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PREVALENCE AND ASSESSMENT OF ASSOCIATED RISK FACTORS OF EARLY CHILDHOOD CARIES IN RURAL OF KHEDA, GUJARAT

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ABSTRACT

Aim: Goal of the present study was to survey the prevalence of early childhood caries and assess its risk factors in children from rural areas of Kheda, Gujarat.

Methodology: Study sample comprised 433 children of both sexes from the age group of 2 to 6 years from 12 rural primary schools and Anganwadi's of Kheda, Gujarat. The selection of the sample was random. A structured questionnaire was asked to children through their class teachers before conducting the examination. The form included information about their child's basic personal details, parental occupational status and type of living, their dishes of interest, feeding habits, tooth-brushing habits, and awareness about dental treatment.

Results: Study surveyed 433 children aged 2–6 years in rural Kheda, Gujarat, to assess the prevalence of early childhood caries (ECC) and its associated risk factors. The mean age of participants was 4.59 ± 0.97 years, with a median age of 5 years (IQR: 4–5). The overall prevalence of ECC was 33.3%, affecting 144 children, while 289 children remained caries-free.

Conclusion: Cross-sectional study of 433 children aged two to six years from rural Kheda, Gujarat, highlights early childhood caries (ECC) as a significant oral health concern, with an overall prevalence of 33.3%.

INTRODUCTION

The American Academy of Pediatric Dentistry defines early childhood caries (ECC) as the "presence of one or more decayed (cavitated or non-cavitated lesion), missing due to caries, or filled tooth surfaces in primary teeth in a child up to the age of 72 months"[1].

Early childhood caries (ECC) is a complex disease that results from the routine consumption of fermentable carbohydrates in an environment of enamel-adherent, acid-producing bacteria within a complex biofilm, along with developmental defects of enamel[2]. The severe form of ECC can progress to rampant decay, infection, pain, abscesses, chewing difficulties, malnutrition, disturbed sleep, gastrointestinal disorders, and compromised self-esteem[3]. These clinical outcomes ultimately impact the quality of life, growth, and development of the child, and in extreme cases, hospitalization may be required. Furthermore, children with ECC have a higher probability of developing new carious lesions as they age[4]. Various studies report ECC prevalence ranging from 19% to 54% in the Indian population.

Rural areas are defined as geographic locations situated outside towns and cities. In India, these areas face challenges with literacy and lack basic infrastructure, such as schools and hospitals. The population lives in poverty, leading to an underprivileged lifestyle. Previously, rural communities had lower caries rates due to healthier diets, but with increased accessibility to processed food containing fermentable sugars, this trend appears to have changed.

Due to the limited availability of dental clinics, economic constraints, and the universal nature of caries prevalence in rural Gujarat, the need for this study arose. The study aimed to assess the prevalence of ECC and its association with various risk factors. The collected data provided a true representation of the dental caries spectrum among rural children, forming the basis for future public health programs to mitigate the burden of ECC. Currently, no available data exists regarding the prevalence and pattern of ECC in the Kheda district of Gujarat. Hence, the aim of the present study was to survey the prevalence of early childhood caries and assess its risk factors in children from rural areas of Kheda, Gujarat.

Methodology

The study sample comprised 433 children of both sexes from the age group of 2 to 6 years from 12 rural primary schools and Anganwadi's of Kheda, Gujarat. The selection of the sample was random. A structured questionnaire was asked to children through their class teachers before conducting the examination. The form included information about their child's basic personal details, parental occupational status and type of living, their dishes of interest, feeding habits, tooth-brushing habits, and awareness about dental treatment. The research protocol of the survey was reviewed, and permission was obtained from the Research Board Committee of the institution. Prior consent for the dental examination of the child had been taken from the school authorities.

Children were usually examined in their respective classrooms by one examiner under daylight or torchlight. No radiographs were taken for any child. The examination was done at random without prior knowledge of the findings of the questionnaire. A plane mouth mirror and a dental explorer were used. Diagnosis depended upon visual evidence of a lesion; the explorer was only

used to remove plaque or food debris and not to confirm or refute a doubtful diagnosis. Sterilized instruments were used for each patient.

In order to assess the prevalence of dental caries in a population, it was important to consider international methods, amongst which, the most commonly known were the WHO (World Health Organization) DMFT (Decay, Missing, Filled Tooth) index, the International Caries Detection and Assessment System (ICDAS), and the Caries Assessment Spectrum and Treatment (CAST). In the present study, the caries status of the child was recorded using the dentition status index given by WHO. Later, the deft index was deduced from the dentition status to calculate the caries experience of the sample and ascertain comparability with previous studies. The deft index (Gruebell, 1944), which was equivalent to the DMFT (WHO) indices used for permanent dentition, was used. Additionally, data were compared to studies recording ICDAS II with code 2 to 6 combined.

