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ORIGINAL ARTICLE

Factors Associated with Frequency of the First Permanent Molar Caries in Young Children of Multan District, Pakistan

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ABSTRACT

Caries is the result of the interaction between tooth surface, microorganisms, and food. The first permanent molar (FPM) is known as the key tooth in the oral cavity and erupts around the age of 6 years. **Objective:** To determine the frequency of caries in the FPMs in young children and analyze factors associated with FPM caries. **Methods:** We recruited 350 subjects from different public and private sector schools of Multan District, Punjab, Pakistan, for this cross-sectional study. A predesigned questionnaire was used to collect data from eligible respondents. Dental caries status was assessed visually using a dental mirror, dental explorer, and light. **Results:** Of the 350 students, 108 were found to be affected with caries, whereas the remaining 242 were caries-free. Among the 108 affected students, 36 were male and 72 were female, and 80 were aged 7–9 years; the remaining 28 students were 10–12 years. **Conclusion:** Caries frequency varied by parent's educational level, parent's socioeconomic status, and also by the age and gender of the child.

Keywords: children, dental caries, school, Pakistan

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INTRODUCTION

Caries is one of the most common oral diseases worldwide due to its increased prevalence in children. It continues to be a major health problem in most parts of the world.[1] Dental caries is the localized destruction of susceptible dental hard tissues by acidic byproducts from bacterial fermentation of dietary carbohydrates. The signs of the carious demineralization are seen on the hard dental tissues, but the disease process is initiated within the bacterial biofilm (dental plaque) that covers the tooth surface.[2] Moreover, very early changes in the enamel are not detected with traditional clinical and radiographic methods. Dental caries is a multifactorial disease that starts with microbiological shifts within the complex biofilm and is affected by salivary flow and composition, exposure to fluoride, and consumption of dietary sugars and improved by preventive behaviors (cleaning teeth).[3] Caries also increase significantly when snacks are consumed between meals. However, the prevalence of caries can be reduced significantly by regularly brushing the teeth, parental supervision, use of a baby toothbrush, and fluoridated dentifrice.[4]

The first permanent molar (FPM) plays a key role in the development and growth of the dental arches and is the tooth most susceptible to caries.[5] An important objective of pediatric oral health programs is to prevent caries of the FPM. Most such programs apply local specific measures based on the sealing of pits and fissures, or the application of fluoride varnish.[6] The FPM is more vulnerable to caries because of its morphological and functional characteristics. A study from Abha City in Saudi Arabia reported the prevalence of dental caries in the FPM to be 66.4%,[7] and in Karachi, the prevalence of dental caries in the FPMs among children 8–12 years old was 30.6%.[8]

Different studies have demonstrated that high sugar, especially sucrose, increases the risk of caries development. Sugar-containing soft drinks can be

cariogenic.[9] A study from Bangalore demonstrated that 76.8% of children consumed snacks in between meals, and a statistically significant correlation was found with between-meal snacking and higher caries prevalence (29%).[10] In Islamabad, children who brushed their teeth only once a day had a higher frequency (45%) of caries compared with children who brushed twice a day (18%).[9] Also, Mohiuddin et al. reported that public schoolchildren suffered from dental caries more than their private school counterparts[11]; this might be explained by the tendency of public school children hailing from low socioeconomic areas, as well as a lack of oral health awareness and improper oral hygiene practices.

Considering the variation in the available information, this study aims to determine the frequency of caries in the FPMs of young children and analyze factors associated with FPM caries.

METHODS

This cross-sectional study was carried out in multiple public and private sector primary schools of Multan District, Pakistan. A total of 350 study subjects were included using the following selection criterias. All children between 6-12 year of age were included in the study. The exclusion criterias were children with mental and physical handicap or with sensory disability, medically compromised, and clinically had hypoplastic and hypomineralized teeth.

