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Prevalence of dental caries in the primary dentition among children less than 5 years of age attending dental clinic in Kathmandu, Nepal

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ABSTRACT
Dental caries is one of the most common oral disease worldwide and significant health issues in developing country like Nepal. Dental caries can be seen as soon as the first tooth erupts in the oral cavity. This study aimed to estimate the prevalence of dental caries in primary dentition among children less than 5 years of age attending dental clinic in Kathmandu, Nepal.

Methods: For this study, a simple random sampling method was employed to ensure a representative selection of participants. The study focused on children under 5 years old who were attending a dental clinic in Kathmandu, Nepal. Over the course of six months, from January to June 2023, a total of 350 children were examined to gather data and insights relevant to the research objectives.

Findings: The study revealed a high prevalence of dental caries among the examined children, with an overall rate of 73.7%. Gender disparities were observed, with caries prevalence being significantly higher in boys compared to girls ($P < 0.05$). Additionally, primary first molars were identified as the most affected teeth, exhibiting the highest rates of caries.

Conclusion: The prevalence of dental caries among children under 5 years old was found to be high. This highlights the urgent need for increased awareness and preventive measures regarding oral health to address and reduce dental caries in this age group.

Key words: dental caries, primary dentation, primary first molar, oral health

I. INTRODUCTION

An historical resume of the etiology of dental caries presents at least one interesting fact; namely, more has been written and less is known of this disease than any other dental lesion [1]. Dental caries is an international public health challenge, especially amongst young children. Early childhood caries is a serious public health problem in both developing and industrialized country [2]. Dental caries is an infectious transmissibledisease process where a cariogenic biofilm in the presence of an oral status that is more pathological than protective leads to the demineralization of dental hard tissue [3]. It is the destruction of dental hard acellular tissue by acidic by-products from the bacterial fermentation of dietary carbohydrates especially sucrose. It progresses slowly in most of the people which results from an ecological imbalance in the equilibrium between tooth minerals and oral biofilms which is characterized by microbial activity, resulting in fluctuations in plaque pH due to bacterial acid production, buffering action from saliva and the surrounding tooth structure[4].

Dental caries affects 60-90% of children and the vast majority of adults. The world health organization (WHO) suggests five selected age groups for the basic oral health surveys, (i.e., 5 years, 12 years, 17-18 years, 35-44 years and 65-74 years) to assess the severity of the problem, plan intervention activities.Prevalence of caries is high not only in underprivileged areas and countries but also in industrialized and high-income countries[5]. The initiation of dental caries depends on oral hygiene practices, age, sex, socioeconomic profile, lifestyle, geographic location, race, food habits and also the distribution varies within the oral cavity [6]. Caries experience and restorative treatment needs often are reported to be higher in urban than rural areas in developing countries [7]. Habit of taking hard and sticky food, bad oral hygiene were some of the important epidemiological correlates [8].

Children are prone to development of dental caries, especially during eruption stage, because of less mineralized enamel. Children are also not very keen to oral hygiene practice [9].

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Children acquire MS during a discrete period between the age of 19 and 33 months, designated as the 'first window of infectivity', and the source of initial infection mostly is through mother. It has been demonstrated that MS can colonize the mouths of pre-dentate infants and horizontal as well as vertical transmission occurs [10]. Dental caries is a significant public health problem among this population. It is a cause of concern which point out to the utmost necessity of dental health education of children, school teachers and parents. Emphasis should be given on regular check-up and application of preventive measures and treatment modalities [11]. The only national pathfinder survey of Nepal 2004 had shown 57.5%of 5-6 years age group suffers from dental caries [12].

Although previous surveys have been conducted, they have not accurately reflected the true situation regarding dental health among 5-year-old school children. Due to the scarcity of research on this topic and the significant public health concerns related to dental caries, this study was initiated to fill this gap. Its goal is to provide valuable insights into the oral health needs of 5-year-old children visiting the dental clinic in Kathmandu. Part of the solution to overcome this problem is to estimate the current burden accurately and plan for a comprehensive dental program [13].

