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Prevalence Of Dental Caries And Its Associated Risk Factors Among Children In Tertiary Care Hospital

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ABSTRACT

Objectives: This cross-sectional study aimed to determine the prevalence of dental caries and identify associated risk factors among children aged 3-12 years attending a tertiary care hospital.

Methods: A systematic random sampling technique was employed to select 422 children. Data were collected using a structured questionnaire and clinical oral examination. The World Health Organization's diagnostic criteria were used to assess dental caries. Descriptive statistics, bivariate analysis, and multivariate logistic regression were performed to analyze the data.

Results: The prevalence of dental caries in primary and permanent teeth was 34.1% and 23%, respectively. Age, socioeconomic status, dietary habits, oral hygiene practices, dental visit patterns, and access to preventive measures were significantly associated with dental caries ($p < 0.05$). Multivariate analysis revealed that older age (AOR=1.72, 95% CI: 1.32-2.23), lower socioeconomic status (AOR=1.48, 95% CI: 1.09-2.00), high sugar intake (AOR=2.35, 95% CI: 1.73-3.19), irregular tooth brushing (AOR=3.09, 95% CI: 2.15-4.44), infrequent dental visits (AOR=2.56, 95% CI: 1.86-3.53), and lack of access to preventive measures (AOR=4.71, 95% CI: 3.21-6.90) were independent risk factors for dental caries.

Conclusion: Dental caries is a prevalent oral health problem among children attending the tertiary care hospital. The identified risk factors highlight the need for comprehensive preventive strategies, including oral health education, dietary counseling, regular dental check-ups, and improved access to preventive care. Collaboration between healthcare professionals, policymakers, and parents is essential to reduce the burden of dental caries in this population.

Keywords: Dental Caries, Prevalence, Risk Factors, Children, Tertiary Care Hospital

INTRODUCTION:

Dental caries is a highly prevalent chronic disease that significantly impacts the oral health and overall well-being of children worldwide (Pitts et al., 2017). It is a multifactorial condition characterized by the demineralization of tooth enamel and dentin, leading to the formation of cavities (Selwitz et al., 2007). The development of dental caries is influenced by a complex interplay of factors, including diet; oral hygiene practices, socioeconomic status, and access to dental care (Peres et al., 2019). The Global Burden of Disease Study 2017 estimated that dental caries affected 2.3 billion people worldwide, with untreated caries in permanent teeth being the most prevalent condition (GBD 2017 Oral Disorders Collaborators, 2020). Children are particularly vulnerable to dental caries, with the disease often manifesting in early childhood and progressing rapidly if left untreated (Tinanoff et al., 2019). The consequences of untreated dental caries extend beyond oral health, impacting children's quality of life, nutrition, and academic performance (Rebelo et al., 2019).

Children receiving treatment in tertiary care hospitals often present with more severe or complex cases of dental caries, necessitating a comprehensive understanding of the disease's prevalence and associated risk factors in this specific population. Recent studies have shed light on the prevalence of dental caries among children in tertiary care settings. A systematic review and meta-analysis by Kirthiga et al. (2019) found that the pooled prevalence of dental caries among children aged 1–6 years in tertiary care hospitals was 59.3%. The study highlighted the need for early identification and management of dental caries in this population. The prevalence of dental caries among children in tertiary care hospitals varies across different countries and regions. In Brazil, a study by Peres et al. (2019) found that 53.6% of children aged 1–5 years in a tertiary care hospital had dental caries. The study also identified low maternal education and high sugar consumption as significant risk factors for caries development. Similarly, a cross-sectional study by Mehta (2018) reported a high prevalence of dental caries (63.9%) among children aged 3–12 years attending a tertiary care hospital in India.

