Effect of Various Indicators on Caries Experience among 12-year-old School Going Children of Kottayam City

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ABSTRACT

Background: The multifactorial etiology of dental caries nowadays is relatively understood. However, the changing trends in the prevalence of dental caries need continuous understanding and investigation. Thus, the review of the past and prediction of the future is the need of the hour.

Objectives: The objective of the present study was to expand the information with regard to children’s oral health by evaluating the experience, the prevalence, and severity of dental caries in private and public school going children of Kottayam City, Kerala and to investigate the relationship between caries experience and various risk indicators.

Methods: In this cross-sectional study, 12-year-old children (n = 400) were selected from eight schools in two different areas of Kottayam City using stratified random sampling participants dental status was evaluated using the 1997 World Health Organization caries diagnostic criteria for decayed, missing, or filled teeth (DMFT). Demographic data and information concerning dental attendance pattern and brushing frequency were collected in prepared format. Chi-squared test and logistic regression analysis were used for the statistical analysis.

Results: The total number of children in the sample was 400, comprising 188 (52.4%) females and 212 (47.6%) males. The mean DMFT, decayed, missed, or filled surfaces, and significant caries index being 1.49, 2.52, and 3.51, respectively, and the prevalence of caries-free children was 44.7%. Significantly high mean DMFT was found in males (P = 0.011). Private school going children (P = 0.012) and children with irregular dental care (P = 0.001). The public schools (odds ratio [OR] = 0.60 [0.40-0.89]) and regular dental care (OR = 0.54 [0.35-0.84]) was having a protective effect on the caries experience of children.

Conclusion: Though the caries experience was moderate, it was influenced by demographic factors such as gender and school, as well as such socio-behavioral variables and dental care.

Key words: Dental caries, Prevalence, School children

INTRODUCTION

Dental caries is a common disease with low mortality and high morbidity and has a big impact on the general health of a population.¹ It is a major cause of tooth loss and pain around the world. Research over the years has shown that caries is a preventable and controllable disease.² To apply measures which can prevent or control caries, a true depiction of it in a population is a prerequisite. Apparently, expressing caries prevalence as the mean decayed, missing, or filled teeth (DMFT) value does not correctly reflect the skewed distribution, leaving high caries groups undiscovered in the population. The use of the significant caries index (SiC) index may solve the problem related to skewed caries distribution.³ In addition, a new goal was proposed: The SiC index should be <3 DMFT among12-year-old by the year 2015.⁴,⁵ Caries incidence is witnessing a decline in developed countries due to the proper availability of fluoride products, better oral health services, and awareness regarding etiology of caries. At the same time, the incidence of caries is increasing in developing countries.⁶ The risk of caries significantly increases among adolescents...
with a high frequency of cariogenic snack consumption. It is also influenced by maternal socio-economic background and educational level, type of school as well as dietary, hygienic, and other socio-economic factors, which demonstrates the importance of preventive educational programs and a comprehensive caries prevention scheme for school children. At present, Indian dentists are primarily concerned with the treatment of oral diseases rather than their prevention or the promotion of oral health. The public information about and behavior toward oral diseases and prevention are limited, especially in a state like Kerala.

The objective of the present study was to expand the information with regard to children oral health by evaluating the experience, the prevalence, and severity of dental caries in private and public school going children of Kottayam City, Kerala and to investigate the relationship between caries experience and various risk indicators.

MATERIALS AND METHODS

The sample for the present cross-sectional study was 400-12-year-old school children attending four public and four private schools in the cities and villages from Kottayam City. The study was approved by the Ethics Committee of the Oxford Dental College and Hospitals, Bangalore. Permission for the study was obtained from the school authorities, who sought and obtained consent from the parents of the children concerned. A multistage random sampling technique was adopted to select the children. The first stage comprised of all the four zones in Kottayam City and two zones were randomly chosen (i.e., North and South Zone). The second stage comprised all the private and public schools in both the zones of Kottayam City. Four public and four private schools were selected randomly. The third stage comprised all the children within the selected schools. Because the number of children differed from school to school, an equal probability scheme was adopted by sampling with a probability proportional to school size.

