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Dentistry

OXIS CLASSIFICATION: UNRAVELLING PROXIMAL CARIES IN YOUNG CHILDREN.

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ABSTRACT

Introduction: Dental caries, caused by bacterial infection, leads to the disintegration of tooth structure, with deciduous teeth playing a crucial role in maintaining proper space for permanent teeth. Factors like tooth architecture and plaque accumulation contribute to inter-proximal caries, leading to potential space loss and oral health complications. **Aim:** This study aims determine the prevalence of OXIS classification in five to eight-year-old children with fully erupted deciduous first and second molars. first and second molars, emphasising the importance of understanding primary tooth contact areas in preventing proximal caries.

Objectives:

1)To evaluate the vulnerability of primary teeth to caries development based on their contact area characteristics.

2)To analyse the association between different types of contact areas, as classified by the OXIS system, and their susceptibility to proximal caries.

3)To contribute to the development of long-term monitoring strategies and preventive interventions for improving every child's oral health.

Methodology: A cross-sectional study design was implemented, involving dental examinations and the application of the OXIS classification system to categorise contact areas in primary molars. Data analysis was conducted using appropriate statistical tools and ethical guidelines. **Result:** In a study of 100 caries-free children, predominant I type contacts were found, with significant inter-arch and intra-arch variations. **Discussion:** The study emphasises the significance of maintaining well-established contact areas to prevent food impaction and subsequent cavities. However, the limitations identified, such as the lack of generalisation across diverse age groups and ethnicities, may impact the comprehensive applicability of the findings. **Conclusion:** Understanding the implications of the OXIS classification and its relationship with caries development is crucial for promoting better oral health in children. The study underscores the need for tailored preventive measures and regular monitoring to ensure optimal dental care during the early stages of tooth developments.

KEYWORDS : OXIS classification, Deciduous teeth, Proximal caries, Contact areas, Preventive Interventions.

INTRODUCTION

Dental caries, a severe condition triggered by bacterial infection in the tooth tissues, leads to the disintegration of its organic content and mineral loss, often causing cavities.[1] Intact deciduous teeth are crucial for maintaining adequate space, ensuring proper alignment during the eruption of permanent teeth. Inter-proximal caries primarily contributes to space loss. Several factors, such as tooth architecture, limited salivary access, rapid development, plaque buildup, diagnostic complexities, and extensive proximal contacts, may contribute to inter-proximal caries.

The term "contact area" refers to the point where the outermost layers of a tooth's mesial and distal surfaces meet.[2] In contrast to permanent molars, primary molars have flatter, larger contact areas situated more gingival[3], making them more vulnerable to caries. The stability and health of dental arches and supporting tissues depend on appropriately positioned contacts.

Establishing effective contact areas that prevent food impaction is crucial for preventing proximal caries.[2] Previous research categorised primary tooth contact areas as open or closed contacts, or based on the form of the proximal surface. Studies by Allison, Schwartz, and Subramaniam et al. revealed a higher incidence of proximal caries in the posterior primary dentition with closed contact points.[2] Interdental spacing aids in cleaning, with Warren et al. finding a modest correlation between the absence of interdental gaps and increased decay in primary dentition.[2] A longitudinal study assessing the predictive ability of primary second molar mesial and first molar distal surface morphology for caries development in children identified four variations, indicating a substantial correlation between concave surfaces and caries development, especially when both surfaces were concave.[4]

The OXIS classification system, proposed by Kirthiga and Muthu MS, categorises primary molar contact areas into four types: O (open contact), X (point contacts), I (straight contacts), and S (curve contacts). Studies on OXIS contact areas indicated that the S type was the most susceptible to proximal caries, followed by I, X, and O contacts.[4] Understanding these contact types can aid in long-term monitoring and caries prevention, ultimately improving the oral health of all children. However, the limitations of reviewed studies include the lack of generalisability to diverse age groups and ethnicities. Therefore, this study aims to determine the prevalence of OXIS classification in five to eight-year-old children with fully erupted deciduous first and second molars.

