2.6-4.4, $p < 0.001$). Diabetes mellitus was associated with increased periodontitis (AOR=2.2, 95% CI: 1.4-3.4, $p = 0.001$). Age demonstrated strong association, with each decade increasing odds by 1.8-fold (AOR=1.8, 95% CI: 1.6-2.1, $p < 0.001$). Male gender (AOR=1.6, $p = 0.008$), low socioeconomic status (AOR=1.8, $p = 0.004$), and infrequent dental visits (AOR=2.4, $p < 0.001$) were additional independent predictors. Calculus presence strongly correlated with periodontitis severity ($r = 0.68$, $p < 0.001$).

DISCUSSION

This comprehensive population-based study reveals high prevalence of oral diseases in Tashkent, Uzbekistan, with dental caries affecting 78.4% and periodontal disease present in 64.8% of adults. These findings underscore the substantial oral health burden and align with global trends showing oral diseases as widespread public health challenges, particularly in developing countries.

Dental caries burden and determinants. The 78.4% caries prevalence observed in our study is consistent with WHO estimates for the European Region but higher than many Western European countries reporting 60-70% prevalence. The mean DMFT of 12.4 in adults indicates moderate-to-high caries experience. Particularly concerning is the high proportion of untreated caries (58.6%), reflecting limited access to restorative dental care and predominantly emergency-driven care-seeking patterns. The low proportion of filled teeth (24.8% of DMFT) suggests substantial unmet treatment need, contrasting sharply with developed countries where 70-80% of caries experience is addressed through fillings.

The strong association between poor oral hygiene and dental caries (AOR=4.2) confirms the critical role of mechanical plaque removal in caries prevention. Only 38.4% of participants brushed twice daily, well below the 70-80% rates in many developed countries. This reflects both limited oral health literacy and socioeconomic constraints affecting access to oral hygiene products. High sugar consumption, present in 46.8% of participants, significantly increased caries risk (AOR=3.6), supporting extensive evidence linking frequent sugar intake to cariogenic bacterial proliferation and acid production.

The absence of water fluoridation in Tashkent likely contributes to elevated caries rates. Fluoride prevents caries through multiple mechanisms: inhibiting demineralization, enhancing remineralization, and reducing bacterial acid production. Countries with water fluoridation typically demonstrate 25-40% lower caries prevalence. Limited fluoride toothpaste use (only 42.6% regularly used fluoridated products) further reduces population fluoride exposure, representing a missed prevention opportunity.

Periodontal disease patterns and risk factors. The 64.8% periodontal disease prevalence aligns with global estimates of 50-70% in adults. The progression from gingivitis (42.4%) to moderate periodontitis (18.6%) and severe periodontitis (3.8%) reflects the natural history of untreated periodontal disease. Age-related increase in prevalence and severity results from cumulative exposure to risk factors, biological aging processes affecting periodontal tissues, and reduced host immune responses.

Smoking's strong association with periodontal disease (AOR=2.8) is well-established in literature. Tobacco impairs neutrophil function, reduces gingival blood flow, alters cytokine production, and promotes pathogenic bacterial colonization. The 52.6% smoking rate among males explains their higher periodontal disease prevalence compared to females. This represents a critical modifiable risk factor amenable to intervention through smoking cessation programs integrated with oral health promotion.

The diabetes-periodontitis association (AOR=2.2) reflects bidirectional relationships. Diabetes impairs immune function and wound healing, increasing susceptibility to periodontal infection. Conversely, periodontal inflammation may worsen glycemic control through systemic inflammatory mediators. This highlights the importance of integrated medical-dental care for diabetic patients.

Socioeconomic determinants of oral health. The consistent association between low socioeconomic status and both dental caries (AOR=2.4) and periodontal disease (AOR=1.8)

reflects the social gradient in oral health. Socioeconomic disadvantage operates through multiple pathways: limited financial resources for oral hygiene products and dental care, lower health literacy affecting preventive behaviors, psychosocial stress impairing immune function, and occupational exposures. These findings emphasize that addressing oral health inequalities requires interventions targeting social determinants, not merely individual behaviors.

Education's protective effect (AOR=0.48 for caries) likely operates through enhanced health literacy, better preventive behaviors, and greater awareness of oral disease consequences. This suggests that oral health education integrated into school curricula and community programs could yield substantial prevention benefits.

Healthcare utilization and access barriers. The predominantly emergency-driven dental care utilization pattern (64.8% seeking care only for pain) reflects both supply-side and demand-side barriers. Cost was the most frequently cited barrier (58.6%), indicating that financial constraints limit access even when services are available. The lack of dental insurance coverage for most participants exacerbates this barrier. Fear and anxiety (28.4%) represent psychological barriers amenable to intervention through patient-centered communication and anxiety management techniques.

Low rates of preventive dental visits (18.6%) perpetuate the treatment-emergency cycle, where dental care focuses on treating advanced disease rather than prevention. Establishing regular preventive care patterns requires both demand creation through health promotion and supply enhancement through accessible, affordable services. The strong protective effect of regular dental attendance (AOR=0.38 for caries) demonstrates the effectiveness of professional preventive interventions including fluoride applications, sealants, and early disease detection.

Public health implications and prevention strategies. The high burden of preventable oral diseases necessitates comprehensive population-level interventions. Evidence-based strategies include: implementing water fluoridation or school-based fluoride programs, promoting twice-daily toothbrushing with fluoride toothpaste through mass media campaigns, restricting marketing and availability of sugary foods/drinks particularly to children, integrating oral health into primary healthcare and maternal-child health programs, expanding school-based prevention programs including dental sealants, implementing tobacco control measures, improving dental workforce distribution to underserved areas, and developing sustainable financing mechanisms including insurance schemes.

The common risk factor approach, addressing shared determinants of oral diseases and other noncommunicable diseases (tobacco, sugar, inadequate hygiene), offers efficient, integrated prevention strategies. Partnering with education, agriculture, and trade sectors to create health-promoting environments represents a whole-of-government approach to oral health improvement.

Limitations. Study limitations include cross-sectional design precluding causal inference, potential recall bias in self-reported behaviors, restriction to urban population limiting rural generalizability, and absence of radiographic examination potentially underestimating caries prevalence. Despite these limitations, the large sample size, standardized methodology, and multivariable analysis strengthen findings.

CONCLUSION

This comprehensive epidemiological study demonstrates high prevalence of oral diseases in Tashkent, Uzbekistan, with multiple modifiable risk factors identified. Principal conclusions include:

1) Dental caries affects 78.4% of the population, with particularly high prevalence in adults (92.3%). Substantial unmet treatment need is evident, with 58.6% having untreated caries and only 24.8% of caries experience addressed through fillings.

2) Periodontal disease prevalence is 64.8% in adults, increasing with age to 84.6% in individuals ≥ 50 years. Severe periodontitis affects 3.8% of adults, contributing significantly to tooth loss.

3) Key modifiable risk factors include poor oral hygiene (AOR=4.2 for caries, 3.4 for periodontitis), high sugar consumption (AOR=3.6), smoking (AOR=2.8 for periodontitis), and infrequent dental visits (AOR=3.8). These represent critical intervention targets.

4) Socioeconomic inequalities in oral health are substantial, with low socioeconomic status increasing risk for both caries (AOR=2.4) and periodontal disease (AOR=1.8). Addressing these inequalities requires interventions targeting social determinants.

5) Dental care utilization is predominantly emergency-driven (64.8%), with limited preventive care (18.6%). Financial barriers (58.6%) and fear (28.4%) limit access, while regular preventive attendance confers strong protection (AOR=0.38).

Comprehensive prevention strategies are urgently needed, including population-level interventions (water fluoridation, sugar reduction policies), health promotion programs targeting oral hygiene and dietary behaviors, integration of oral health into primary healthcare, expansion of preventive services particularly for children and disadvantaged populations, and health system strengthening to improve access and affordability. Addressing oral health inequalities requires whole-of-government approaches targeting social determinants. Future research should evaluate intervention effectiveness and assess rural oral health needs to inform national oral health policy.

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