Relationship of Sociodemographic Factors on Dental Caries Experience among 11–14-Year-Old Schoolchildren in India

Abstract

Background: As dynamics of caries is changing, there is a need to understand the impact of sociodemographic factors on dental caries to broaden the horizon of dental caries etiology. Aim: The aim of this study was to assess the relationship of sociodemographic factors on dental caries experience among 11–14-year-old schoolchildren in India. Materials and Methods: A cross-sectional study was carried out among 11–14-year-old schoolchildren in 2015 at Rohtak, India, after approval from the Institution’s Ethics Committee. A multi-stage cluster sampling technique was employed for selecting a school randomly from every cluster. Every odd-numbered child from selected class was included in the study through systematic random sampling. Demographic factors were recorded such as education, occupation, income, and socioeconomic status (SES) were assessed using modified Kuppuswamy classification (Oberoi SS 2015). Dental caries was recorded using Caries Assessment Spectrum and Treatment index. Data were analyzed using SPSS 18, Kruskal–Wallis, and Chi-square tests were used with P value fixed at 0.05. Results: The prevalence of dental caries was 28.6% with mean decayed, missing, or filled teeth of 0.60 ± 1.13. Age, gender, position of child, number of siblings, type of family, father’s and mother’s education, and father’s occupation had no significant relationship with dental caries (P > 0.05), whereas mother’s occupation, family income, and SES were significantly related to dental caries (P < 0.05). Conclusions: High socioeconomic status of parents had a significant role on increased dental caries experience among children.

Keywords: Dental caries experience, Kuppuswamy scale, Rohtak, social inequalities, sociodemographic factors

Introduction

The enjoyment of highest attainable standards of health is one of the fundamental rights of every human being without distinction of race, religion, and socioeconomic status. Sociodemographic factors play an important role in health outcomes of an individual. Oral health is an integral part of general health. Despite evidence-based strategies, the burden of oral diseases is increasing in many regions across the world and particularly in developing countries. The WHO “Oral health report 2013” has highlighted the pandemic distribution of oral diseases.

Social inequalities have major consequences on oral health. Even in the developed countries like the United States, over 50% of 5–9-year-old children have at least one cavity or restoration, and that proportion increases to 78% among 17-year-olds, directly indicating the role of socioeconomic factors. The impact is far more worse in developing countries, like India, where the prevalence of dental caries ranges from 60%–65% making it the most prevalent chronic disease among schoolchildren.

A substantial body of literature documents the relationship between socioeconomic status (SES) and caries and consistently finds an inverse relationship between SES and the incidence and prevalence of dental caries. SES is a broader concept embracing income, skills, and attitude toward hygiene, parent’s education, job, and nutritional status which directly or indirectly influences the development of healthy lifestyle and behaviors and helps habit formation necessary for optimal oral health.

The biological plausible mechanism of sociodemographic variables cannot be established as they are complex and challenging because the influence on dental caries may be due to a combined synergistic effect of socioeconomic factors.
effect along with local host factors of dental caries such as diet and oral hygiene practices; however, influence of SES can be studied as a surrogate marker for host factors affecting caries. Moreover, as the dynamics of caries is changing; there is a need to understand the impact of sociodemographic factors on dental caries to broaden the horizon of dental caries etiology.

Against this background and fortified with the fact that such comprehensive community-wide studies are few in India, the present study was undertaken to assess the relationship with various sociodemographic and socioeconomic factors with dental caries experience among 11–14-year-old school-going children in Rohtak city, Haryana, India.

Materials and Methods

Study setting

A cross-sectional descriptive survey was conducted among 11–14 years’ school-going children of Rohtak city, Haryana, India, between June and August 2015.

Official permission, ethical clearance, and informed consent

The study protocol was reviewed by the Institutional Ethics Review Board and was granted ethical clearance (IEC/2015/53). An official permission was obtained from the District Education Officer and also from all the concerned school authorities. After explaining the purpose and details of the study, a written informed consent was obtained from the parents of all children aged 11–14 years.

Sample size derivation

Depending on the prevalence obtained in the pilot study, the sample size was calculated using the standard formula \( z^2pq/E^2 \) seeking results at 95% confidence interval for which the value of \( z = 1.96 \), the allowable error (\( e \)) taken as 0.05. As the sampling technique employed was cluster random sampling, thus a design effect of 1.8 was used to adjust sample size. The minimum sample size was determined to be 540.