Statistical Analysis

Sample was calculated using open software http://www.openepi.com for confidence level of 95 % and population size of 100000 design effect was kept 1 in order to get random sample and hypothesised frequency of outcome was kept at 65.8 based on data of prevalence by other studies. All data were entered into SPSS Version 30.0.0 and analyzed using descriptive statistics, logistic regression, and linear regression models to assess the relationship between early childhood caries (ECC) and various risk factors. A binary logistic regression model was used to determine the predictors of caries presence. A linear regression model was used to determine the relationship between various risk factors and deft scores.

Results

This cross-sectional study surveyed 433 children aged 2–6 years in rural Kheda, Gujarat, to assess the prevalence of early childhood caries (ECC) and its associated risk factors. The mean age of participants was 4.59 ± 0.97 years, with a median age of 5 years (IQR: 4–5). The overall prevalence of ECC was 33.3%, affecting 144 children, while 289 children remained caries-free.

Oral hygiene status emerged as the most significant factor influencing caries prevalence. Among the 137 children (31.6%) with poor oral hygiene, 82 children had caries, accounting for 53.25% of total caries cases. In comparison, children with fair hygiene (49.4%) and good hygiene (18.9%) had lower caries rates. Logistic regression analysis confirmed a strong association between poor hygiene and caries, showing that children with poor hygiene were 16.7 times more likely to develop caries than those with good hygiene (OR: 16.684; p < 0.001). Despite frequent consumption of packaged foods (46.9%) and milk before bedtime (81.1%), these dietary factors did not show a significant association with caries prevalence. However, an analysis of the children's favorite foods revealed that their diets were predominantly composed of home-cooked meals, which were rich in fiber and carbohydrates but contained minimal processed sugars. This dietary pattern, characteristic of the rural setting, appeared to have a protective effect against caries.

Variable	OR (Odds Ratio)	95% CI	p-value
Poor Oral Hygiene	16.68	(6.137 – 45.36)	<0.001
Fair Oral Hygiene	8.91	(3.403 – 23.324)	<0.001
Age	0.359	-	0.016
Milk Before Sleep	1.12	-	0.404 (NS)
Sugary Food Intake	0.94	-	0.482 (NS)

Table:1 showing statistical values

Posterior teeth showed the highest prevalence of caries, with DE (16.4%), CD (14.8%), and DD (14.3%) being the most commonly affected. This pattern aligns with anatomical and behavioral factors, as posterior teeth are more prone to food retention and plaque accumulation.

Contrary to the traditional hypothesis that milk pooling causes caries in the maxillary anterior teeth, the data showed minimal involvement in anterior teeth. For instance, AA (3.7%) and AB (4.1%) were among the least affected, further supporting the idea that oral hygiene plays a greater role than milk consumption in ECC development.

No significant associations were found between caries prevalence and socio-economic indicators, such as: Type of house: Kaccha (hut) – 25.4%, Pakka (concrete roof) – 74.6%, Child's birth order in the family (eldest, youngest, middle, or only child).

However, the disproportionate concentration of caries among children with poor oral hygiene highlights the overriding importance of oral hygiene over socio-economic variables in this population.

