

# Discrepancy in Caries Prevalence by Gender Among School-Going Children in the Population of Hyderabad: A Cross-Sectional Study

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## ABSTRACT

**Background:** Dental caries is a highly prevalent oral disease. The primary cause of dental caries involves bacteria, notably Streptococcus mutans, thriving in an acidogenic environment, breaking down fermentable carbohydrates and ultimately leading to the formation of cavities. Multiple studies have indicated a higher female predilection towards dental caries.

**Aim:** The aim of this study is to find out a possible relationship between gender and the prevalence of dental caries among children in order to increase awareness of the significance of consistent oral hygiene practices.

**Materials and Methods:** This was a cross-sectional survey conducted on a study sample of 5332 children from 8 to 16 years. Intraoral camera was used to carry out the clinical examination by trained dental professionals. Data was compiled and analysed using SPSS version 29. Statistical analysis was done using Chi square test.

**Results:** Among 5332 subjects, 844 males (31.34%) out of 2693 and 894 females (33.88%) out of 2639 were found to have dental caries. Chi square test was used to determine the significance of difference between the prevalence of dental caries among males and females. It showed a statistically significant correlation between dental caries and gender ( $p < 0.05$ ).

**Conclusion:** Dental caries is frequently disregarded in its early stages, despite its

detrimental effects. Considering the plethora of variables that contribute, especially in women, it is essential to encourage self-awareness and refrain from underestimating its impact. Ignoring dental cavities can lead to premature tooth loss, which can have an adverse effect on general health.

**Keywords:** Dental Caries, Gender, Prevalence, Children, Chi-square test, Intraoral camera

## INTRODUCTION

One of the most common diseases that may be preventable in early stages is dental caries, which is the primary cause of toothache. [1]

Caries develops in a complex manner, influenced by a wide range of interrelated factors. The key variables that cause caries to arise are specifically the existence of bacteria, food or sugars as a substrate for the bacteria, the oral environment of the host, and time. [2]

Bacterial load, inadequate fluoride exposure, inadequate oral hygiene, and poverty are risk factors. Saliva, hormonal levels, and sex-linked predisposition are biological variables that contribute to dental caries. [3]

The biofilm microflora that typically inhabits the oral cavity in a condition of equilibrium is altered to become cariogenic,

acidogenic, and aciduric when carbohydrates are consumed often. This is how dental caries develops. This alteration could result in a net mineral loss in the tooth's hard tissues, which would show up as an obvious carious lesion, or it could have a clinically insignificant effect. [4]

The WHO Global Oral Health Status Report for 2022 underscores the global neglect of oral health, indicating an estimated average global prevalence of 43% for caries in deciduous teeth and 29% for caries in permanent teeth. According to the Indian National Oral Health Survey Report from 2004, caries prevalence in India varied across different age groups, with rates of 51.9%, 53.8%, and 63.1% at ages 5, 12, and 15 years, respectively, in various regions of the country. [5]

Age, gender, ethnicity, sociodemographic factors, economic level, geographic location, dietary practices, and oral hygiene habits all affect the occurrence and severity of dental caries, even within the same nation or region across different continents. [6]

Extensive research has been conducted on gender disparities in dental caries among adults. Numerous studies have consistently indicated that females bear a greater burden of dental caries. But when it comes to paediatric population, the evidence remains inconclusive, with various studies yielding mixed conclusions. Certain studies indicate a gender bias in caries prevalence among children, pointing to females as more susceptible, while others support an opposing trend. Conversely, other researches haven't discovered any gender differences in the prevalence of caries in paediatric population. [7]

Research has shown that women are more susceptible to dental caries due to a variety of reasons, including hormonal changes, dietary choices, genetic variations and distinct social responsibilities within the family. Also, women have a different salivary composition and flow rate, making them more susceptible to caries. [8]

Of all the issues pertaining to paediatric patients' oral health, dental decay is the one

that most often results in functional and aesthetic problems during a child's day-to-day interaction, which therefore lowers their quality of life in general. The severity of the impact has been found to increase with the number of teeth a patient has lost or are affected with caries. The adverse effects of caries on the lives of children encompass various aspects, including difficulties in chewing and speech, disruptions in schooling like increased absenteeism, psychological issues like sleep disturbances and irritability, and broader social interaction factors such as compromised smiling and reluctance to speak. [9]

The aim of the present study is to determine whether there is a significant correlation between gender and dental caries in school-going children.

## **MATERIALS & METHODS**

Among students in schools of Hyderabad, between the ages of 8 and 16 years, OroGlee Solutions Private Limited carried out a cross-sectional survey. The investigation was conducted between January and April of 2023. A total of 5332 students were assessed across all locations of Hyderabad. A questionnaire was created in order to collect information such as age, gender, and relevant dental and medical history. The dentist used an intraoral camera to perform an oral examination. The intraoral camera is extremely effective in capturing minute details of the oral cavity. Approval from respective school administration was taken for the same.

### **Inclusion Criteria**

- Children aged 8 to 16 years were included in the study.

### **Exclusion Criteria**

- Participants below the age of 8 years and above the age of 16 years were excluded from the study.

## STATISTICAL ANALYSIS

The data analysis was done using SPSS version 29. Chi square test was used to determine the significance of difference between the prevalence of dental caries among males and females.  $P \leq 0.05$  was considered statistically significant.

## RESULT

Among camps conducted in schools, a total of 5332 subjects, aged between 8-16 years participated in the study. Gender distribution is as follows: Males were 2693 (50.5%) and females were 2639 (49.5%). The following table shows the prevalence of caries among them:

Table 1: Prevalence of Dental Caries According to Gender

GENDER	TOTAL NUMBER OF SUBJECTS	SUBJECTS WITH CARIES (N)	PREVALENCE OF CARIES (IN %)
Males	2693	844	31.34%
Females	2639	894	33.88%

Chi square test was used to determine the significance of difference between the prevalence of dental caries among males and females. Chi square value is 3.90 which is higher than the value (3.84) for the significance level of 0.05. This shows that there is a significant relation between gender and dental caries.

## DISCUSSION

Caries in the teeth is caused by a complex process involving the long-term interaction of fermentable carbohydrates and acidogenic microbes with saliva and teeth as hosts. A lesion appears as a marker of the disease if more minerals are lost from the hard tissues over time than are acquired. Hence, the process of dental caries is best understood as a dynamic balance between re- and demineralization. If dental caries is not treated, it can lead to non-cavitated carious lesions, which can later become cavitated. [10]

Based on research conducted by Pandey P, Nandkeoliar T, Tikku AP, Singh D, Singh MK among the Indian population, the overall prevalence of dental caries among individuals aged 3 to 18 years was reported as 52%. When categorizing by dentition, the prevalence rates were 54%, 58% and 46% for primary, mixed and permanent dentition, respectively. The DMFT index for caries prevalence in primary dentition was determined to be 59%, but the prevalence rates of DMFT index for caries in mixed and permanent dentition were identified as 66% and 43%, respectively. [11]

Three components are commonly identified as the cause of dental caries: substrate, bacteria, and host. A tooth surface that is exposed to refined sugars becomes colonized by cariogenic bacteria, which causes dental caries. Lactic acid is created by bacterial pathogens through the fermentation of carbohydrates. This acid destroys the tooth's hydroxyapatite crystal structure and results in cavities. [1]

Additionally, an individual's age, gender, nutritional state, and socioeconomic level are also contributing factors that affect caries prevalence. [12]

One of the reasons behind increased susceptibility to caries in females is the variation in chronological tooth eruption. In females, teeth tend to erupt earlier, resulting in an extended exposure to acidogenic substances. Furthermore, hormonal changes brought on by the onset of puberty, menstruation or pregnancy may also contribute to variations in saliva content and total flow rate, making female adolescents more vulnerable to dental caries. [7]

Another possibility could be due to genetic variables that are associated with sex chromosomes and show sex-linked mechanisms of inheritance. Genes situated on either the X or Y chromosome have the potential to introduce variations in the oral environment of the host and influence the response to the initiation of caries. One such gene, Amelogenin (AMELX), is situated on the p arm of the X chromosome. The amelogenin protein, constituting 90% of the enamel matrix, plays a crucial role in the

origin of enamel. A weak AMELX gene or low amelogenin protein concentrations can interfere with the production of the enamel matrix, making teeth more vulnerable to caries. Studies report that variations in AMELX in females can be caused by X inactivation and mosaicism. [8]

According to our study, among 5332 school going children, 31.34% males and 33.88% females were affected with caries. Chi-square test was used to determine the significance of difference between the prevalence of dental caries among males and females. The results showed a statistically significant association with a p-value <0.05.

In a study by Tharanga Nandasena, Peiris RD, Kapila Arambawatta, Bannehaka *et al* on Sinhalese population, among 5-7 years and 12-15-years age groups, caries prevalence was significantly higher in females than in males. [2]

According to a study done by Demirci M, Tuncer S, Yuceokur AA at Istanbul University, located in Istanbul, Turkey between 2001 and 2004, females (59.1%) showed a higher prevalence of caries than males (40.9%). [13]

While a study done in Iran among the age group of 7-12 years by Youssefi MA, Afroughi S, the caries prevalence of permanent teeth in girls was 46% and in boys was 36.7%. [14]

Similarly, in a study by Zhang S, Chau AM, Lo EC *et al* among 12-year-old Hongkong children, girls had a higher DMFT than boys ( $0.45 \pm 0.89$  compared with  $0.23 \pm 0.61$ ,  $p = 0.001$ ). [15]

In a study done among 12-14-year-olds by Al-Darwish M, El Ansari W, Bener A. in Qatar, female children showed a significantly higher prevalence of dental caries than male children with a p-value < 0.05. [16]

On the contrary, a study done by Kalita C, Choudhury B, Sarmah P *et al* on 3- to 17-year-old children in Guwahati, caries prevalence was higher in males (45.85%) than females (40.92%), and the difference was statistically significant. [17]

Dental caries, when left untreated, results in pain, inflammation, difficulty in chewing and sleeping along with significant effects on growth and quality of life. Increased days of restricted activity, missed school, a decreased ability to study, and a higher chance of hospitalizations and emergency dental visits are all the consequences of elevated caries levels. [18]

A thorough knowledge of how to maintain a healthy mouth free from cavities is aided by evaluating an individual's risk of caries by considering aspects including their salivary flow, calculus, presence of retentive pits and fissures, past caries experience, current caries index, and snacking habits. Implementing proper brushing and flossing techniques, regular fluoride applications, the use of pit and fissure sealants, and opting for sucrose alternatives are also effective strategies in promoting oral health. [19]

## CONCLUSION

The increased prevalence in females emphasizes the need for gender-tailored preventive and therapeutic approaches. Recognizing and understanding the factors contributing to this difference will be essential in developing targeted treatment plans to mitigate the impact of dental caries, promoting improved oral health outcomes for all. Public health campaigns must take these gender-specific factors into account when developing comprehensive plans to lower dental caries rates and promoting equitable oral health for all.

### Declaration by Authors

**Ethical Approval:** Ethical approval was not taken as no human interventions were done.

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**Conflict of Interest:** The authors declare no conflict of interest.

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