Sampling technique

The sample frame consisted of middle and high schools in Rohtak city, and the list was obtained from the District Education Officer. Multi-stage cluster sampling technique was employed in which Rohtak city was divided into nine clusters. In the second stage, one school was randomly selected from each cluster with lottery method. Children studying from 6th to 10th standards (11–14 years old) were considered and every odd roll numbered child of selected standards was enrolled to reach a sample of 586.

Schedule of survey

Visit to the schools was made on the predecided dates. It was established during the study that on an average, it took about 15–20 min to examine a child. Around 25–30 children were examined in a day. Before conducting the study, training and calibration of the examiner were done at the department of public health dentistry of the dental institution where the study was conducted to assess the examiner variability, and kappa value was found to be 0.82 which was satisfactory.

Dental examination

Demographic details of children were recorded including age, gender, and locality. Parental education, occupation, and income were also elicited. Socioeconomic status was calculated using modified Kuppuswamy classification 2015 (Oberoi SS 2015).[8] Caries was recorded using the Caries Assessment Spectrum and Treatment (CAST) index developed by Frencken et al in 2011.[9]

Statistical analysis

Data entry and analysis were performed using Statistical Package for Social Sciences version 18, IBM Corporation, (SPSS Inc., Chicago, IL, USA). Chi-square test was used to find the association between caries prevalence and gender, Kruskal–Wallis test was used to find the difference of mean decayed, missing, or filled teeth (DMFT) between various sociodemographic variables. \( P \) value was fixed at 0.05.

Results

A total of 586 participants of age 11–14 years were recruited for the present study. There were 73% (428) male and 27% (158) female with the mean age of 11.92 ± 1.06 years [Table 1]. The distribution of sociodemographic characters is shown in Tables 1 and 2. The overall mean DMFT of the study population was 0.60 ± 1.13. The highest mean DMFT

| Table 1: Sociodemographic details of the study participants |
|----------------------------------------------------------|
| Characteristics                                          | \( n \) (%) |
| Age (years)                                              |            |
| 11                                                      | 282 (48.1) |
| 12                                                      | 142 (24.2) |
| 13                                                      | 89 (15.2)  |
| 14                                                      | 73 (12.5)  |
| Number of children in family                             |            |
| 1                                                       | 33 (5.6)   |
| 2                                                       | 352 (60.1) |
| 3 and above                                             | 201 (34.3) |
| Child position among siblings in the family              |            |
| 1st                                                     | 273 (46.6) |
| 2nd                                                     | 234 (39.9) |
| 3rd                                                     | 61 (10.4)  |
| 4th and above                                           | 18 (3.1)   |
| Type of family                                           |            |
| Nuclear                                                 | 415 (70.8) |
| Joint                                                   | 171 (29.2) |
| Mean age: 11.92±1.06 years                              |            |
was observed in 12-year-old female (0.75 ± 1.24) and the lowest mean DMFT was observed in 12-year-old male (0.36 ± 0.77). Results showed that with increased number of siblings, the mean DMFT of the child decreased as well, but the difference was not found to be statistically significant (P = 0.72). Similarly, the difference in mean DMFT of the child across the position of child among siblings did not differ significantly either (P = 0.98).

When the onset of dental caries was correlated with family status, it was found that the mean DMFT of children with a nuclear family was more when compared to children in a joint family but was not statistically significant (P = 0.82).

When the mean DMFT scores of children according to their father’s education was correlated, children whose father had higher education had a higher mean DMFT than children whose father had lesser education, but the difference was not found to be statistically significant (P = 0.25). Similarly, no significant difference was observed among different education levels of mother and mean DMFT of child (P = 0.73) [Table 3].

Father’s occupation had no significant role on child’s mean DMFT (P = 0.38), whereas it was found that higher the level of mother’s occupation, more was the mean DMFT (4.00 ± 2.82) of the child compared to mean DMFT (0.56 ± 1.02) of children whose mothers were unemployed, and difference was found to be statistically highly significant (P = 0.00) [Table 4].

Children of parent’s with low income had a statistically significant (P = 0.03) lower mean DMFT compared to children of parent’s with higher income [Table 5]. The mean DMFT of the children belonging to higher socioeconomic status was more when compared to children belonging to lower SES, and the difference was found to be statistically significant (P = 0.03) [Table 6].

Discussion

SES is a measure of physical assets, economic status, education, occupation, social position, social participation, caste, muscle power, and political influence of individuals and families. It is an important determinant of health and nutritional status as well as of mortality and morbidity. Socioeconomic status also influences the accessibility, affordability, acceptability, and actual utilization of various available health facilities.

