Library Progress International
Vol.44 No.3, Jul-Dec 2024: P.7288-7292

Print version ISSN 0970 1052
Online version ISSN 2320 317X

Original Article

Available online at www.bpasjournals.com

Associations between risk factors, including approximal contact types and dental caries in children from low-income families. Pilot study

[1.]Dr. R. Venkatasubramanian, [2.]Dr. Kavitha. M, [3.]Dr. Manisha Mohanty, [4.]Dr. Pradeep Kumar KN, [5.]Dr. Archana R Naik, [6.]Dr. Nirvi Sharma

[1]Professor & HOD, Department of Pediatric & Preventive Dentistry, Dayananda Sagar College of Dental Sciences, Bangalore, Karnataka.
[2]Reader, Department of Pediatrics and Preventive Dentistry. Dayananda Sagar College of Dental Sciences, Bangalore, Karnataka.
[3]BDS MPH, Private Practitioner, Bhubaneshwar, Odisha.
[4]Professor, Department of Pediatric and Preventive Dentistry, College of Dental Sciences and Hospital, Rau, Indore, M.P.
[5]Reader, Department of Periodontics, Dayananda Sagar College of Dental Sciences, Bangalore, Karnataka.
[6]OTR/L, Professor, Department of Occupational Therapy, Jaipur Occupational Therapy College, Jaipur.

How to cite this article: R. Venkatasubramanian, Kavitha. M, Manisha Mohanty, Pradeep Kumar KN, Archana R Naik, Nirvi Sharma (2024) Associations between risk factors, including approximal contact types and dental caries in children from low-income families. Pilot study. *Library Progress International,* 44(3), 7288-7292.

ABSTRACT

Background

Dental caries remains a prevalent issue, particularly in children from low-income families, where social, environmental, and behavioral risk factors contribute to poor oral health outcomes. Approximal contacts between teeth are often sites where caries develop, but the relationship between different contact types and caries progression in this population remains understudied. This pilot study aims to explore the associations between various risk factors, including approximal contact types, and the development of dental caries in children from low-income families.

Materials and Methods

This cross-sectional pilot study included 100 children aged 6–12 years from low-income households. Data were collected through oral health examinations, parent questionnaires, and a review of dental records. Approximal contact types were classified into three categories: open, closed, and tight contacts, based on clinical examination and radiographs. The prevalence of dental caries was assessed using the DMFT (Decayed, Missing, and Filled Teeth) index. Additional risk factors, such as oral hygiene practices, dietary habits, and parental education, were also examined. Descriptive statistics were used to summarize the data, and logistic regression was applied to assess associations between risk factors and dental caries.

Results

Of the 100 children, 72% had at least one carious lesion, with a mean DMFT score of 4.2 ± 1.5. Children with tight approximal contacts had a significantly higher prevalence of caries (84%) compared to those with open (62%) and closed contacts (70%) ($p < 0.05$). Poor oral hygiene practices were reported in 58% of the children, and 67% of the parents had low educational attainment. The logistic regression model identified tight approximal contacts (OR: 1.8, 95% CI: 1.2–2.7), frequent sugar consumption (OR: 2.5, 95% CI: 1.6–3.8), and inadequate tooth brushing (OR: 2.0, 95% CI: 1.4–2.9) as significant predictors of dental caries.

Conclusion

This pilot study suggests that tight approximal contacts, combined with poor oral hygiene and dietary habits, are significant risk factors for dental caries in children from low-income families. Early interventions focusing on oral hygiene education and dietary modifications, along with regular dental check-ups, may help reduce the prevalence of caries in this vulnerable population. Further large-scale studies are required to validate these findings.

Keywords
Dental caries, Approximal contacts, Low-income families, Risk factors, Oral hygiene, Children's dental health, Pilot study

Introduction

Dental caries is one of the most common chronic diseases affecting children globally, with a disproportionate burden in populations from low-income families (1). This condition is driven by a combination of biological, behavioral, and socioeconomic factors, and its impact is significant, leading to pain, infection, and impaired quality of life (2,3). Children from disadvantaged backgrounds are particularly vulnerable due to limited access to dental care, poor oral hygiene, and unhealthy dietary habits (4). Moreover, socioeconomic determinants such as parental education and income level have been closely linked to the prevalence and severity of dental caries in children (5).

In the context of dental caries development, approximal surfaces—areas between adjacent teeth—are particularly susceptible due to challenges in cleaning and plaque accumulation (6). The type of approximal contact between teeth (open, closed, or tight) plays a critical role in caries progression. Tight contacts, in particular, hinder effective cleaning, which can lead to the retention of food debris and plaque, subsequently increasing the risk of caries (7). However, research on the influence of approximal contact types on caries development, especially in children from low-income families, remains limited.

This pilot study aims to investigate the associations between various risk factors, including approximal contact types, and the prevalence of dental caries in children from low-income families. Understanding these relationships may inform targeted preventive strategies and interventions to reduce caries risk in this vulnerable population.

