Hygienic Evaluation of Environmental Factors Associated with Oral Health and Prevention of Oral Cavity Diseases

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ABSTRACT

Oral cavity diseases remain among the most prevalent non-communicable diseases worldwide and significantly affect quality of life, nutritional status, and overall health. Environmental factors, including drinking water quality, atmospheric air pollution, waste disposal conditions, residential hygiene, and access to preventive dental services, play an important role in the development and prevention of oral diseases. The present study aimed to assess the influence of environmental factors on oral health and preventive behaviors among the adult population. A cross-sectional questionnaire-based survey was conducted among 150 respondents aged 18–65 years. Data were collected regarding environmental conditions, oral hygiene practices, dietary habits, dental service utilization, and self-reported oral health complaints. The findings demonstrated that inadequate environmental conditions were associated with a higher prevalence of dental caries, gingival bleeding, oral discomfort, and irregular preventive dental visits. Respondents exposed to unfavorable environmental conditions reported poorer oral hygiene practices and lower awareness regarding oral disease prevention. The study highlights the importance of environmental hygiene measures and public health interventions aimed at improving oral health outcomes.

Keywords: *oral health, environmental factors, oral cavity diseases, prevention, hygiene, dental caries, gingivitis, public health.*

INTRODUCTION

Oral health is an essential component of general health and well-being. According to the World Health Organization, oral diseases affect nearly 3.5 billion people globally and remain a major public health concern. Dental caries, periodontal diseases, oral mucosal disorders, and tooth loss are among the most common oral health problems affecting populations in both developed and developing countries.

The development of oral diseases is influenced by multiple biological, behavioral, socioeconomic, and environmental factors. While inadequate oral hygiene, unhealthy dietary habits, tobacco use, and limited access to dental care are widely recognized risk

factors, increasing attention has been directed toward the role of environmental conditions in shaping oral health outcomes.

Environmental factors may directly or indirectly affect oral health. Poor drinking water quality, insufficient fluoride levels, atmospheric pollution, industrial emissions, poor waste management, and unfavorable residential hygiene conditions can contribute to the occurrence of oral diseases. In addition, environmental influences may affect health behaviors, healthcare accessibility, and awareness regarding preventive practices.

Rapid urbanization and industrial development have increased environmental challenges in many regions. Exposure to environmental pollutants has been associated with inflammatory responses, immune dysfunction, and increased susceptibility to oral diseases. Several studies have reported associations between environmental contamination and higher rates of dental caries, gingivitis, periodontal disease, and oral mucosal abnormalities.

Prevention remains the cornerstone of oral health promotion. Effective preventive measures include regular tooth brushing, fluoride use, healthy nutrition, routine dental examinations, public health education, and environmental improvements. Understanding the relationship between environmental conditions and oral health behaviors is important for developing targeted preventive strategies.

Despite growing scientific interest in environmental determinants of oral health, limited information is available regarding public perceptions and experiences related to environmental influences on oral disease prevention in many developing regions. Therefore, population-based surveys may provide valuable information for planning preventive interventions and improving community oral health programs.

The present study was conducted to evaluate environmental factors associated with oral health and prevention of oral cavity diseases among adult respondents using a structured questionnaire survey.

MATERIALS AND METHODS

A cross-sectional questionnaire-based study was conducted to assess the influence of environmental factors on oral health status and preventive practices among the adult population. The study was carried out between January and March 2026 among residents of urban and rural areas. A total of 150 respondents aged between 18 and 65 years voluntarily participated in the survey.

The study population included 72 males (48.0%) and 78 females (52.0%). Participants were selected using a simple convenience sampling method. Individuals with severe systemic diseases, cognitive impairments, or inability to complete the questionnaire were excluded from the study. Participation was anonymous and voluntary, and informed consent was obtained from all respondents before data collection.

Data were collected using a structured questionnaire specifically designed for the study. The questionnaire consisted of five sections containing a total of 32 questions. The first section included socio-demographic information such as age, gender, educational status, occupation, and place of residence. The second section evaluated environmental conditions, including drinking water quality, residential sanitation, waste management, atmospheric air quality, and exposure to environmental pollution sources. The third section assessed oral hygiene practices, including tooth brushing frequency, use of fluoride-containing toothpaste, mouthwash utilization, and replacement of toothbrushes. The fourth section focused on dietary habits and preventive dental behaviors. The final section collected information regarding self-reported oral health complaints, including dental caries, tooth sensitivity, gingival bleeding, oral discomfort, halitosis, and frequency of dental visits.

Respondents were asked to evaluate environmental conditions in their residential areas using a five-point scale ranging from “very good” to “very poor.” Oral health status was assessed through self-reported symptoms and previous dental diagnoses. Preventive behavior indicators included regular dental check-ups, frequency of oral hygiene procedures, and awareness of oral disease prevention measures.

The collected data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 26. Descriptive statistical methods were applied. Continuous variables were expressed as means and standard deviations, while categorical variables were presented as frequencies and percentages. Associations between environmental conditions and oral health indicators were evaluated using chi-square tests. A p-value less than 0.05 was considered statistically significant.

The study was conducted in accordance with ethical principles for biomedical research involving human participants. Confidentiality of respondents was maintained throughout all stages of data collection and analysis.

RESULTS

The analysis of socio-demographic characteristics showed that the largest proportion of respondents belonged to the 26–45-year age group, accounting for 44.7% of the study population. Participants aged 18–25 years represented 28.0%, whereas respondents older than 45 years accounted for 27.3%.

Evaluation of environmental conditions revealed that only 24.7% of respondents considered the environmental quality in their residential area to be good or very good. Meanwhile, 41.3% described environmental conditions as satisfactory, and 34.0% reported poor or very poor environmental quality. The most frequently reported environmental concerns included atmospheric air pollution (52.7%), inadequate waste disposal systems (46.0%), poor drinking water quality (38.7%), and insufficient sanitation infrastructure (34.7%).

Assessment of oral hygiene practices demonstrated that 58.0% of respondents brushed their teeth twice daily, while 28.7% reported brushing only once per day. Approximately 13.3% admitted irregular tooth brushing habits. Fluoride-containing toothpaste was used by 62.0% of participants, whereas only 18.7% reported regular use of mouthwash products.

The prevalence of self-reported oral health complaints was relatively high. Dental caries was reported by 64.0% of respondents, tooth sensitivity by 48.7%, gingival bleeding by 42.0%, halitosis by 31.3%, and recurrent oral discomfort by 26.7%. Only 22.0% of participants reported no significant oral health complaints during the previous year.

Regular preventive dental visits were observed among only 29.3% of respondents. Nearly half of participants (48.7%) visited a dentist only when symptoms developed, while 22.0% had not undergone any dental examination during the previous 12 months. Respondents who reported unfavorable environmental conditions demonstrated significantly higher frequencies of dental caries and gingival complaints compared to those living in environmentally favorable areas ($p<0.05$). Poor drinking water quality was particularly associated with increased reports of dental sensitivity and caries. Similarly, exposure to air pollution and poor sanitation conditions was associated with higher prevalence of gingival inflammation and oral discomfort.

The findings also revealed insufficient awareness regarding oral disease prevention. Only 37.3% of respondents demonstrated good knowledge regarding preventive oral health measures. Individuals with higher educational levels showed significantly better oral hygiene practices and greater utilization of preventive dental services compared with participants having lower educational attainment.

The overall results suggest that environmental factors play an important role in oral health outcomes and may influence both the occurrence of oral diseases and preventive health behaviors among adults.

DISCUSSION

The findings of the present study demonstrate that environmental conditions play a significant role in the maintenance of oral health and the prevention of oral cavity diseases. The results indicate that respondents living in unfavorable environmental conditions reported a higher prevalence of oral health complaints, including dental caries, gingival bleeding, tooth sensitivity, and oral discomfort. These findings are consistent with previous international studies that have identified environmental factors as important determinants of oral health outcomes.

One of the most important observations of the present study was the association between poor drinking water quality and increased prevalence of dental caries and tooth sensitivity. Drinking water is considered a major environmental determinant of

oral health because it directly influences the mineralization and resistance of dental tissues. Several studies have demonstrated that inadequate fluoride concentration and poor water quality contribute to increased susceptibility to dental caries. Communities with access to safe and adequately fluoridated water generally show lower rates of oral diseases compared with populations exposed to poor-quality water sources.

Atmospheric air pollution was another environmental factor frequently reported by respondents. More than half of participants considered air pollution a significant problem in their residential areas. Environmental pollutants may affect oral tissues through chronic inflammatory mechanisms and oxidative stress. Previous investigations have suggested that prolonged exposure to industrial emissions, particulate matter, and environmental toxins may contribute to periodontal inflammation and deterioration of oral health. Although oral diseases are multifactorial in origin, environmental contamination appears to be an important contributing factor.