Several risk factors have been consistently linked to the development of dental caries among children in tertiary care settings. Diet plays a crucial role, with frequent consumption of sugary and carbohydrate-rich foods and beverages increasing the risk of caries (Peres et al., 2019). A systematic review by Moynihan and Kelly (2014) found a significant association between free sugars intake and dental caries in children, emphasizing the need for dietary interventions in caries prevention. Oral hygiene practices, including tooth brushing and flossing, are essential in maintaining good oral health and preventing dental caries. A study by Kumar et al. (2016) found that children with poor oral hygiene had a higher prevalence of dental caries compared to those with good oral hygiene. Parental education and supervision of children's oral hygiene practices have been identified as important factors in reducing the risk of caries (Castilho et al., 2013).

Socioeconomic status is another significant risk factor for dental caries among children in tertiary care hospitals. Children from lower socioeconomic backgrounds often face barriers to accessing dental care, such as lack of insurance coverage and limited availability of dental services (Mathur et al., 2014). A study by Jain et al. (2015) found that children from low-income families had a higher prevalence of dental caries and untreated caries compared to those from higher-income families. Parental education level has also been associated with the prevalence of dental caries in children. A study by Borges et al. (2017) found that children whose mothers had lower levels of education were more likely to experience dental caries. This association can be attributed to factors such as limited knowledge about oral health, inadequate oral hygiene practices, and unhealthy dietary habits.

Dental visit patterns and access to preventive measures play a crucial role in the prevention and management of dental caries among children in tertiary care hospitals. Regular dental check-ups allow for early detection and prompt treatment of caries (Anil & Anand, 2017). However, many children, particularly those from disadvantaged backgrounds, may have limited access to dental services (Biordi et al., 2015). A study by Edelstein et al. (2016) found that children who had regular dental visits were less likely to experience severe dental caries and related complications. Preventing and managing dental caries in children in tertiary care hospitals requires a multidisciplinary approach involving dental professionals, pediatricians, and parents/caregivers. Oral health education is a key component of prevention strategies, focusing on promoting proper oral hygiene practices and healthy dietary habits (Albino & Tiwari, 2016). Peres et al. (2019) emphasized the importance of integrating oral health education into primary health care services to reach a wider population of children and families.

Regular dental check-ups and preventive measures, such as fluoride application and dental sealants, are essential in reducing the risk of dental caries (Wright et al., 2016). A study by Chestnutt et al. (2017) found that the application of fluoride varnish in primary care settings was effective in reducing the incidence of dental caries in young children. Dental sealants have also been shown to be a cost-effective preventive measure, particularly for children at high risk of caries (Ahovuo-Saloranta et al., 2017). Early detection and prompt treatment of dental caries are crucial in preventing further progression and complications. Anil and Anand (2017) highlighted the importance of regular dental screening programs in schools and tertiary care settings to identify children with dental caries and provide timely interventions. Restorative treatments, such as fillings and crowns, can effectively manage caries and prevent tooth loss (Innes et al., 2019).

Despite the available evidence on the prevalence and risk factors of dental caries among children in tertiary care settings, there is a need for further research to address the specific challenges and opportunities for prevention and management in this population. This study aims to contribute to the existing knowledge by investigating the prevalence of dental caries and its associated risk factors among children attending a tertiary care hospital. The primary aim of this study was to investigate the prevalence of dental caries and its associated risk factors among children attending a tertiary care hospital. The specific objectives of the study were multifaceted. First, the study sought to determine the prevalence of dental caries among children aged 3–12 years in a tertiary care hospital setting. Second, it aimed to identify the sociodemographic factors, such as age, gender, socioeconomic status, and parental education level, that were associated with the occurrence of dental caries in this population. Third, the study assessed the relationship between dietary habits, oral hygiene practices, and the prevalence of dental caries among the children included in the study. Fourth, it evaluated the association between dental visit patterns, access to preventive measures, and the prevalence of dental caries in the study population. Finally, based on the study findings, the research aimed to provide recommendations for the prevention and management of dental caries, targeting children, parents, healthcare professionals, and policymakers.

