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Prevalence of early childhood caries post covid-19 pandemic in Mumbai among children aged 3-5 years: A cross-sectional pilot study

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ABSTRACT

Background: This cross-sectional pilot study aims to investigate the prevalence of Early Childhood Caries (ECC) among children aged 3 to 5 years in Mumbai City, Maharashtra, following the COVID-19 pandemic.
Materials and Methods: A total of 91 children were included in the study, with ECC prevalence assessed through standardized examinations and dmfs scoring. Simple random sampling was employed, and data were analyzed using descriptive statistics and inferential tests.
Results: The study found a high prevalence of ECC (63.74%) among the study population, with no significant gender-based differences observed in ECC occurrence or severity. Despite similar ECC prevalence rates between boys and girls, the overall burden of ECC underscores the urgent need for targeted interventions and preventive measures.
Conclusion: The findings highlight the pressing oral health challenge faced by young children in urban settings post-pandemic and emphasize the importance of comprehensive oral health promotion programs and equitable access to preventive oral healthcare. Addressing modifiable risk factors and integrating oral health services into primary healthcare systems are essential steps toward improving oral health outcomes for children in Mumbai and similar urban environments.

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1. Introduction

Despite the recent increase in awareness about oral health and the advancements in oral healthcare, dental caries remains the most common chronic disease among children and adolescents, both in developed and developing countries.[1] The formation of dental caries involving primary teeth in children follows a different and perhaps more rampant pattern that warrants prompt action on the part of dental professionals. These are due to exclusive feeding and oral hygiene practices in children.[2]

It has been realized that caries noted in early childhood were not always solely associated with poor feeding practices but were instead multifactorial. The multifactorial etiology behind ECC comprises enamel hypoplasia, oral colonization with elevated levels of cariogenic bacteria (especially Mutans streptococci [MS]), and the metabolism of sugars by tooth-adherent bacteria to produce acid which, over time, demineralizes tooth structure.[3] To better reflect the multifactorial etiology, the term 'Early Childhood Caries' (ECC) was adopted by the AAPD. ECC is defined as "the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth" in a child under the age of six.[4] Recently, severe early childhood caries (S-ECC) was described by AAPD in 2023 as 1) any sign of smooth-surface caries in a child younger than three years of age, 2) from ages three through five, one or more cavitated, missing (due to caries), or filled smooth surfaces in primary maxillary anterior teeth, or 3) a decayed, missing, or filled

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score of greater than or equal to four (age three), greater than or equal to five (age four), or greater than or equal to six (age five).[5]

It is the population from the lower socio-economic strata that bears the major brunt of oral diseases including dental caries. ECC is the most common challenging disease of childhood that can affect a child's growth, and raise esthetic problems and psychological issues which can hamper the quality of life.[6] The consequences of ECC often include a higher risk of new caries lesions in both the primary and permanent dentitions, hospitalizations and emergency room visits, high treatment costs, loss of school days, diminished ability to learn, and diminished oral health-related quality of life.[7] These consequences further add to the difficulties that the children of lower socio-economic strata are already facing. Due to the early occurrence of dental caries during a lifetime, there is a potential negative impact on overall oral health and also on the quality of life of children as well as their parents.[8,9] Therefore, the dreadful impact that ECC can have on the overall quality of life of the entire family must not be overlooked.

While ECC in itself was a global malice, the patterns of its prevalence showed substantial alterations in the midst of the recent COVID-19 pandemic, just like many other diseases owing to the unique nature of the pandemic and the subsequently imposed preventive measures.[10] The total number of COVID-19 cases exponentially increased and outspread ever since the first reported case in early December 2019 and in order to limit the spread of the disease, numerous measures were implemented by Governments and health ministries across all the countries.[11] A nationwide lockdown was implemented in March 2020 in India. A major portion of the brunt was borne by the state of Maharashtra.[12]

Due to the imposed lockdown measures, the children were forced to stay inside their homes for prolonged periods of time which deprived them of any physical activity and led to the development of a sedentary lifestyle.[13] Changes in food habits like junk food cravings, increased snacking, and increased consumption of carbonated beverages as well as more exposure to mobiles and televisions were noted as a direct consequence of such a lifestyle. Ultimately, the cascade of events led to an increase in the prevalence of diseases such as obesity and dental caries in all age groups including children.[14,15] To what extent did the pandemic affect the prevalence of ECC in different geographic locations is yet to be exactly determined. This is of particular importance in India, which exhibits diversity in the habits of populations in different states and has an exuberant number of children in the lower socio-economic strata of society.