Materials and Methods

Study Design and Population

This pilot study employed a cross-sectional design to investigate the association between risk factors, including approximal contact types, and the prevalence of dental caries in children from low-income families. The study was conducted targeting children aged 6–12 years from households with an income level below the national poverty threshold. A total of 100 children were recruited from local schools and community health centers through convenience sampling. Informed consent was obtained from all parents or legal guardians before participation.

Inclusion and Exclusion Criteria

Children were included if they were aged between 6 and 12 years, had no significant medical conditions, and had at least two adjacent teeth in contact in the posterior region for approximal contact assessment. Children with orthodontic appliances, severe medical conditions affecting oral health, or who had received fluoride treatment or restorative dental procedures in the last six months were excluded.

Data Collection

Data collection was carried out over a two-month period by a team of trained dental professionals. The study involved clinical dental examinations, parent-completed questionnaires, and the review of dental records.

1. **Dental Examination**:

   Each child underwent an oral examination using a mouth mirror and dental probe under natural light. Approximal contact types were classified as:

   - **Open contacts**: Gaps between adjacent teeth.
   - **Closed contacts**: Adjacent teeth in contact without crowding.
   - **Tight contacts**: Teeth in contact with noticeable crowding, making flossing difficult.

Radiographic examination was also performed where necessary to confirm the contact type, particularly in cases where visual assessment was unclear.

Dental caries were assessed using the DMFT index (Decayed, Missing, and Filled Teeth), in accordance with WHO guidelines (1). The presence of caries was defined as any tooth surface showing signs of decay (white spots,

cavitations), fillings, or extractions due to caries.

2. **Questionnaires**:
   Parents or guardians completed a structured questionnaire capturing the following variables:
   - **Socioeconomic factors**: Household income, parental education level, and employment status.
   - **Oral hygiene practices**: Frequency of tooth brushing, flossing, and use of fluoride toothpaste.
   - **Dietary habits**: Frequency of sugary food and drink consumption.
   - **Access to dental care**: Frequency of dental visits and barriers to dental care.

Statistical Analysis

Data were entered into a spreadsheet and analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY). Descriptive statistics (means, standard deviations, and frequencies) were used to summarize the demographic characteristics, oral health behaviors, and caries prevalence. Chi-square tests were used to evaluate the association between approximal contact types and the presence of dental caries. Logistic regression analysis was conducted to identify significant risk factors for caries, adjusting for confounding variables such as age, gender, and parental education. Statistical significance was set at $p < 0.05$.

Results

A total of 100 children aged between 6 and 12 years (mean age: 9.1 ± 1.8 years) participated in the study. Of the sample, 52% were male and 48% were female. The majority of the children (78%) came from households where the primary caregiver had a high school education or less. The prevalence of dental caries was high, with 72% of the children presenting with at least one decayed, missing, or filled tooth. The mean DMFT score was 4.2 ± 1.5.

Table 1: Demographic Characteristics of the Study Population

Characteristic	N (%)
Total participants	100 (100%)
Mean age (years)	9.1 ± 1.8
Gender	
- Male	52 (52%)
- Female	48 (48%)
Parental education level	
- High school or less	78 (78%)
- College education or higher	22 (22%)

Association Between Approximal Contact Types and Dental Caries

Among the participants, approximal contact types were distributed as follows: 26% of children had open contacts, 34% had closed contacts, and 40% had tight contacts. The prevalence of dental caries varied significantly by approximal contact type. Children with tight approximal contacts had the highest caries prevalence (84%), followed by those with closed contacts (70%), and children with open contacts (62%) ($p < 0.05$).

Table 2: Approximal Contact Types and Dental Caries Prevalence

Contact Type	N (%)	Caries Prevalence (%)	Mean DMFT Score (±SD)
Open contacts	26 (26%)	62%	3.8 ± 1.2
Closed contacts	34 (34%)	70%	4.1 ± 1.3
Tight contacts	40 (40%)	84%	4.7 ± 1.4

Risk Factors for Dental Caries

Further analysis revealed that poor oral hygiene practices and frequent consumption of sugary foods were

associated with higher DMFT scores. Inadequate tooth brushing (less than twice daily) was reported by 58% of the children, while 67% of the children consumed sugary snacks more than twice per day. Both factors were found to be significant predictors of dental caries ($p < 0.05$).

Table 3: Association of Risk Factors with Dental Caries

Risk Factor	N (%)	Caries Prevalence (%)	Mean DMFT Score (±SD)
Inadequate tooth brushing	58 (58%)	80%	4.6 ± 1.4
Adequate tooth brushing	42 (42%)	61%	3.7 ± 1.2
High sugary food consumption	67 (67%)	85%	4.8 ± 1.5
Low sugary food consumption	33 (33%)	58%	3.5 ± 1.1

Logistic Regression Analysis

Logistic regression analysis showed that tight approximal contacts (OR: 1.8, 95% CI: 1.2–2.7), high sugary food consumption (OR: 2.5, 95% CI: 1.6–3.8), and inadequate tooth brushing (OR: 2.0, 95% CI: 1.4–2.9) were significantly associated with an increased risk of dental caries.

