ORIGINAL RESEARCH

Exploring the impact of dietary habits on the development of oral pathologies, such as erosion, caries, and inflammatory conditions

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ABSTRACT
Background: Dietary habits play a crucial role in the development and progression of various oral pathologies, including dental erosion, caries, and inflammatory conditions. The consumption of acidic foods, high sugar intake, and poor nutritional choices can significantly impact oral health, leading to detrimental effects on the hard and soft tissues of the oral cavity. This study aims to explore the association between dietary habits and the prevalence of these oral pathologies among a diverse population.**Materials and Methods:** A cross-sectional study was conducted with 500 participants aged 18-65 years, randomly selected from urban and rural areas. Participants completed a detailed food frequency questionnaire, which included questions on their daily intake of acidic foods, sugary beverages, and other dietary habits. Clinical examinations were performed to assess the presence of dental erosion, caries, and inflammatory conditions such as gingivitis and periodontitis. Data were analyzed using statistical software, and the correlation between dietary habits and oral pathologies was assessed using Pearson's correlation coefficient.**Results:** The study found that 70% of participants with high consumption of acidic foods and beverages exhibited signs of dental erosion. Similarly, 65% of participants with high sugar intake had a higher prevalence of dental caries. Furthermore, inflammatory conditions were more prevalent among individuals with poor overall dietary habits, with a significant correlation ($r = 0.52$, $p < 0.01$) between poor diet and gingivitis. The data suggest a strong association between unhealthy dietary habits and the development of oral pathologies.**Conclusion:** The findings of this study highlight the critical role of dietary habits in the development of oral pathologies. Public health initiatives should focus on promoting healthier eating habits to reduce the risk of erosion, caries, and inflammatory conditions in the population. Future research should explore the impact of specific dietary interventions on oral health outcomes.
Keywords: Dietary habits, dental erosion, dental caries, inflammatory conditions, oral health, nutrition, public health.

INTRODUCTION

Dietary habits have long been recognized as a significant determinant of oral health, influencing the development and progression of various oral pathologies. The oral cavity is continuously exposed to a variety of dietary components, which can have both beneficial and harmful effects. Among the most common oral pathologies associated with diet are dental erosion, caries, and inflammatory conditions such as gingivitis and periodontitis.

Dental erosion is the chemical dissolution of tooth enamel and dentin caused by acidic foods and beverages, independent of bacterial action. The prevalence of dental erosion has increased significantly, particularly in populations with high consumption of acidic drinks like soft drinks, fruit juices, and sports beverages (1,2). This condition can lead to hypersensitivity, aesthetic concerns, and, in severe cases, significant tooth structure loss.

Dental caries, on the other hand, is a multifactorial disease that results from the interaction between

dietary sugars, oral bacteria, and the host's oral environment. The frequent consumption of fermentable carbohydrates, particularly sucrose, has been strongly linked to the development of caries (3). Despite advances in preventive measures, dental caries remains one of the most prevalent chronic diseases worldwide, affecting individuals of all ages (4).

Inflammatory conditions, including gingivitis and periodontitis, are also influenced by dietary factors. Poor nutritional intake, characterized by high consumption of processed foods and low intake of fruits and vegetables, has been associated with increased levels of systemic inflammation, which can exacerbate periodontal disease (5). Additionally, certain dietary deficiencies, such as those in vitamin C and calcium, have been implicated in the development of gingival inflammation and bone loss (6).

Given the critical role that diet plays in oral health, there is a need for a deeper understanding of the specific dietary factors that contribute to the development of these pathologies. This study aims to explore the association between dietary habits and the prevalence of dental erosion, caries, and inflammatory conditions in a diverse population. By identifying key dietary risk factors, this research seeks to inform public health strategies aimed at improving oral health outcomes.

MATERIALS AND METHODS
Study Design and Population
This cross-sectional study was conducted over six months from January to June 2024. A total of 500 participants, aged 18-65 years, were randomly selected from urban and rural areas of Chhattisgarh, India. Participants were recruited through public announcements and community health centers. Inclusion criteria included adults without systemic diseases that could affect oral health, such as diabetes or autoimmune disorders. Participants who had undergone dental treatment for caries, erosion, or periodontal diseases within the past year were excluded to ensure that the study reflected current dietary impacts.

Data Collection
Participants were required to complete a detailed food frequency questionnaire (FFQ) specifically designed to capture their dietary habits over the past year. The FFQ included sections on the frequency and quantity of acidic foods (e.g., citrus fruits, soft drinks), sugary foods (e.g., candies, desserts), and general dietary patterns (e.g., frequency of meals, snacking habits). The questionnaire was validated in a pilot study involving 50 participants from the same population.

In addition to the FFQ, participants provided demographic information, including age, gender, socioeconomic status, and educational background. Trained dental professionals conducted oral examinations to assess the presence of dental erosion, caries, and inflammatory conditions (gingivitis and periodontitis). Dental erosion was diagnosed based on the Basic Erosive Wear Examination (BEWE) index. Dental caries were identified using the decayed, missing, and filled teeth (DMFT) index. Periodontal status was assessed using the Community Periodontal Index (CPI).

Statistical Analysis
Data were entered into a computerized database and analyzed using SPSS version 25.0 (IBM Corp, Armonk, NY). Descriptive statistics were used to summarize the demographic characteristics and dietary habits of the participants. The prevalence of dental erosion, caries, and inflammatory conditions was calculated as a percentage of the total sample.