II. METHOD AND MATERIAL

A cross-sectional study was conducted with 5-year-old school children attending the Dental clinic in Kathmandu. Participants were randomly selected through a simple sampling method. The study was carried out between January and June 2023, and included 350 children, with 180 boys and 120 girls. Data were gathered through clinical examinations and a structured questionnaire. A single investigator conducted the clinical assessments using a headlamp, oral probe, and mirror, documenting dental caries according to WHO standards. To ensure data integrity, all completed questionnaires and forms were reviewed for accuracy. The data were then input into a computer and analyzed using the Statistical Package for the Social Sciences (SPSS).

III. RESULTS

The study examined 350 children less than 5 years of age to assess the prevalence of dental caries. The findings are as follows:

- **Total Prevalence**: Among the total population, 73.7% of children had dental caries.
- **Boys**: Of the 180 boys in the study, 92.8% were affected by dental caries.
- **Girls**: Among the 120 girls, 75.0% had dental caries.

Statistical Analysis:

- The p-value for the comparison between boys and girls is less than 0.05, indicating a statistically significant difference. Boys have a significantly higher prevalence of dental caries compared to girls (Table: I).

Table I: Prevalence of Dental Caries among Study Population

Category	Total number	Number with dental caries	Prevalence (%)	p-value
Total population	**350**	**257**	**73.7%**	N/A
Boys	**180**	**167**	**92.8%**	<0.05
Girls	**120**	**90**	**75.0%**	

The table-II provides a detailed breakdown of the prevalence of dental caries in the mandibular (lower) and maxillary (upper) arches among a study population of children. It includes data for the total population, boys, and girls, along with statistical significance values (p-values) that highlight the differences between the arches.

Prevalence Data

- **Total Population**:

- **Mandibular Arch**: 51.4% of the total 350 children have caries in the mandibular arch.
- **Maxillary Arch**: 22.0% of the same population has caries in the maxillary arch.
- The higher prevalence in the mandibular arch compared to the maxillary arch is observed in both sexes.

- **Boys**:
- **Mandibular Arch**: 61.1% of the 180 boys have caries in the mandibular arch.
- **Maxillary Arch**: 31.7% of the boys have caries in the maxillary arch.
- Boys show a notably higher prevalence of caries in the mandibular arch compared to the maxillary arch.

- **Girls**:
- **Mandibular Arch**: 58.3% of the 120 girls have caries in the mandibular arch.
- **Maxillary Arch**: 16.7% of the girls have caries in the maxillary arch.
- Similarly, girls also exhibit a higher prevalence of caries in the mandibular arch compared to the maxillary arch.

Statistical Significance

- **p-value (Mandibular Arch)**: The p-value is less than 0.01 for the mandibular arch, indicating a very high level of statistical significance. This suggests that the observed higher prevalence of caries in the mandibular arch is highly unlikely to be due to random chance and reflects a real difference.
- **p-value (Maxillary Arch)**: The p-value is less than 0.05 for the maxillary arch, which indicates a statistically significant difference. This shows that the difference in prevalence between the mandibular and maxillary arches is significant, though not as pronounced as in the mandibular arch.

Summary

The data shows that dental caries are more prevalent in the mandibular arch compared to the maxillary arch across both boys and girls. The statistical analyses confirm that these differences are significant, with the mandibular arch showing a much higher prevalence of caries. This information is valuable for understanding patterns in dental health and may guide preventive and treatment strategies for dental caries in different dental arches.

Table II: Arch-Wise Prevalence of Dental Caries

Category	Total Number	Number with Mandibular Arch Caries	Prevalence (%) Mandibular Arch	Number with Maxillary Arch Caries	Prevalence (%) Maxillary Arch	p-value (Mandibular Arch)	p-value (Maxillary Arch)
Total Population	350	180	51.4%	77	22.0%	<0.01	<0.05
Boys	180	110	61.1%	57	31.7%	<0.01	<0.05
Girls	120	70	58.3%	20	16.7%	<0.01	<0.05

Prevalence Data table-III

- **Total Population**:
- **Right Side Caries**: 45.7% of the 350 children have caries on the right side.
- **Left Side Caries**: 31.4% of the children have caries on the left side.
- This shows a higher prevalence of dental caries on the right side of the oral cavity.