 Mothers’ education, dental attendance pattern, type of school, brushing frequency, and socio-economic status (SES) were obtained using a questionnaire. SES was established by using Kuppuswamy’s SES scale - 2014. A calibrated dental examiner conducted the dental examination, and the clinical part of the form was filled in by another trained dentists (kappa values for inter-examiner reliability was 0.89). The World Health Organization (WHO) 1997 caries diagnostic criteria were followed. The DMFT, decayed, missed, or filled surfaces (DMFS), and SiC indices were used to evaluate children dental caries experience. The principles of calculation of the SiC Index are to sort the individuals according to their DMFT, select the one-third of the population with the highest caries values and calculate the mean DMFT for this subgroup. To calculate directly the SiC Index for any given group, a program was used (http://www.whocollab.od.mah.se/explicalculation.xls). Where one could obtain the index simply by putting in the data without sorting the individuals, nor selecting the subgroup.

Statistical Analysis

Statistical Package for the Social Sciences version 19.0 (SPSS Pvt. Ltd., Chicago, IL, USA) was used for statistical analysis. Data were analyzed by descriptive statistics (frequency distribution and cross-tabulation). For the statistical analysis, a significance level of 5% was adopted. The Wilcoxon test and Kruskal–Wallis test were applied to verify whether there were differences between the mean/median DMFT between various variables. The utilization of non-parametric tests was justified since the DMFT index did not present normal distribution in any of the situations studied by Kolmogorov–Smirnov tests (P < 0.001).

Chi-squared test was used to investigate caries experience according to SEC, gender, brushing pattern, and dental attendance pattern. Logistic regression analysis was used to study the effect of the above-mentioned variables on caries experience.

RESULTS

A total of 400-12-year-old children were surveyed (212 males and 188 females). The sample comprised 200 (50%) public and 200 (50%) private school students. The mean DMFT, DMFS, SiC, and the prevalence of caries-free children, both for the sample and the type of school are presented in Table 1. Overall, the prevalence of caries was found to be 53%. The mean number of DMFT was 1.49 ± 1.66, and DMFS was 2.52 ± 3.31. Data on untreated decayed teeth (D) were 0.89 ± 1.19 and filled teeth (F) were 0.33 ± 3.31. Caries prevalence was more in private school (55.7) compared to public school (44.3%).

Significant Caries Index

The present data indicate that the 12-year-old in this sample had a mean DMFT of 1.49 ± 1.66 teeth. In this group of children, 47% had no dental caries experience. Our data indicate that the one-third of the group with the highest caries scores (SiC Index) among 12-year-old had a mean DMFT of 3.51 teeth. SiC was found higher in private school (3.65) compared to public school (3.34).

Oral Health-related Behavior Tooth

Toothbrushing was measured with the response alternatives of 3 times a day; twice a day; once a day; several times a week; never. For the analysis, toothbrushing was dichotomized into >twice a day, or <once a day.

Attendance patterns were measured with a question measuring the frequency of dental care visits as Yearly, immediate past year, more than 1 year, acutely or never. Dental care attendance was split into “regular” (Yearly, immediate past year) or “irregular” (more than 1 year, acutely or never) dental care.

Calculation of Significant Caries Index

The principles of calculation of the SiC Index are to sort the individuals according to their DMFT, select the one-third of the population with the highest caries values and to calculate the mean DMFT for this subgroup. To calculate directly the SiC Index for any given group, a program was used (http://www.whocollab.od.mah.se/explicalculation.xls). Where one could obtain the index simply by putting in the data without sorting the individuals, nor selecting the subgroup.
After comparing mean/median DMFT based on various variables in Table 2, it was found that there was no difference in the distribution of DMFT based on socio-economic status, mother’s education, brushing pattern, and self-perceived oral health. Males had a significantly \( P = 0.011 \) higher mean DMFT (1.71 ± 1.77) compared to females (1.24 ± 1.50). Children in private school (1.67 ± 1.63) were found to have significantly higher \( P = 0.012 \) mean DMFT compared to students in public school (1.32 ± 1.68). Children who are having regular dental attendance showed a significantly \( P > 0.001 \) lower mean DMFT (1.3 ± 1.62) compared to students with irregular attendance (1.86 ± 1.68).

### Participation Analysis

Comparisons between the presence and absence of DMFT among various variables are given in Table 3. Of those included in the study group, 44.7% were classified as belonging to the DMFT = 0 and 55.3% to the DMFT >0 groups. There was a significant difference in the type of school between the groups (Table 3). Individuals in the DMFT >0 group were more from private schools than public schools \( P = 0.012 \). No statistically significant differences in gender, mother’s education, socio-economic status, and self-perceived oral health were found between the groups.