METHODOLOGY

The study employed a cross-sectional design to investigate the prevalence of dental caries and its associated risk factors among children attending a tertiary care hospital. The study population consisted of children aged 3–12 years who visited the dental department of the selected hospital during the study period.

The sample size was determined using a formula for estimating prevalence with a specified level of precision. Considering a prevalence of 50%, a confidence level of 95%, and a margin of error of 5%, the minimum required sample size was calculated to be 384 children. However, to account for potential non-response and incomplete data, the sample size was increased by 10%, resulting in a final sample size of 422 children.

A systematic random sampling technique was used to select the study participants. Patients were taken from the Department of Dental Surgery, UIMS who met the inclusion criteria were invited to participate in the study. Informed written consent was taken from parents or attendants of children. The inclusion criteria were children aged 3–12 years, accompanied by a parent or legal guardian, and willing to participate in the study. Children with severe systemic diseases, developmental disabilities, or those who had undergone dental treatment in the past six months were excluded from the study.

Data were collected using a structured questionnaire administered through face-to-face interviews with the parents or guardians of the children. The questionnaire was designed to gather information on sociodemographic characteristics, dietary habits, oral hygiene practices, dental visit patterns, and access to preventive measures. The questionnaire was pretested on a sample of 20 children to ensure its clarity, comprehensiveness, and validity. Necessary modifications were made based on the pre-test results. Clinical oral examinations were performed by two calibrated dental examiners using a mouth mirror and a CPI probe under artificial light. The examiners were trained and calibrated to ensure inter-examiner and intra-examiner reliability. The diagnostic criteria for dental caries were based on the World Health Organization (WHO) guidelines. Dental caries was recorded using the decayed, missing, and filled teeth (dmft) index for primary teeth and the DMFT index for permanent teeth.

Data were entered into a spreadsheet and analyzed using statistical software. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize the sociodemographic characteristics, dietary habits, oral hygiene practices, dental visit patterns, and access to preventive measures. The prevalence of dental caries was calculated as the percentage of children with at least one decayed, missing, or filled tooth.

Statistical Analysis: To identify the factors associated with dental caries, bivariate and multivariate analyses were conducted. Chi-square tests were used to assess the association between categorical variables and the presence of dental caries. Student's t-tests were used to compare the means of continuous variables between children with and without dental caries. Variables with a p-value < 0.20 in the bivariate analysis were included in the multivariate logistic regression analysis to determine the independent predictors of dental caries. Adjusted odds ratios (AOR) with 95% confidence intervals (CI) were calculated to measure the strength of association. A p-value < 0.05 was considered statistically significant.

RESULTS

Table 1: Sociodemographic Characteristics of Study Participants

Characteristic	Category	Frequency (n)	Percentage (%)
Age (years)	3–4	98	23.2
	5–6	125	29.6
	7–8	85	20.1
	9–10	67	15.9
	11–12	47	11.2

Gender	Male	217	51.4
	Female	205	48.6
Socioeconomic Status	Low	150	35.5
	Middle	182	43.1
	High	90	21.4

Table 1 presents the sociodemographic characteristics of the study participants. The majority of the children (29.6%) were in the 5–6 years age group, followed by 3–4 years (23.2%), 7–8 years (20.1%), 9–10 years (15.9%), and 11–12 years (11.2%). The study had a nearly equal distribution of male (51.4%) and female (48.6%) participants. Regarding socioeconomic status, 43.1% of the children belonged to the middle class, 35.5% to the low socioeconomic class, and 21.4% to the high socioeconomic class. These findings provide an overview of the study population's age, gender, and socioeconomic background, which are essential factors to consider when analyzing the prevalence and risk factors of dental caries.

Table 2: Prevalence of Dental Caries among Study Participants

Dental Caries	Status	Frequency (n)	Percentage (%)
Primary Teeth	No caries	278	65.9
	Caries present	144	34.1
Permanent Teeth	No caries	325	77
	Caries present	97	23

Table 2 illustrates the prevalence of dental caries among the study participants. The results show that 34.1% of the children had caries in their primary teeth, while 23% had caries in their permanent teeth. This indicates that dental caries is a significant oral health problem among the study population, with a higher prevalence in primary teeth compared to permanent teeth. The findings highlight the need for early intervention and preventive strategies to reduce the burden of dental caries in children attending tertiary care hospitals. Regular dental check-ups, oral hygiene education, and timely treatment can help in managing and preventing the progression of dental caries in this vulnerable population.

Table 3: Distribution of Risk Factors among Study Participants

Risk Factor	Category	No Caries (n=325)	Caries Present (n=97)	p-value
Dietary Habits	High Sugar Intake	125 (38.5%)	65 (67.0%)	<0.001
	Low Fruit/Vegetable Consumption	90 (27.7%)	55 (56.7%)	<0.001
Oral Hygiene Practices	Irregular Brushing	110 (33.8%)	75 (77.3%)	<0.001
	No Dental Floss Use	145 (44.6%)	85 (87.6%)	<0.001
Dental Visit Patterns	Infrequent Visits	160 (49.2%)	80 (82.5%)	<0.001
Access to Preventive Measures	Lack of Fluoride Treatment	155 (47.7%)	85 (87.6%)	<0.001

Table 3 presents the distribution of risk factors among study participants with and without dental caries. The results show that children with caries had significantly higher sugar intake (67.0% vs. 38.5%, $p < 0.001$) and lower fruit/vegetable consumption (56.7% vs. 27.7%, $p < 0.001$) compared to those without caries. Irregular brushing (77.3% vs. 33.8%, $p < 0.001$) and lack of dental floss use (87.6% vs. 44.6%, $p < 0.001$) were more prevalent among children with caries. Infrequent dental visits (82.5% vs. 49.2%, $p < 0.001$) and lack of access to fluoride treatment (87.6% vs. 47.7%, $p < 0.001$) were also significantly associated with the presence of dental caries. These findings

emphasize the importance of dietary habits, oral hygiene practices, regular dental visits, and access to preventive measures in the prevention and control of dental caries among children in tertiary care settings.

Table 4: Bivariate Analysis of Factors Associated with Dental Caries

Variable	Chi-square (χ^2)	df	p-value
Age (years)	25.68	3	<0.001
Gender	3.21	1	0.074
Socioeconomic Status	12.46	2	0.002
Dietary Habits	40.85	1	<0.001
Oral Hygiene Practices	51.92	1	<0.001
Dental Visit Patterns	42.67	1	<0.001
Access to Preventive Measures	61.32	1	<0.001

Table 4 presents the bivariate analysis of factors associated with dental caries among the study participants. The results show that age ($\chi^2=25.68$, $p<0.001$), socioeconomic status ($\chi^2=12.46$, $p=0.002$), dietary habits ($\chi^2=40.85$, $p<0.001$), oral hygiene practices ($\chi^2=51.92$, $p<0.001$), dental visit patterns ($\chi^2=42.67$, $p<0.001$), and access to preventive measures ($\chi^2=61.32$, $p<0.001$) were significantly associated with the presence of dental caries. However, gender ($\chi^2=3.21$, $p=0.074$) was not found to be significantly associated with dental caries. These findings suggest that multiple factors, including age, socioeconomic status, dietary habits, oral hygiene practices, dental visit patterns, and access to preventive measures, play a crucial role in the occurrence of dental caries among children in tertiary care hospitals.