The study also revealed that inadequate sanitation and waste management systems were associated with poorer oral health outcomes. Poor environmental sanitation reflects broader public health challenges and often correlates with lower socioeconomic status, reduced access to healthcare services, and limited health literacy. Respondents reporting poor sanitation conditions demonstrated higher frequencies of gingival complaints and oral discomfort. Similar findings have been reported in community-based studies conducted in developing countries, where environmental hygiene deficiencies were associated with increased prevalence of preventable oral diseases.

Oral hygiene practices among respondents were found to be suboptimal. Although more than half of participants reported brushing their teeth twice daily, a considerable proportion brushed only once per day or irregularly. International oral health guidelines recommend brushing teeth at least twice daily using fluoride-containing toothpaste. Insufficient oral hygiene facilitates plaque accumulation and increases the risk of dental caries and periodontal diseases. The relatively high prevalence of oral complaints observed in the present study may partially reflect inadequate oral hygiene behavior.

Another important finding was the low utilization of preventive dental services. Less than one-third of respondents attended regular preventive dental examinations. Most participants sought dental care only after the development of symptoms. This pattern is commonly observed in many low- and middle-income countries and represents a major challenge for preventive dentistry. Early detection and management of oral diseases are essential components of oral health promotion and can substantially reduce disease burden and treatment costs.

The relationship between educational level and oral health awareness was also evident in the present study. Respondents with higher educational attainment demonstrated

better knowledge regarding oral disease prevention and more favorable oral hygiene practices. Education is recognized as one of the strongest predictors of health behavior and plays a crucial role in the adoption of preventive measures. Public health programs aimed at improving oral health literacy may therefore contribute significantly to disease prevention.

The findings emphasize the importance of integrating environmental health and oral health promotion strategies. Traditional oral disease prevention programs often focus primarily on individual behaviors such as tooth brushing and dietary habits. However, the present results suggest that environmental improvements may also contribute substantially to better oral health outcomes. Ensuring access to safe drinking water, reducing environmental pollution, improving sanitation infrastructure, and strengthening community hygiene programs should be considered important components of comprehensive oral health promotion.

The results further highlight the need for multidisciplinary collaboration among dental professionals, public health specialists, environmental health experts, and local authorities. Such collaboration may facilitate the development of effective interventions addressing both environmental determinants and behavioral risk factors associated with oral diseases.

Despite the valuable findings obtained, several limitations should be acknowledged. The study relied on self-reported information, which may be affected by recall bias and subjective perceptions. Furthermore, clinical dental examinations were not performed, and oral health status was evaluated based on participant responses. Nevertheless, the questionnaire-based approach provided useful information regarding environmental perceptions, preventive behaviors, and oral health complaints within the studied population.

Overall, the findings support the growing body of evidence indicating that environmental factors significantly influence oral health and preventive practices. Improving environmental conditions alongside promoting oral hygiene and preventive dental care may contribute to reducing the burden of oral cavity diseases and improving population health outcomes.

CONCLUSION

Environmental factors represent important determinants of oral health and significantly influence the prevention of oral cavity diseases. The results of this questionnaire-based study involving 150 respondents demonstrated that poor drinking water quality, atmospheric air pollution, inadequate sanitation, and insufficient waste management were associated with a higher prevalence of oral health complaints and less favorable preventive behaviors.

A considerable proportion of respondents reported dental caries, gingival bleeding, tooth sensitivity, and irregular utilization of preventive dental services. Individuals living in environmentally unfavorable conditions experienced oral health problems more frequently than those residing in areas with better environmental quality.

The study findings indicate that effective prevention of oral cavity diseases requires not only individual oral hygiene measures but also improvements in environmental health conditions. Public health interventions aimed at ensuring safe drinking water, reducing environmental pollution, improving sanitation infrastructure, and increasing oral health awareness may contribute significantly to the reduction of oral disease burden.

Strengthening preventive dental programs, promoting regular dental examinations, and enhancing community education regarding oral health should remain priority objectives for healthcare systems. A comprehensive approach integrating environmental hygiene and preventive dentistry may provide sustainable improvements in oral health and quality of life among the population.

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