### Oral Health-related Behavior Tooth

Statistically significant differences between the high and low Diet Adherence groups were found, which reflected more caries experience in irregular dental attendance \( P < 0.006 \) (Table 3). No statistically significant differences in the brushing pattern were found between the groups.

### Regression Analysis

A logistic regression analysis was performed with the level of DMFT (0 [DMFT = 0] and 1 [DMFT >0]) as the dependent variable. The independent variables were school and dental care (Table 4). Both private school and regular dental attendance were found to have a significant protective effect on the children. The children in public school were 40% less likely to have caries (odds ratio [OR] = 0.60) compared to students from the private school. The children who were having regular dental care were 46% less likely to have caries (OR = 0.56) compared to children with irregular dental care. After adjusting there was not much difference in the ORs.

### DISCUSSION

The study aimed to assess the experience, the prevalence, and severity of dental caries in private and public school going children of Kottayam City, Kerala and to investigate the relationship between caries experience and various risk indicators. A 12-year-old school children study group was selected as it is caries and disease trend global monitoring age for international comparisons and monitoring. The overall mean DMFT was 1.49 and this can be classified as low dental caries experience. However, the caries-free prevalence was 44.7%, and the caries prevalence was 55.3%. If the results of the study group are used as a proxy for the total Kerala population, the severity of disease is likely to increase in the future.

A goal was formulated jointly by the WHO and the Fédération Dentaire Internationale (FDI) World Dental Federation for oral health to be achieved by the year 2000, to have the global average to be no more than 3 DMFT at 12 years of age. This study shows that DMFT of the 12 year age group were within the limit. However, the SiC was found to be 3.5, which was higher than the goal formulated. This represents the skewed distribution of dental caries in the population. Thus, the assessment of caries status should be done at standard intervals of time, as recommended by the WHO.

In addition, the DMFT score for 12-year olds was 1.49 ± 1.66, lower than reports from other regions of the world.
is higher caries prevalence in girls due to earlier permanent teeth eruption; teeth were exposed for longer periods of time, which increased decay risk.¹⁶

In Kerala, children from higher socio-economic backgrounds were generally enrolled in private schools, and children from lower socio-economic backgrounds primarily attended public schools. The results of the study showed that private school children had a higher mean DMFT value 4.62 ± 3.08 than public school children 5.11 ± 3.6. The public schools had a protective effect with OR being 0.60. The children from private schools were presumably from higher socio-economic levels, increasing their opportunity to access more refined food items. This was in contradiction to studies conducted by Al-Darwish et al.¹²

Children who are having regular dental care were having significantly less mean DMFT (1.3 ± 1.62) compared to children having irregular dental care (1.86 ± 1.68). Regular dental care was even having a protective effect on the caries experience (OR = 0.54). Similar results were given by Pakpour et al.¹³ This suggests that adolescents who regularly visit a dentist are more sensitive to, or aware of their own oral health, and that regular checkup can help to preserve intact teeth from caries attack.

No such system is present in Kerala where routine dental visits are the accepted norm. In addition, there is no national or state oral health policy and oral health education programs have not been launched in the school curriculum. For dental caries among children to be reduced, and oral health improved, responsible policymakers must develop and implement appropriate oral health promotion and care programs for use in schools and primary health care centers.

From explanations to limitations as in any study there were limitations to this study, which need to be discussed. First, the data were cross-sectional. Causality cannot be determined using a cross-sectional design. Second, no attempt was made to adjust for dietary factors and fluoride intake.

**Recommendations**

Oral health authorities should also focus attention on policies that promote behavioral changes in dietary habits at a national level, which can be achieved through restrictions on advertising and legislation to control unhealthy foods, and bans on unhealthy and sugary food sales in and around schools with enhanced accessibility to healthy foods.

Implementation of community-based preventive oral health programs focused on healthy diet and adequate oral hygiene practices should be promoted in school curricula and services to combat the growing dental caries problem.

**CONCLUSION**

Though the caries experience was moderate, it was influenced by demographic factors such as gender and school, as well as such socio-behavioral variables as dental care. With this information, health providers in India and elsewhere can most appropriately target programs and policies to reduce disparities in access to preventive services and treatment for all.

**REFERENCES**


HOW TO CITE THIS ARTICLE: