Prevalence and Distribution of Dental Caries in Five Surfaces of Primary Anterior Teeth Among Children 3-5 Years of Age

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Introduction

While all primary teeth are susceptible to caries, previous studies have consistently identified maxillary incisors as among the most affected teeth, likely due to their anatomical position, early eruption, and exposure to cariogenic feeding practices.[1-4] In addition to their functional role in mastication, primary incisors are critical for aesthetics, speech development, and psychosocial well-being, underscoring the importance of their preservation.[5] Despite the extensive body of literature on early childhood caries, most epidemiological studies have focused on overall caries indices or grouped dentitions, often overlooking detailed analyses by individual tooth type and specific surface distribution.[2,6,7] Although factors such as age and gender have been explored as potential predictors of caries risk, findings remain inconsistent,[8-11] with limited data regarding how caries lesions are distributed across the mesial, distal, lingual, facial, and incisal surfaces of primary incisors.[1,12] To address these gaps, the present study aimed to evaluate the prevalence, distribution, and association of caries prevalence with age and gender, as well as the severity of dental caries in primary maxillary and mandibular incisors among children aged 3 to 5 years in Newark, New Jersey.

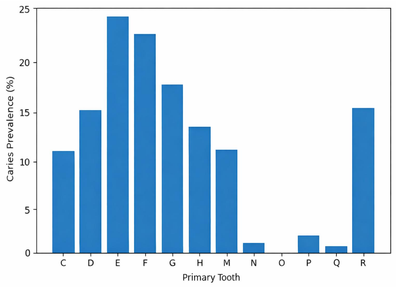

Fig.1 Overall Prevalence of Caries by Primary Tooth

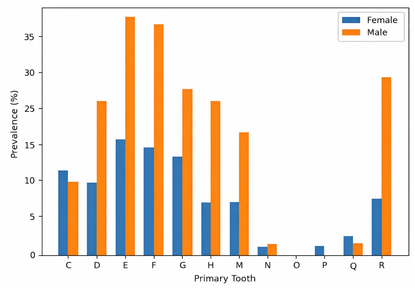

Fig.2 Caries Prevalence by Gender

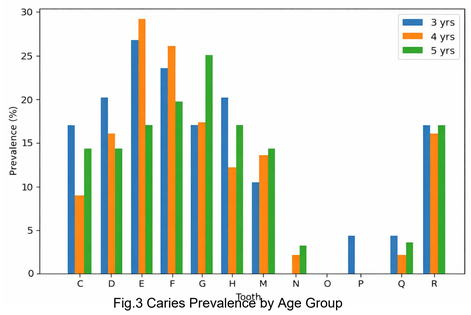

Fig.3 Caries Prevalence by Age Group

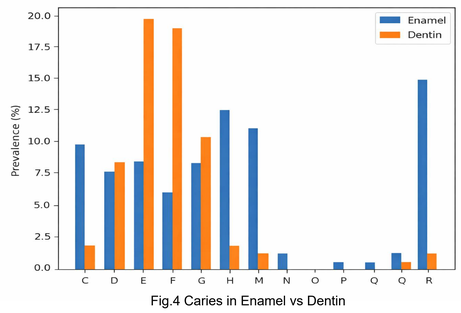

Fig.4 Caries in Enamel vs Dentin

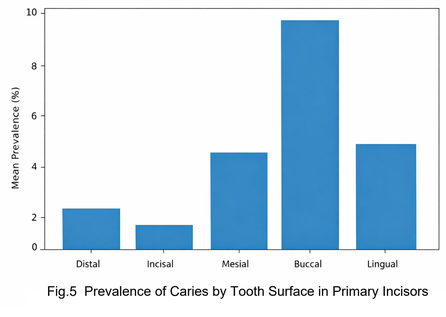

Fig.5 Prevalence of Caries by Tooth Surface in Primary Incisors

Methods

This retrospective cross-sectional study used secondary data from dental screenings conducted among preschool children enrolled in the Head Start Program and the Public School System in Newark, New Jersey, during the 2018–2019 academic year. Institutional and administrative approvals were obtained, and written informed consent was secured from parents or guardians prior to participation(IRB number: Pro:2022001070).

A total of 143 healthy, cooperative children aged 3 to 5 years were included in the study. Children with systemic conditions, intellectual disabilities, or those undergoing pharmacological therapies that could affect oral health were excluded.