Table 1: Age group distribution

	Frequency (n)	Percentage (%)
5 years	39	39%
6 years	22	22%
7 years	15	15%
8 years	24	24%
Total	100	100%

Table 2: Gender Distribution

	Frequency (n)	Percentage (%)
Male	46	46%
Female	54	54%
Total	100	100%

Table 3: Maxilla OXIS classification type distribution

	Right n (%)	Left n (%)
O' type	8 (8%)	8 (8%)
X' type	11 (11%)	9 (9%)
I' type	35 (35%)	28 (28%)
S' type	7 (7%)	13 (13%)

Chi square test value, p value	Chi = 49.0, p<0.001**	Chi = 43.1, p<0.001**

Table 4: Mandibular OXIS classification type distribution

	Right n (%)	Left n (%)
O' type	9 (9%)	9 (9%)
X' type	6 (6%)	11 (11%)
I' type	35 (35%)	28 (28%)
S' type	0 (0%)	5 (5%)
Total	100 (100%)	100 (100%)
Chi square test value, p value	Chi = 53.68, p<0.001**	Chi = 61.0, p<0.001**

****p<0.001 – highly statistical significant difference**

METHODOLOGY

Ethics Committee Approval:

The study protocol received approval from the institutional review board (1EC/2351/2023).

Consent:

Informed consent was obtained from the parents and guardians accompanying the participating children.

Study Population and Size:

This cross-sectional investigation utilised a representative sample of 400 contact areas from 100 caries-free children aged five to eight. The study population comprised thirty-nine five-year-olds, twenty-two six-year-olds, fifteen seven-year-olds, and twenty-four eight-year-olds, as indicated in Table 1. Table 2 demonstrates that 46 of the 100 children were male and 54 were female.

Sampling Strategy:

The population for the research was selected using a simple random sampling technique.

Acceptance Criteria:

Inclusion Criteria -

- Children between the ages of five to eight years.
- Children with caries-free molars.
- Cooperative children.
- Children whose parents provided consent for the study.
- Good oral hygiene.

Reasons for Exclusion:

- Children with carious molars.
- Morphological defects in dentition.
- Children belonging to age groups other than five to eight.
- Specifically abled children.

Training of the Examiner:

Before the commencement of the trial, one examiner underwent a month-long clinical assessment of the contact regions under the supervision of an expert, following substantial preparation. The examiner was presented with various clinical images and was instructed to differentiate between the types of contact areas. Once the examiner successfully distinguished the contact areas, she was permitted to conduct clinical examinations in the caries-free children within the study population.

Examination:

The examination was conducted by the examiner in a clinical setup. To ensure clear visibility of the contact areas, the tooth was cleaned and dried. Type 3 examination was carried out. The four identified types of contact areas were O type, X type, I type, and S type. The data was then organised in the form of tables.

The contact was categorised as Open (O) when there was no contact with the neighbouring tooth. A contact was classified as X when the Williams probe measured a buccolingual contact point of less than 1 mm between the proximal surfaces. Using the Williams probe to assess the buccolingual surface contact between the two teeth, if the contact was greater than 1, it was categorised as either an S or I type based on its appearance. If the contact appeared straight, it was classified as an I type; if it appeared curved, it was classified as an S type.

Analysis of the Statistics:

Chi-square test and p-value test were utilised.

RESULT

Statistics:

The initial hundred caries-free participants in the study were randomly selected from children aged five to eight. The study population consisted of 39 five-year-olds, 22 six-year-olds, 15 seven-year-olds, and 24 eight-year-olds. A total of 400 contact areas were examined, with a gender ratio of 23 males to 27 females observed.

Frequency and percentage of contact:

I type contact was the most often discovered kind (63% in the maxilla and 63% in the mandible). X type (20% in maxilla and 17% in mandible) came next. O type contact accounts for the third most common kind (18% in the mandible and 16% in the maxilla). The S type is the least common (20% in the maxilla and 5% in the mandible).

Inter-arch prevalence:

Type I contacts were evenly distributed in both the maxillary and mandibular arches. O type contacts were more prevalent in the mandibular arch than in the maxillary arch. In the maxillary arch, X type contact was observed in 20% of quadrants, compared to 17% in the mandibular arch. S type contacts were primarily distributed in the maxillary arches compared to the mandibular arch.

Intra-arch prevalence:

1) Maxillary arch:

The distribution of O type contact was determined to be 8%, evenly distributed in the left and right quadrants. On the right side, X type of contact was more common at 11% compared to 9% on the left side. Additionally, the right quadrant exhibited a higher frequency of I type contact at 35% than the left quadrant at 28%. In the left quadrant, S type contact was more common (13% and 7% in the right quadrant).

2) Mandibular arch:

O type contacts were found at a frequency of 9%, evenly distributed throughout both quadrants. On the left side, X type of contact was more common at 11% compared to 6% on the right side. Conversely, the right side exhibited a higher percentage of I type contacts at 35% compared to 28% on the left side. The right quadrant displayed almost no S type of contact, whereas the left quadrant exhibited 5%.

DISCUSSION

The presented study examines the prevalence and distribution of various contact types using the OXIS classification system among caries-free children aged five to eight years. Maintaining the integrity of dental arches and supporting structures requires a properly positioned, well-contoured, and firm proximal contact.[6] Notably, the results shed light on the significance of different contact areas and their implications for preventive dental care strategies.

The age and gender distribution of the study population revealed a diverse representation across different age groups, with a slightly higher proportion of females. This gender distribution emphasises the need for gender-based analyses when considering dental health and preventive measures, particularly in children.

The predominance of I type contacts in both the maxilla and mandible underscores their significance in maintaining oral health[4]. This finding suggests the importance of proper contact area formation in preventing proximal caries, aligning with previous research that emphasises the crucial role of well-established contact areas in dental health maintenance[5]. Evidence supports the notion that wide proximal contact areas in primary teeth may heighten the risk of caries. This can be attributed to a decrease in mechanical cleansing action due to restricted movement between adjacent teeth, resulting in increased plaque accumulation.[10][11]

The observed differences in the prevalence of contact types within the maxilla and mandible suggest potential variations in susceptibility to caries development between the upper and lower dental arches. The higher prevalence of O type contacts in the mandibular arch compared to the maxillary arch implies potential vulnerabilities in the upper dental structure[9], highlighting the need for targeted preventive measures in this region.

The notable distribution patterns within the maxillary and mandibular arches indicate distinct differences in contact type prevalence.

Notably, the prevalence of X type contacts is slightly higher in the maxilla, while the prevalence of S type contacts is significantly higher in the maxilla compared to the mandible. These variations in prevalence between the upper and lower dental arches emphasise the complex interplay of dental morphology and susceptibility to caries development, suggesting the need for comprehensive preventive strategies tailored to each dental arch.

Furthermore, the observed significant differences in the distribution of contact types, particularly the OXIS classification types, highlight the importance of understanding the specific vulnerabilities associated with each contact type. The highly statistically significant differences emphasise the clinical relevance of the OXIS classification system in identifying potential areas of concern and implementing targeted preventive measures for children at risk of caries development[2].

The findings of this study support the need for tailored preventive dental care interventions, considering the distinctive distribution patterns and prevalence of different contact types within the maxillary and mandibular arches. Addressing the specific vulnerabilities associated with each contact type can significantly contribute to the development of effective preventive strategies for caries-free children[7].

However, the study's limitations should be acknowledged. Firstly, the study's relatively small sample size and the restricted age range of the participants may limit the generalisability of the findings to a broader paediatric population. Additionally, the study's focus on caries-free participants may not fully represent the overall prevalence and distribution of different contact types among children with existing caries. Further research involving a larger and more diverse population would provide a more comprehensive understanding of the prevalence and distribution of contact types and their association with caries susceptibility across different age groups and demographics.

In conclusion, the study's findings underscore the significance of the OXIS classification system in identifying and understanding the prevalence and distribution of different contact types among caries-free children. The observed variations in contact type prevalence within the maxillary and mandibular arches highlight the complex interplay between dental morphology and susceptibility to caries development.

These findings emphasise the importance of tailored preventive dental care strategies, particularly considering the vulnerabilities associated with specific contact types. Further research with a larger and more diverse population is warranted to validate and expand upon these findings, ultimately contributing to the development of comprehensive preventive measures for promoting optimal oral health in children.

CONCLUSIONS

The significance of OXIS contacts is unquestionable in comprehending the mechanism of proximal caries[8]. The study's exploration of the prevalence and distribution of contact types using the OXIS classification system among caries-free children has provided valuable insights into the intricate relationship between contact area characteristics and susceptibility to dental caries. The findings highlight the paramount importance of well-established contact areas, particularly the prevalence of I type contacts, in maintaining optimal oral health and preventing proximal caries.

Moreover, the observed variations in contact type prevalence between the maxillary and mandibular arches underscore the need for tailored preventive measures to address the specific vulnerabilities associated with each dental region. While the study's limitations suggest the necessity for further research with a more extensive and diverse sample, the current findings serve as a significant foundation for developing targeted preventive strategies for enhancing the oral health of children.

Ultimately, this study reinforces the critical role of the OXIS classification system in identifying potential areas of concern and guiding the implementation of effective preventive measures. By acknowledging the intricate nuances of contact type prevalence and distribution, dental practitioners can proactively design personalised preventive interventions, thus contributing to the promotion of optimal oral health and well-being in children.

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