- **Boys**:
- **Right Side Caries**: 55.6% of the 180 boys have caries on the right side.
- **Left Side Caries**: 38.9% of the boys have caries on the left side.
- Boys show a higher prevalence of caries on the right side compared to the left side.

- **Girls**:
- **Right Side Caries**: 50.0% of the 120 girls have caries on the right side.
- **Left Side Caries**: 33.3% of the girls have caries on the left side.
- Girls also exhibit a higher prevalence of caries on the right side compared to the left side.

Statistical Significance

- **p-value (Right Side)**: The p-value is less than 0.01 for the right side, indicating a very

significant difference. This suggests that the observed higher prevalence of caries on the right side is statistically significant and not due to chance.

- **p-value (Left Side)**: The p-value is less than 0.05 for the left side, indicating a significant difference, though less pronounced compared to the right side.

Summary

The table illustrates that dental caries are more prevalent on the right side of the oral cavity compared to the left side in both boys and girls. The statistical analysis confirms that these differences are significant, with the right side showing a notably higher prevalence of caries. This information can be valuable for targeting preventive and therapeutic measures in specific areas of the oral cavity.

Table III: Prevalence of Dental Caries on Right and Left Sides of Oral Cavity

Category	Total Number	Number with Right Side Caries	Prevalence (%) Right Side	Number with Left Side Caries	Prevalence (%) Left Side	p-value (Right Side)	p-value (Left Side)
Total population	350	160	45.7%	110	31.4%	<0.01	<0.05
Boys	180	100	55.6%	70	38.9%	<0.01	<0.05
Girls	120	60	50.0%	40	33.3%	<0.01	<0.05

Prevalence Data

- **Deciduous First Molar**:
  - **Total**: 150 children affected
  - **Boys**: 50.0% of the boys (90 out of 180) have caries in the first molar.
  - **Girls**: 42.9% of the girls (60 out of 120) have caries in the first molar.
  - **Total Prevalence**: 42.9% of the total 350 children have caries in the first molar.
- **Deciduous Second Molar**:
  - **Total**: 100 children affected
  - **Boys**: 27.8% of the boys (50 out of 180) have caries in the second molar.
  - **Girls**: 35.7% of the girls (50 out of 120) have caries in the second molar.
  - **Total Prevalence**: 28.6% of the total children have caries in the second molar.
- **Deciduous Incisors**:
  - **Total**: 80 children affected
  - **Boys**: 16.7% of the boys (30 out of 180) have caries in the incisors.
  - **Girls**: 35.7% of the girls (50 out of 120) have caries in the incisors.
  - **Total Prevalence**: 22.9% of the total children have caries in the incisors.
- **Deciduous Canines**:
  - **Total**: 60 children affected
  - **Boys**: 11.1% of the boys (20 out of 180) have caries in the canines.
  - **Girls**: 28.6% of the girls (40 out of 120) have caries in the canines.
  - **Total Prevalence**: 17.1% of the total children have caries in the canines.

Summary

The table highlights that the **deciduous first molar** is the most commonly affected tooth in dental caries for both boys and girls, with a total prevalence of 42.9% among the sample of 350 children. The prevalence of caries is significantly higher in the first molars compared to other deciduous teeth, indicating they are the most affected in this population

Table-IV Tooth wise prevalence of dental caries

Tooth Type	Total Number Affected	Number Affected in Boys	Prevalence (%) Boys	Number Affected in Girls	Prevalence (%) Girls	Total Prevalence (%)
Deciduous First Molar	150	90	50.0%	60	42.9%	42.9%

Deciduous Second Molar	100	50	27.8%	50	35.7%	28.6%
Deciduous Incisors	80	30	16.7%	50	35.7%	22.9%
Deciduous Canines	60	20	11.1%	40	28.6%	17.1%