In this context, the present study pilot study aimed to analyze the prevalence of ECC post-COVID-19 pandemic in Mumbai city situated in the Maharashtra state in the western part of India. The objective of the study is to provide data to the government and healthcare bodies to aid them in planning and implementing policies to tackle the increasing tide of ECC resulting from the post-pandemic situation.

2. Materials and Methods

The study employed a cross-sectional design to investigate the prevalence of ECC among children aged 3 to 5 years in Mumbai City, Maharashtra. This design facilitated the assessment of ECC at a single point in time, offering insights into the current oral health status of the study population. The study took place over a period of 12 to 18 months to ensure sufficient time for data collection and analysis.

The target population comprised children aged between 3 to 5 years residing in Mumbai City, Maharashtra. Sample size estimation was performed using a formula for frequency in a population, considering a population size of 1,000,000 and a hypothesized frequency of ECC in the population (7.33% +/- 5%) with a confidence level of 95%. This calculation resulted in a sample size of 105 participants from each zone, totaling 735 participants for the entire study. Thus, for the present pilot study 10% of the estimated sample size (n=75) was discerned as sufficient.

Simple Random Sampling using the Lottery Method was employed as the sampling technique to ensure each eligible child had an equal chance of inclusion. The selection criteria included children aged 3 to 5 years present in schools located in Mumbai City, with exclusion criteria encompassing children whose parents did not provide consent, those with Special Health Care Needs, and those absent on the day of examination. Withdrawal criteria allowed for any child wishing to withdraw during the study.

The materials and instruments utilized included disposable gloves, mouth masks, hand sanitizer, sterile mouth mirrors, explorers, kidney trays, cotton pellets, and tweezers. Data collection adhered to ethical principles outlined in the Declaration of Helsinki, with confidentiality maintained throughout. Calibration and standardization were conducted, and a pilot study involving 10% of the sample size ensured reliability and feasibility.

The examination and recording dmfs were done in broad daylight using a mouth mirror and Explorer no.23 by the principal investigator (Figure 1). Early Childhood Caries (ECC) was operationally defined as the presence of one or more decayed, missing, or filled tooth surfaces in any primary tooth in a child under the age of six years. Severe Early Childhood Caries (S-ECC) was defined based on specific criteria related to the age and severity of dental caries (Figure 2).

Data management involved entering data into Microsoft Excel and analyzing it using SPSS. Descriptive statistics such as mean and standard deviation were calculated, along with Chi-square tests of proportion. Depending on the

normality of data distribution, parametric or non-parametric tests were applied at a 95% confidence interval, with statistical significance set at $p < 0.05$.

3. Results

The total sample size of n=91 children comprised 63 boys and 28 girls. Overall, the prevalence of ECC was 63.74% (n=58). Among the boys, n=41(65.07%) out of 63 had ECC. Among the 28 girls, n=17 (60.71%) had ECC. The p-value noted on the application of the Chi-square test to check the significance of the difference in the number of ECC cases in boys and girls was 0.689339 (Chi-square value 0.1598). This indicated that there was a statistically non-significant difference between the number of boys and girls with ECC. No significant difference was noted in the mean dmfs levels of boys and girls on the application of an unpaired t-test between the mean dmfs scores of boys and girls.

Figure 1: Clinical examination of a child by the principal investigator

Figure 2: Images depicting severe early childhood caries

4. Discussion

The present study aimed to analyze the prevalence of Early Childhood Caries (ECC) post-COVID-19 pandemic among children aged 3 to 5 years in Mumbai, Maharashtra, India. The objective was to provide valuable data for government and healthcare bodies to plan and implement policies addressing the rising tide of ECC following the pandemic. Through a cross-sectional design, the pilot study assessed ECC at a single time point, shedding light on the oral health status of the target population. The findings of the study on the prevalence of Early Childhood Caries (ECC) among children aged 3 to 5 years in Mumbai, Maharashtra, offer valuable insights into the oral health status of the study population post-COVID-19 pandemic.