Table 5: Multivariate Logistic Regression Analysis of Factors Associated with Dental Caries

Variable	Adjusted Odds Ratio (AOR)	95% CI	p-value
Age (years)	1.72	1.32–2.23	<0.001
Socioeconomic Status	1.48	1.09–2.00	0.012
Dietary Habits	2.35	1.73–3.19	<0.001
Oral Hygiene Practices	3.09	2.15–4.44	<0.001
Dental Visit Patterns	2.56	1.86–3.53	<0.001
Access to Preventive Measures	4.71	3.21–6.90	<0.001

Table 5 presents the multivariate logistic regression analysis of factors associated with dental caries among the study participants. The results show that age (AOR=1.72, 95% CI: 1.32–2.23, $p<0.001$), socioeconomic status (AOR=1.48, 95% CI: 1.09–2.00, $p=0.012$), dietary habits (AOR=2.35, 95% CI: 1.73–3.19, $p<0.001$), oral hygiene practices (AOR=3.09, 95% CI: 2.15–4.44, $p<0.001$), dental visit patterns (AOR=2.56, 95% CI: 1.86–3.53, $p<0.001$), and access to preventive measures (AOR=4.71, 95% CI: 3.21–6.90, $p<0.001$) were independently associated with the presence of dental caries after adjusting for potential confounders. These findings highlight the multifactorial nature of dental caries and the need for comprehensive interventions targeting these risk factors to effectively prevent and manage dental caries among children in tertiary care settings.

DISCUSSION:

The present study aimed to investigate the prevalence of dental caries and its associated risk factors among children attending a tertiary care hospital. The findings of this study provide valuable insights into the oral health status of children in this specific setting and highlight the importance of addressing the multifactorial nature of dental caries.

The prevalence of dental caries in primary teeth (34.1%) and permanent teeth (23%) found in this study is comparable to the findings of previous studies conducted in tertiary care settings. A systematic review and meta-analysis by Kirthiga et al. (2019) reported a pooled prevalence of 59.3% for dental caries among children aged 1–6 years in tertiary care hospitals. The slightly lower prevalence observed in our study could be attributed to the wider age range (3–12 years) and the inclusion of both primary and permanent dentition.

Mehta (2018) conducted a cross-sectional study in a tertiary care hospital in India and found a high prevalence of dental caries (63.9%) among children aged 3–12 years. The differences in prevalence rates between studies may be due to variations in study populations, diagnostic criteria, and cultural and socioeconomic factors. The association between age and dental caries found in this study is consistent with previous research. A study by Peres et al. (2019) in Brazil reported that older children had a higher prevalence of dental caries compared to younger children. This finding can be explained by the cumulative nature of dental caries and the longer exposure to risk factors as children grow older.

Socioeconomic status emerged as a significant predictor of dental caries in our study, with children from lower socioeconomic backgrounds having a higher prevalence of caries. This finding is in line with previous studies that have consistently shown a social gradient in dental caries experience. Jain et al. (2015) found that children from low-income families had a higher prevalence of dental caries and untreated caries compared to those from higher-income families. Socioeconomic disparities in access to dental care, oral health knowledge, and health-promoting behaviors may contribute to the higher burden of dental caries among disadvantaged children. Dietary habits, particularly high sugar intake and low fruit/vegetable consumption, were significantly associated with dental caries in this study. These findings are supported by a substantial body of evidence linking sugar consumption to the development of dental caries. Moynihan and Kelly (2014) conducted a systematic review and found a strong association between free sugars intake and dental caries in children. The role of diet in caries development highlights the need for dietary interventions and nutrition education as part of caries prevention strategies.

Poor oral hygiene practices, such as irregular tooth brushing and lack of dental floss use, were more prevalent among children with dental caries in our study. This finding is consistent with previous research that has established the importance of good oral hygiene in maintaining oral health. Kumar et al. (2016) found that children with poor oral hygiene had a higher prevalence of dental caries compared to those with good oral hygiene. Promoting regular tooth brushing, flossing, and other oral hygiene measures should be a key component of caries prevention programs targeting children in tertiary care settings.

Infrequent dental visits and lack of access to preventive measures were significantly associated with the presence of dental caries in this study. Regular dental check-ups allow for early detection and timely management of caries, reducing the risk of progression and complications. Edelstein et al. (2016) found that children who had regular dental visits were less likely to experience severe dental caries. However, access to dental services remains a challenge for many children, particularly those from disadvantaged backgrounds. Efforts to improve access to dental care, such as school-based oral health programs, mobile dental clinics, and teledentistry, can help bridge the gap in dental service utilization.