To assess the association between dietary habits and oral pathologies, Pearson's correlation coefficient was used. A p-value of <0.05 was considered statistically significant. Multivariate logistic regression analysis was performed to control for potential confounding factors, including age, gender, and socioeconomic status.

RESULTS
Demographic Characteristics
The study included 500 participants, with an average age of 35.4 years (SD = 10.8). Of these, 52% (n = 260) were female, and 48% (n = 240) were male. The majority of participants, 60% (n = 300), were from urban areas, while the remaining 40% (n = 200) were from rural areas. The socioeconomic distribution was as follows: 40% (n = 200) belonged to the lower-income group, 45% (n = 225) to the middle-income group, and 15% (n = 75) to the higher-income group.

Prevalence of Oral Pathologies
The prevalence of dental erosion, caries, and inflammatory conditions among the participants is summarized in Table 1.

Table 1: Prevalence of Oral Pathologies (N = 500)

Oral Pathology	Number of Participants	Prevalence (%)
Dental Erosion	140	28%
Dental Caries	325	65%
Gingivitis	210	42%
Periodontitis	150	30%

Association Between Dietary Habits and Oral Pathologies

The analysis revealed significant associations between specific dietary habits and the prevalence of oral pathologies.

Table 2: Association Between Dietary Habits and Oral Pathologies

Dietary Habit	Oral Pathology	Correlation Coefficient (r)	p-value
High Acidic Food Intake	Dental Erosion	0.65	<0.001
High Sugar Intake	Dental Caries	0.58	<0.001
Poor Nutritional Intake	Gingivitis	0.52	<0.001
Low Calcium Intake	Periodontitis	0.47	<0.01

Participants with high acidic food intake had a significantly higher prevalence of dental erosion (r = 0.65, p < 0.001), with 70% of those with high acidic food intake showing signs of erosion. High sugar intake was strongly correlated with the prevalence of dental caries (r = 0.58, p < 0.001), with 65% of participants in this group affected. Poor nutritional intake, characterized by low consumption of fruits and vegetables, was significantly associated with gingivitis (r = 0.52, p < 0.001). Low calcium intake was moderately associated with periodontitis (r = 0.47, p < 0.01).

Multivariate Analysis

Multivariate logistic regression analysis showed that after adjusting for confounding factors such as age, gender, and socioeconomic status, high acidic food intake remained a strong independent predictor of dental erosion (OR = 3.5, 95% CI = 2.4-5.2, p < 0.001). Similarly, high sugar intake was an independent predictor of dental caries (OR = 2.8, 95% CI = 1.9-4.0, p < 0.001).

These results underscore the significant impact of dietary habits on the development of oral pathologies and suggest that targeted dietary interventions could play a crucial role in improving oral health outcomes.

DISCUSSION

The findings of this study underscore the significant impact of dietary habits on the development of various oral pathologies, including dental erosion, caries, and inflammatory conditions. The results align with existing literature that emphasizes the critical role of diet in oral health (1,2).

The study found a strong association between high acidic food intake and the prevalence of dental erosion, with 70% of participants exhibiting signs of erosion. This is consistent with previous studies that have demonstrated a clear link between the consumption of acidic beverages, such as soft drinks and fruit juices, and the progression of dental erosion (3). The chemical dissolution of enamel by acids is well-documented, and our findings further support the need for public health interventions aimed at reducing the consumption of these harmful foods and beverages.

The significant correlation between high sugar intake and dental caries observed in this study reaffirms the well-established relationship between dietary sugars and caries development. The frequent consumption of fermentable carbohydrates, particularly sucrose, provides a substrate for cariogenic bacteria, leading to acid production and subsequent demineralization of the tooth structure (4). The 65% prevalence of caries among participants with high sugar intake highlights the ongoing challenge of sugar consumption in modern diets, despite increased awareness and preventive efforts. These findings suggest that further efforts are needed to educate the public on the dangers of excessive sugar consumption and to promote healthier dietary alternatives.

Poor nutritional intake, characterized by low consumption of fruits, vegetables, and other essential nutrients, was significantly associated with the prevalence of gingivitis in this study. This finding is consistent with research indicating that inadequate intake of vitamins and minerals can compromise the immune response, increasing susceptibility to inflammatory conditions like gingivitis and periodontitis (5). Specifically, deficiencies in vitamin C and calcium have been linked to increased inflammation and periodontal disease progression (6). Our results highlight the importance of a balanced diet rich in essential nutrients to maintain periodontal health and prevent inflammatory conditions.

The results of this study have important implications for public health strategies aimed at improving oral health outcomes. Given the significant associations between dietary habits and oral pathologies, targeted dietary interventions should be a key component of oral health promotion programs. Educational campaigns focusing on the reduction of acidic and sugary foods, along with the promotion of balanced, nutrient-rich diets, could play a critical role in preventing these conditions.

Limitations and Future Research

Despite the robust findings, this study has some limitations. The cross-sectional design precludes the ability to establish causality between dietary habits and oral pathologies. Additionally, the reliance on self-reported dietary data may introduce recall bias. Future longitudinal studies are needed to further explore the causal relationships between diet and oral health outcomes. Moreover, research into specific dietary interventions and their effectiveness in preventing oral pathologies would be valuable.

Conclusion

In conclusion, this study provides strong evidence of the impact of dietary habits on the development of dental erosion, caries, and inflammatory conditions. The findings emphasize the need for comprehensive public health strategies that include dietary education and interventions to improve oral health in the population.

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