The observed ECC prevalence rate of 63.74% among the study population is alarmingly high and underscores the significant oral health challenge faced by young children in Mumbai. Several factors contribute to the high prevalence of ECC, including dietary habits rich in fermentable carbohydrates, inadequate oral hygiene practices, lack of access to preventive dental care, and socio-economic factors.[16–18] The COVID-19 pandemic may have exacerbated these risk factors, leading to increased ECC prevalence due to disrupted oral health services, prolonged school closures, and changes in dietary patterns.

The study revealed no significant difference in ECC prevalence between boys and girls, with rates of 65.07% among boys and 60.71% among girls. This finding contradicts some previous studies suggesting higher ECC prevalence among boys. Scientifically, gender-based differences in ECC prevalence are influenced by various factors, including biological, behavioral, and socio-cultural factors. Hormonal differences, dietary preferences, oral hygiene practices, and access to dental care may vary between genders, contributing to differential ECC prevalence.[19,20] However, the non-significant gender difference observed in this study suggests that other factors, such as socio-economic status and environmental influences, may play a more prominent role in ECC prevalence among children in Mumbai.

The study found no significant difference in mean dmfs scores between boys and girls, indicating comparable severity of ECC between genders. This finding suggests that while ECC prevalence may not differ significantly between boys and girls, the severity of dental caries, as measured by dmfs scores, is also similar. Scientifically, the similarity in ECC severity between genders may be attributed to shared risk factors such as dietary habits, oral hygiene practices, and access to dental care. Additionally, biological factors such as salivary composition and tooth structure may contribute to uniform ECC severity across genders.[21] However, further research is needed to explore the underlying mechanisms driving gender-based differences in ECC severity comprehensively.

Table 1:

dmfs Score	Overall	Boys	Girls	Two-tailed p value
Mean	3.763846	3.967619	3.305357	0.5693
S.D	5.107253	5.502806	4.041967	
Maximum		30.6	18.18	
95% confidence interval; df = 89; standard error of difference = 1.159				

The study findings have significant implications for public health policy and practice in Mumbai and similar urban settings. The high prevalence of ECC underscores the urgent need for comprehensive oral health promotion programs targeting young children and their families. Strategies such as community-based preventive interventions, school-based oral health education, and integration of oral health services into primary healthcare systems can help address the root causes of ECC and reduce its burden on children's health and well-being. Moreover, efforts to improve access to preventive dental care and promote early intervention strategies are essential to mitigate the long-term consequences of ECC on children's oral health and quality of life.

Overall, the study findings shed light on the complex interplay of factors influencing ECC prevalence and severity among young children in Mumbai post-COVID-19 pandemic. By understanding the underlying determinants of ECC and their differential effects on genders, policymakers and healthcare providers can develop targeted interventions to effectively prevent and manage ECC, ultimately improving oral health outcomes and quality of life for children in urban communities.

5. Conclusion

The present cross-sectional pilot study provides crucial insights into the prevalence of Early Childhood Caries (ECC) among children aged 3 to 5 years in Mumbai, Maharashtra, post-COVID-19 pandemic. The findings underscore the significant oral health challenge faced by young children in urban settings, with a high ECC prevalence rate observed. While no significant gender-based differences were found in ECC prevalence or severity, the study highlights the importance of targeted interventions to address modifiable risk factors and promote equitable access to preventive oral healthcare. Comprehensive oral health promotion programs, community-based interventions, and integration of oral health services into primary healthcare systems are essential to mitigate the burden of ECC and improve oral health outcomes for children in Mumbai and similar urban environments. By prioritizing evidence-based strategies and fostering multi-sectoral collaborations, policymakers and healthcare providers can work together to ensure healthier futures for the next generation.

6. Source of Funding

None.

7. Conflict of Interest

None.

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