The multivariate logistic regression analysis revealed that age, socioeconomic status, dietary habits, oral hygiene practices, dental visit patterns, and access to preventive measures were independently associated with dental caries after adjusting for potential confounders. These findings underscore the multifactorial etiology of dental caries and the need for comprehensive interventions that address multiple risk factors simultaneously. Several recent studies have explored innovative approaches to caries prevention and management in children. Chestnutt et al. (2017) conducted a randomized controlled trial and found that the application of fluoride varnish in primary care settings was effective in reducing the incidence of dental caries in young children. This finding highlights the potential of integrating oral health interventions into primary care services to reach a wider population of children.

Ahovuo-Saloranta et al. (2017) conducted a systematic review and found that dental sealants were a cost-effective preventive measure, particularly for children at high risk of caries. The use of dental sealants as part of a comprehensive caries prevention program can help reduce the burden of dental caries in children attending tertiary care hospitals. Restorative treatments, such as fillings and crowns, remain an important aspect of caries management. Innes et al. (2019) compared the effectiveness of different restorative techniques and found that minimally invasive approaches, such as the Hall Technique, were effective in managing caries in primary teeth. Adopting evidence-based restorative treatments can improve the outcomes of caries management in children.

Oral health education is a fundamental component of caries prevention strategies. Albino and Tiwari (2016) emphasized the importance of culturally tailored oral health education interventions for children and their families. Peres et al. (2019) highlighted the need for integrating oral health education into primary health care services to reach a wider population. Oral health education programs should focus on promoting healthy dietary habits, good oral hygiene practices, and regular dental visits. Addressing socioeconomic disparities in oral health is crucial in reducing the burden of dental caries among children in tertiary care settings. Mathur et al. (2014) proposed a framework for promoting oral health equity, which includes improving access to dental care, strengthening the oral health workforce, and implementing policies that support oral health. Ramos-Gomez et al. (2021) emphasized the importance of interprofessional collaboration and community engagement in improving access to care and reducing oral health disparities.

The COVID-19 pandemic has posed additional challenges in the delivery of dental services and caries prevention efforts. Banakar et al. (2020) discussed the impact of the pandemic on dental care and highlighted the need for innovative strategies, such as teledentistry and minimally invasive interventions, to ensure the continuity of care. Adapting caries prevention and management approaches to the changing healthcare landscape is essential to address the oral health needs of children in tertiary care settings.

CONCLUSION

The present study provides valuable insights into the prevalence of dental caries and its associated risk factors among children attending a tertiary care hospital. The findings highlight the high burden of dental caries in this population and underscore the need for comprehensive prevention and management strategies. Age, socioeconomic status, dietary habits, oral hygiene practices, dental visit patterns, and access to preventive measures were identified as significant predictors of dental caries. The multifactorial nature of dental caries necessitates a multi-pronged approach that addresses these risk factors simultaneously.

Oral health education, dietary interventions, promotion of good oral hygiene practices, regular dental check-ups, and improved access to preventive measures are key components of caries prevention programs. Innovative approaches, such as the integration of oral health into primary care, teledentistry, and minimally invasive interventions, can help overcome barriers to dental care access and improve the oral health outcomes of children in tertiary care settings. Addressing socioeconomic disparities and promoting oral health equity through policy interventions and community engagement are crucial in reducing the burden of dental caries. The COVID-19 pandemic has highlighted the need for adaptable and resilient oral healthcare systems that can respond to the changing needs of children. Future research should focus on evaluating the effectiveness of caries prevention and management strategies, exploring innovative service delivery models, and addressing the social determinants of oral health. By prioritizing the oral health of children and implementing evidence-based interventions, we can work towards reducing the burden of dental caries and improving the overall well-being of children in tertiary care settings.

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