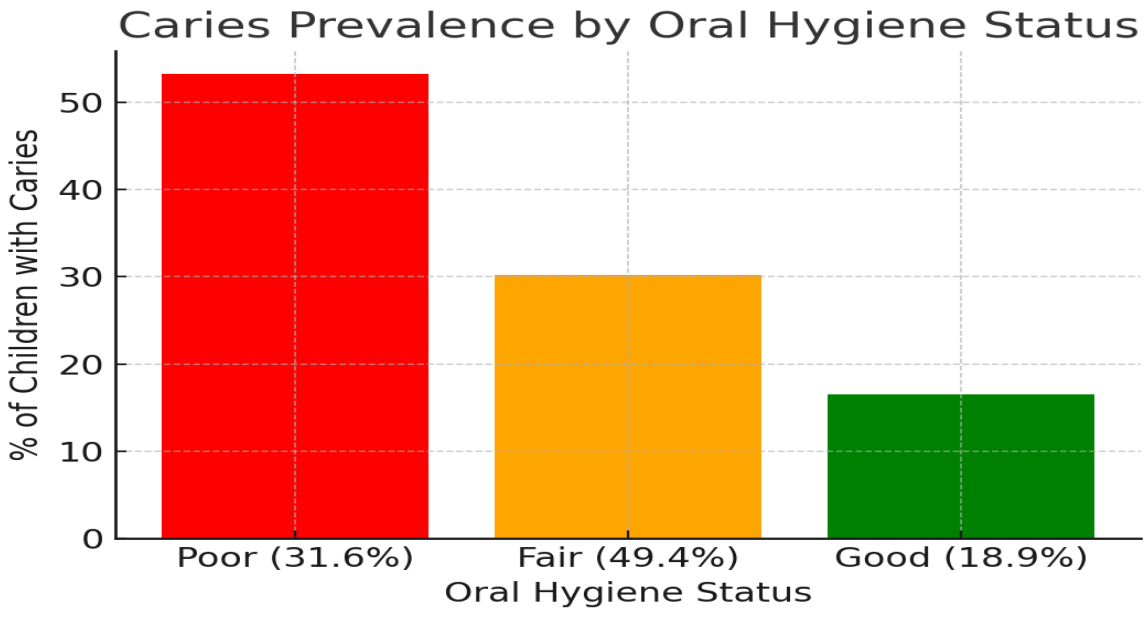

Chart 1: Caries Prevalence by Oral Hygiene Status: -This bar chart illustrates the significant relationship between oral hygiene and caries prevalence, highlighting those children with poor oral hygiene had the highest proportion of caries cases.

DISCUSSION

This study provides novel insights into the interplay of dietary, hygiene, and socio-economic factors influencing ECC in a rural population, underscoring the critical role of oral hygiene and the protective effects of traditional diets. The study revealed that over half of all caries cases (53.25%) occurred in children with poor oral hygiene, despite this group representing only 31.6% of the population. Logistic regression analysis further underscored the significance of oral hygiene, with children having poor hygiene being nearly 17 times more likely to develop caries[5,6]. These findings emphasize the need to prioritize oral hygiene education and access to resources in caries prevention programs. A surprising finding was the lack of a significant association between caries and sugary food or milk consumption, behaviours typically linked to caries in urban populations[7].

Dietary Factor	Never (%)	Sometimes (%)	Everyday (%)	p-value
Milk before Sleeping	6.0%	12.9%	81.1%	0.404 (NS)
Sugary Food Intake	2.8%	50.3%	46.9%	0.482 (NS)

Table 2: Presents the relationship between dietary habits (milk before sleeping, sugary food intake) and caries prevalence. The p-values indicate that neither factor showed a significant correlation with ECC.

This discrepancy can be explained by the distinct dietary patterns observed in the rural population Most children's favourite foods were home-cooked meals composed of fiber-rich carbohydrates with minimal processed sugars. These foods are less cariogenic compared to the refined, sugar-laden snacks prevalent in urban settings. High-fiber diets stimulate saliva production, which neutralizes acids and cleanses the teeth. Additionally, caries in the milk consumed at night result in typical pattern of ECC mainly involving upper anterior teeth. However anterior teeth, particularly maxillary incisors, showed significantly lower caries rates. This pattern challenges the long-standing assumption that milk pooling is major factor in ECC, milk's calcium and phosphate content may counteract its cariogenic potential when consumed in moderation. Although packaged food consumption (46.9%) was prevalent, its limited association with caries could reflect the protective influence of oral hygiene and traditional diets. However, as processed foods become more accessible in rural areas, there is a risk of increased caries prevalence. Posterior teeth exhibited the highest caries prevalence, which aligns more with behavioral factors like incomplete brushing and dietary habits. Public health interventions must address this potential shift by promoting balanced diets and minimizing the intake of processed sugars. While socio-economic variables, such as the type of house or family position, did not show significant associations, these factors often influence access to dental care and parental attention. Children in pakka houses, for example, may have better access to hygiene resources and healthcare. Future studies should further explore these dynamics to develop targeted interventions.

CONCLUSION

In conclusion, this cross-sectional study of 433 children aged two to six years from rural Kheda, Gujarat, highlights early childhood caries (ECC) as a significant oral health concern, with an overall prevalence of 33.3%. Notably, poor oral hygiene emerged as the most influential risk factor, with children in this category being substantially more prone to developing caries. While previous research often associates ECC with frequent sugar intake and nighttime milk consumption, the findings here suggest that these dietary factors did not play a critical role in this rural setting. Instead, the traditional eating habits prevalent in the community—emphasizing home-cooked foods with minimal refined sugars—appear to provide a protective benefit.

A striking observation was the higher rate of caries in posterior teeth, which can be attributed to challenges in cleaning the back of the mouth and the tendency for food particles to accumulate in these areas. Interestingly, the study did not find a notable link between caries prevalence and socio-economic indicators, such as housing type or birth order, implying that oral hygiene practices overshadow these variables. This underscores the importance of targeted public health initiatives that focus on reinforcing daily brushing, promoting regular dental check-ups, and educating caregivers on effective oral hygiene routines.

Overall, the research underscores that addressing ECC in rural settings requires comprehensive strategies prioritizing awareness, prevention, and resources for maintaining proper oral hygiene. By building on the relatively protective dietary patterns already in place and offering improved dental education and services, policymakers and health professionals can mitigate the impact of ECC and contribute to better long-term oral health outcomes for children in rural Kheda.

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