Clinical examinations were performed by three calibrated examiners, including a board-certified pediatric dentist and two pediatric dental residents. Examiner calibration for caries detection was conducted using the International Caries Detection and Assessment System (ICDAS II), achieving a kappa agreement of ≥86% prior to data collection. Teeth were cleaned with a toothbrush and water, dried using an air syringe, and isolated with cotton rolls. Visual-tactile examination was conducted using a sterile dental mirror and explorer under appropriate lighting conditions. Caries was assessed on five surfaces (mesial, distal, lingual, facial, and incisal) of primary maxillary and mandibular incisors and canines using the ICDAS II criteria. Data were recorded on standardized forms and subsequently entered into Microsoft Excel and analyzed using SAS 9.4 and SPSS Statistics 30. Before the statistical analysis, the carious lesions were categorized into enamel (ICDAS codes 1–3) and dentin (ICDAS codes 4–6) involvement. Descriptive statistics for caries prevalence by tooth type and Inferential analyses included Chi-square or Fisher's Exact tests to compare the prevalence of caries by gender and age groups, and between enamel and dentin lesions were used. Statistical significance was set at $p < 0.05$. The average prevalence of any caries for each surface was compared among the surfaces using repeated measures ANOVA.

Results

A total of 143 children were included in the analysis. The overall prevalence of dental caries by tooth ranged from 0% to 25.9%. The highest prevalence was observed in the primary maxillary right central incisor (25.9%), followed by the primary maxillary left central incisor (23.8%). In comparison, the primary mandibular left central incisor showed no evidence of caries (0%). When analyzed by gender, significant differences were observed in the primary maxillary right central incisor, primary maxillary left central incisor, primary maxillary left canine, and primary mandibular right canine ($p < 0.05$), with males having a higher caries prevalence than females. No significant gender differences were identified for the remaining teeth. Analysis by age groups (3, 4, and 5 years) revealed no significant differences in caries prevalence across all teeth ($p > 0.05$). Comparison of lesion severity showed significant differences in enamel and dentin involvement across most teeth. Enamel caries was significantly more prevalent in the primary maxillary right canine, primary maxillary left canine, primary mandibular left canine, primary mandibular left lateral incisor, primary mandibular right central incisor, and primary mandibular right canine ($p < 0.05$). In contrast, dentin caries was significantly more prevalent in the primary maxillary right central incisor and primary maxillary left central incisor($p < 0.05$). No significant differences between enamel and dentin lesions were observed in the primary maxillary right lateral incisor, primary maxillary left lateral incisor, primary mandibular left central incisor, and primary mandibular right lateral incisor ($p>0.05$). Caries prevalence differed significantly among anatomical surfaces ($p = 0.03$). The buccal surface showed the highest prevalence(9.91%), followed by the lingual (4.84%) and mesial (4.44%) surfaces. The lowest prevalence was observed in the distal (1.98%) and incisal (1.05%) surfaces. No significant differences was found among the lingual, mesial, distal and incisal surfaces. (Fig.5).

Discussion

This retrospective cross-sectional study demonstrates variation in the prevalence according to tooth type, gender, and lesion severity. The highest prevalence of caries was observed in maxillary incisors, particularly the primary maxillary right central incisor and primary maxillary left central incisor. while certain mandibular incisors showed minimal or no involvement. These findings are consistent with previous literature highlighting the increased susceptibility of maxillary anterior teeth (Fig.1). Gender-based differences were evident, with males exhibiting significantly higher caries prevalence in the maxillary central incisors and primary canines, suggesting that behavioral or environmental factors such as poorer oral hygiene practices, higher frequency of sugar consumption, reduced parental supervision, and less frequent utilization of preventive dental care services may contribute to increased risk in this group (Fig.2). In contrast, no statistically significant differences were observed across age groups, indicating that within this narrow age range, caries distribution may be influenced more by individual risk factors than by age alone (Fig.3). Analysis of the severity of the lesion revealed significant differences between enamel and dentin involvement in most teeth. While several teeth exhibited a higher prevalence of enamel lesions, indicating an early stage of the disease, the maxillary incisors showed significantly higher prevalence of dentinal caries, reflecting a more advanced progression of the caries lesion (Fig.4). This underscores the importance of early detection and timely intervention to prevent disease progression.

Conclusion

This study highlights the importance of evaluating caries at a detailed tooth-specific and surface-specific level. Such an approach provides valuable insights into disease patterns that are not captured by traditional indices. The findings support the need for targeted preventive strategies focused on high-risk teeth and populations, as well as early clinical interventions aimed at reducing the burden of early childhood caries and improving oral health outcomes in preschool children.

References

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