Data collection procedure

Children were selected from Multan Public School, Multan and Govt. Primary School Jail Road, Multan, on the basis of our inclusion and exclusion criteria. This study was approved by the Ethics Review Committee. Informed consent was obtained from school authorities. A predesigned questionnaire was administered to eligible respondents. At the end of the questionnaire, the status of dental caries was assessed visually by three dentists certified by the Pakistan Medical and Dental Council, using a dental mirror, dental explorer, and light, in accordance with the international caries detection and assessment system criteria.[12] Radiograph was not used to detect caries. The parents of the study subjects were categorized into three socioeconomic groups on the basis of socioeconomic status (SES); 1) low socioeconomic income, <12000 PKR per month; 2) middle socioeconomic group, 12001–35000 PKR per month; 3) high socioeconomic group, >35000 PKR per month. For data regarding family income and parents' educational level, researchers relied on the information given by the parents/guardians of the study subjects but did not verify this information.

Data analysis

Data were entered and analyzed in SPSS version 20.0. Descriptive statistics were used to calculate the mean standard deviation for quantitative variables, such as age of patients. Frequencies and percentages were calculated for qualitative variables, such as caries and tooth-brushing habit. Effect modifiers, such as age, gender, SES, and parents' educational level, were controlled by stratification. Post-stratification chi-squared test was applied. A p-value ≤ 0.05 was considered statistically significant.

Table 1. Differences in sociodemographic factors with to caries frequency in the study participants

Characteristics	Caries	No Caries	p
Gender			
Male (147)	36	111	0.028*
Female (203)	20372	131	
Age			
7-9 y.o (215)	80	135	0.001*
10-12 y.o (135)	28	107	
Parents Education			
Father			
<8 years (156)	62	132	0.082
≥8 years (210)	46	110	
Mother			
< 8 years (210)	92	118	<0.001*
≥ 8 years (140)	16	124	
Socioeconomic status			
Low (170)	62	108	0.034*
Middle (105)	31	74	
High (75)	15	60	

*statistically significant by chi-squared test

RESULTS

Among the 350 students, 147 were male and 203 were female. After a brief interview and filling out of the proforma, a brief clinical dental examination was performed. Among the 350 students, 108 (30.9%) had caries in their FPMs, and the remaining 242 (69.1%) were caries-free.

There was a difference in the age groups: children aged 7–9 years showed more caries than children aged 10–12 years. Among the 108 subjects with caries, 80 students were aged between 7 and 9 years, whereas the remaining 28 caries-positive children were in the 10–12-year age group.

Table 1 describe the difference of sociodemographic factors with caries frequency in the study participants. A greater proportion of female students were prone to caries compared with males. Among 203 female students, 72 (35.5%) had FPM caries compared with 36/147 (24.5%) males who were caries-positive.

Students were divided into two categories based on parents who had less than 8 years of education and

those whose parents had ≥8 years of education. We also compared the educational level of fathers and mothers with regard to caries frequency. The frequency of dental caries was lower in children whose mothers and fathers had ≥8 years of formal education. When we applied the chi-squared test to determine the association between the educational level of fathers and mothers and caries frequency, the result was statistically significant: p = 0.082 and 0.001, respectively .

A difference in caries frequency was also found between the three socioeconomic groups. Children of parents with low socioeconomic background have proportionally more caries (20.0% caries-free) compared with children of middle socioeconomic class parents (29.5% caries-free), compared with children of high socioeconomic class parents (36.5% caries-free). Thus, among the socioeconomic classes, the highest caries exposure was found among children of low socioeconomic class parents.

DISCUSSION

In most children, the FPM is the earliest erupting tooth of the permanent dentition and has control over the teeth erupting later behind and in front. The FPM has the maximum root surface area and is considered to be the best source of anchorage for moving the tooth, supporting the main masticatory duty, influencing the vertical distance of the upper and lower jaws, occlusal height, and esthetic proportions.[13] Various factors have been associated with caries prevalence in FPM, including the earliest eruption of FPM in oral cavity, caries prone age of the patient due to less-developed food and cleaning habits, and high sugar diet. A multivariate analysis by Llena and Calabuig et al concluded that a cariogenic diet, especially soft drinks, was associated with high DMF-T and DMFT-M scores when both cavitated and non-cavitated caries were considered in the FPM.[14] They concluded that the intake of sweets and soft drinks, brushing frequency, caries in DT, and MIH in PT were the best predictors of caries in PT.[14]