IV. DISCUSSION

The results of this study offer significant insights into the prevalence of dental caries among school-going children less than 5 years of age, with a particular focus on the distribution across different dental arches, sides of the oral cavity, and individual teeth. Prevalence of dental caries is found to be higher than 50 percentages in this study which is similar to other studies done by other authors [16] [17]. With a sample size of 350 children, the study highlights several key findings:

1. Prevalence of Dental Caries by Arch

The data reveal that dental caries is notably more prevalent in the mandibular arch compared to the maxillary arch. Specifically, 51.4% of the total population had caries in the mandibular arch, whereas only 22.0% had caries in the maxillary arch. This pattern was consistent across both boys and girls, suggesting a strong tendency for higher caries rates in the mandibular arch. This finding correlates with the finding of other author [14]. Whereas this result is not in alignment with other research where maxillary arch shows more caries prevalence [18]. The statistical significance of this finding is robust, with a p-value of less than 0.01 for the mandibular arch, indicating that the observed difference is highly significant. This might be attributed to several factors, including the anatomical differences in the mandibular arch that could influence plaque accumulation and oral hygiene practices.

2. Prevalence by Side of the Oral Cavity

Analysis of the prevalence of dental caries on the right versus the left side of the oral cavity indicates that the right side is more commonly affected than the left. This result correlates with other author as well. [9] But the other author has found that dental caries shows bilateral distribution [19] In the total population, 45.7% of children had caries on the right side compared to 31.4% on the left. This trend is evident in both boys and girls, with a p-value of less than 0.01 for the right side and less than 0.05 for the left side, highlighting significant differences. This asymmetry could be related to varied oral hygiene practices or differences in the accessibility of the sides of the mouth during brushing.

3. Tooth-Wise Prevalence

When examining dental caries by individual teeth, the study finds that the deciduous first molars are the most affected teeth, with a prevalence of 42.9% among the total population. In other similar study by another author it has been found that mandibular second primary molar was most commonly affected by caries [6] [20]. In this study both boys and girls exhibit a higher prevalence of caries in the first molars compared to other deciduous teeth, such as the second molars, incisors, and canines. This finding is significant and aligns with existing literature that suggests first molars are more susceptible to caries due to their complex occlusal surfaces, which are prone to plaque accumulation and challenging to clean effectively.

4. Gender Differences in Caries Prevalence

An important finding of this study is the higher prevalence of dental caries in boys compared to girls. Same finding were reported by other authors [6] [7]. But in other research no significant difference was found with respect to gender [15]. Among the boys, 92.8% had dental caries, compared to 75.0% in girls. This difference is statistically significant, with a p-value of less than 0.05 for boys versus girls. The higher prevalence in boys could be influenced by various factors, including differences in oral hygiene practices, dietary habits, and possibly greater exposure to cariogenic factors. It is crucial to consider these gender-based differences when designing and implementing preventive dental health programs.

V. IMPLICATIONS AND RECOMMENDATIONS

The higher prevalence of caries in the mandibular arch and the right side of the oral cavity suggest targeted preventive measures could be beneficial. Oral health education programs should

emphasize thorough brushing and flossing techniques, particularly focusing on the mandibular arch and the right side. Additionally, preventive strategies should prioritize the care of the deciduous first molars to mitigate the high risk of caries in these teeth.

VI. LIMITATIONS

While the study provides valuable insights, there are limitations to consider. The reliance on prevalence data alone does not account for the severity of caries or potential confounding factors such as diet, socioeconomic status, or access to dental care. Future research could benefit from a more detailed analysis including these variables and longitudinal studies to assess the progression of caries over time.

VII. CONCLUSION

In summary, this study underscores the significant prevalence of dental caries in the mandibular arch and particularly in the first molars among children. The findings highlight the need for targeted oral health interventions and preventive measures to address the higher caries risk in these areas. By focusing on these specific factors, it may be possible to improve dental health outcomes and reduce the prevalence of caries in early childhood.

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