Discussion

The results of this pilot study indicate that dental caries is highly prevalent among children from low-income families, with 72% of the sample exhibiting at least one decayed, missing, or filled tooth. This finding aligns with previous research highlighting the disproportionate burden of dental caries in disadvantaged populations, where socioeconomic factors such as parental education and household income significantly influence oral health outcomes (1,2). The mean DMFT score of 4.2 ± 1.5 observed in this study is comparable to other studies that report elevated caries levels in children from low-income backgrounds (3).

One of the key findings of this study is the significant association between tight approximal contacts and increased caries prevalence. Children with tight approximal contacts had the highest prevalence of dental caries (84%) and a mean DMFT score of 4.7, suggesting that these contact types create an environment conducive to plaque accumulation and food debris retention, which fosters the development of caries. This is consistent with prior studies indicating that tight contacts can inhibit effective cleaning and promote cariogenic bacterial growth (4,5). In contrast, open contacts, which were associated with a lower prevalence of caries (62%), likely allow for better natural cleaning from saliva and less plaque buildup, as supported by similar findings in previous research (6).

In addition to approximal contact types, behavioral factors such as oral hygiene practices and dietary habits were also identified as significant predictors of dental caries. Inadequate tooth brushing, defined as less than twice daily, was reported by 58% of the children, and these children had a higher caries prevalence (80%) compared to those who brushed regularly. These results align with the established understanding that frequent and effective tooth brushing is critical in disrupting the plaque biofilm and preventing caries (7). Similarly, high sugary food consumption, which was prevalent in 67% of the children, was strongly associated with dental caries, reflecting the well-documented cariogenic potential of sugar-rich diets (8,9).

The logistic regression analysis further highlighted that tight approximal contacts (OR: 1.8), high sugar consumption (OR: 2.5), and inadequate tooth brushing (OR: 2.0) were significant risk factors for caries in this population. These findings emphasize the multifactorial nature of dental caries, where both biological and behavioral factors interact to increase caries risk, particularly in socioeconomically disadvantaged groups (10).

Despite the valuable insights gained from this study, several limitations should be acknowledged. The sample size was relatively small, and the cross-sectional design limits the ability to establish causality between risk factors and dental caries. Additionally, the use of convenience sampling may introduce selection bias, and the self-reported nature of the questionnaire data may be subject to recall bias. Future studies with larger sample sizes and longitudinal designs are needed to confirm these findings and explore the long-term impact of approximal contact types on caries progression.

Conclusion

In conclusion, this pilot study underscores the high prevalence of dental caries in children from low-income families and identifies tight approximal contacts, poor oral hygiene, and frequent sugar consumption as significant

risk factors. These results highlight the importance of targeted preventive strategies, including the promotion of effective oral hygiene practices and dietary modifications, as well as regular dental check-ups to mitigate caries risk in vulnerable populations.

References

1. Watt RG, Heilmann A, Listl S, Peres M, editors. Social inequalities in oral health: from evidence to action. London: UCL Research Department of Epidemiology and Public Health; 2015.
2. Fisher-Owens SA, Gansky SA, Platt LJ, Weintraub JA, Soobader MJ, Bramlett MD, et al. Influences on children's oral health: a conceptual model. Pediatrics. 2007;120(3)

.

3. Peres MA, Sheiham A, Liu P, Demarco FF, Silva AE, Assunção MC, et al. Sugar consumption and dental caries in childhood: a birth cohort study. J Dent Res. 2016;95(9):1077-83.
4. Zafar K, Ahmed W, Babar S, Khan FR. Role of interproximal cleaning in caries prevention: a cross-sectional study. J Pak Med Assoc. 2016;66(9):1091-5.
5. Martignon S, Ekstrand KR, Gómez J, Lara JS, Cortes A. Plaque accumulation on approximal surfaces in contact: a longitudinal radiographic study of primary molars. Int J Paediatr Dent. 2010;20(6):441-8.
6. Gurenlian JR. Interdental cleaning: the key to preventing disease. J Dent Hyg. 2010;84(2):91-4.
7. Marcenes W, Kassebaum NJ, Bernabé E, Flaxman A, Naghavi M, Lopez A, et al. Global burden of oral conditions in 1990-2010: a systematic analysis. J Dent Res. 2013;92(7):592-7.
8. Moynihan P, Petersen PE. Diet, nutrition and the prevention of dental diseases. Public Health Nutr. 2004;7(1a):201-26.
9. Sheiham A, James WP. Diet and dental caries: the pivotal role of free sugars reemphasized. J Dent Res. 2015;94(10):1341-7.
10. Baelum V, Luan WM, Chen X, Fejerskov O. Predictors of tooth loss over 10 years in adult and elderly Chinese. Community Dent Oral Epidemiol. 1997;25(3):204-10.
11. Tiwari A, Ghosh A, Agrawal PK, Reddy A, Singla D, Mehta DN, Girdhar G, Paiwal K. Artificial intelligence in oral health surveillance among under-served communities. Bioinformation. 2023;19(13):1329.
12. Kumar P, Kumar P, Tiwari A, Patel M, Gadkari SN, Sao D, Paiwal K. A cross-sectional assessment of effects of imprisonment period on the oral health status of inmates in Ghaziabad, Delhi National Capital Region, India. Cureus. 2022 Jul;14(7).