Caries prevalence in the current study is consistent with that in some previous studies but deviates from others. It was reported that the prevalence of first molar caries was 36% in Sri Lankan school children, with 11% of the FPMs affected by caries, consistent with our work. This may be due to similar food habits, socioeconomic factors, and educational level between Pakistani and Sri Lankan populations. On the contrary, Hescot reported that 4.9% of the children have the FPM caries at the age of 6.[15,16] A study from China (2018) determined the caries status of the FPM among young children aged 7–9 years and reported that the prevalence rate of the FPM caries was 47.5%. The prevalence and mean DMFT of the FPM caries were significantly different between age and gender groups ($p < 0.05$). However, the mean DMFS of the FPM caries only showed a significant difference between age groups ($p < 0.05$).[17] The prevalence of caries in the Chinese study is markedly higher than the present study and might be explained by greater consumption of refined sugars and different food habits.

It is not immediately clear why women and girls appear to be more prone to caries, and this might differ between the study populations. One possible explanation is earlier tooth eruption in girls (and therefore, increased time of exposure to cariogenic processes), differences in dietary behaviors, access and utilization of oral health care, hormonal and/or physiological differences, and characteristics of the dentition, tooth enamel, or saliva.[18,19] In the current study, proportionally more female students had caries compared with male students, which is consistent with the literature. Shaffer et al. (2015) reported that no significant gender differences were observed for children aged 1–5 years, but contrary to national and international trends, girls aged 6–11 years had 1.5 fewer affected teeth than boys. However, by ages 12–17, caries indices in the WV girls matched those in boys.[20]

John et al. reported almost twice the number of females affected by caries compared with males; to explain this, he proposed 1) earlier eruption of teeth in girls, hence longer exposure of girls' teeth to the cariogenic oral environment; 2) easier access to food supplies by women and frequent snacking during food preparation; 3) and pregnancy.[21] In the present study, the third point is not applicable as we studied a population from age 8 to 12 years. The first point suggests earlier eruption of teeth among female students, as girls are a step ahead in development than boys; thus, teeth that erupt early will have more chances in developing caries as they are exposed earlier to environmental factors.

Elamin et al. (2018) reported that sociodemographic characteristics affect the frequency of dental caries and that self-rated middle-income parents had the highest prevalence of dental caries in the United Arab Emirates.[22] A difference was found between the SES of parents and caries prevalence among children of school-age; this is in contrast with the current study which found that children of parents in lower SES had increased prevalence of caries compared with children of parents in middle and higher SES. However, our results are similar with another study which reported that children with favorable lifestyle and high socioeconomic background are in better general health and have a good oral health condition compared with children whose parents are of low SES or low quality of life. The findings of this study also show that the parent's own level of education and SES is directly linked with the children's oral health status, especially with regard to caries prevalence.[23]

Our findings and those in Sri Lanka actually report lower frequencies compared with first-world countries. The obvious reason may be similar genetic makeup, environmental factors, and food and hygiene habits. The higher frequency of dental caries in first-world countries may be due to easy access to more refined foods as this trend is quite low in less-developed countries.

This study has some limitations which require discussion. The detection of dental caries was defined based on clinical visualization without dental radiographs. This is a methodological limitation as researchers were not able to carry and use an X-ray machine in the school due to budgetary constraints and radiation exposure laws without protective measures, such as lead shielding. Finally, we relied on the information given by parents/guardians regarding SES and parents' educational level and did not verify these data. Further studies should be conducted with a larger sample size to better determine caries frequency in Pakistan, specifically among the population of lower Punjab.

CONCLUSION

Caries frequency in the FPMs was 30.9% similar with other studies. This study also show that the parent's own level of education and SES is directly linked with the children's oral health status, especially with regard to caries prevalence.

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CONFLICT OF INTEREST

None to declare.

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