The socioeconomic matrix of India has significantly changed in the last decade and has resulted in a decrease in the percentage of people living below poverty line. Hence, the present cross-sectional study was carried out to assess the relationship of socioeconomic status with dental caries among 11–14 years old children in Rohtak City.

Measuring SES is a challenging and different scales have been developed. Kuppuswamy and Prasad are the two classifications which have been most commonly used and validated in urban settings. Kuppuswamy classification is a composite scale of income, occupation, and education unlike BG Prasad, which solely relies on income, and thus, former scale is a better indicator of SES. It can also be upgraded for any year by utilizing price index. Hence, the current study utilized modified Kuppuswamy Classification 2015 (Oberoi SS 2015), along with its domains to better understand the impact of SES on caries.

### Table 2: Parent’s education, occupation, income, and socioeconomic status of the study participants

| Characteristics | Father, n (%) | Mother, n (%) |
|-----------------|---------------|---------------|
| Parent’s education |               |               |
| Illiterate      | 2 (0.3)       | 15 (2.6)      |
| Primary         | 5 (0.9)       | 14 (2.4)      |
| Middle          | 21 (3.6)      | 53 (9.0)      |
| High            | 135 (23.2)    | 146 (24.9)    |
| Intermediate/diploma | 167 (28.7)  | 151 (25.8)    |
| Graduate/postgraduate | 244 (42.0)  | 203 (34.6)    |
| Profession/honors | 2 (0.3)       | 3 (0.5)       |
| Expired         | 5 (0.9)       | 1 (0.2)       |
| Parent’s occupation |           |               |
| Semi-profession | 35 (6.0)      | 2 (0.3)       |
| Clerical/shop owner | 12 (2.0)   | 10 (1.7)      |
| Skilled worker  | 63 (10.8)     | 8 (1.4)       |
| Semi-skilled worker | 384 (65.5) | 23 (3.9)      |
| Unskilled worker | 45 (7.7)      | 69 (11.8)     |
| Unemployed      | 42 (7.2)      | 473 (80.7)    |
| Expired         | 5 (0.9)       | 1 (0.2)       |
| Family income (Rs) |         |               |
| 1932-9633      | 99 (16.9)     |               |
| 9634-19,290    | 130 (22.2)    |               |
| 19,291-38,600  | 357 (60.9)    |               |
| SES            |               |               |
| Upper          | 26 (4.4)      |               |
| Upper middle   | 355 (60.6)    |               |
| Lower middle   | 173 (29.5)    |               |
| Upper lower    | 25 (4.3)      |               |
| Lower          | 7 (1.2)       |               |

SES=Socioeconomic status

| Characteristics | n (%) |
|-----------------|-------|
| Mean DMFT±SD    |       |
| Father          |       |
| Illiterate      | 0.00±0.00 | 0.53±0.99 | 0.25(father) |
| Primary         | 0.20±0.44 | 0.71±1.06 | 0.73(mother) |
| Middle          | 0.43±0.87 | 0.53±1.08 |      |
| High            | 0.56±1.03 | 0.50±0.94 |      |
| Intermediate    | 0.58±1.06 | 0.58±1.07 |      |
| Graduate and postgraduate | 0.66±1.25 | 0.71±1.31 |      |
| Profession and honors | 2.50±2.12 | 0.69±1.42 |      |
| Total           | 0.60±1.13 | 0.60±1.13 |      |

DMFT=Decayed, missing, and filled teeth, SD=Standard deviation
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Mean DMF±SD

- Shyam, et al.: [16] and Mohammadi and Goyal (32.6%), and Grewal (49.2%), and Grewal and Mohebbi and two studies in Seoul and Korea carried [21]

This variation could be attributed to the fact that a wider age range of 6–14 years was included compared to our study.

Gender

Cultural and social differences between men and women influence their oral health status by affecting their exposure to risk factors and shaping their access to protective factors and care. Our study revealed that females had a higher mean DMFT compared to males but was not found to be significant. Similar findings were reported in studies conducted by Popoola and Denloye[24] and Khan.[21]

Birth order, number of children in family, type of family

There was no significant association between birth order, number of children in family, type of family, and dental caries. Similar results were obtained by Namal et al.,[25] whereas our results did not support the findings from a previous study done by Nicolau et al.[20] who reported that the first child in the family often shows better oral health compared to his/her siblings because the child is given full attention.

Education

Jahani et al.[27] and two studies in Seoul and Korea carried out by Jin et al.[28] reported that there was no significant association between parental educational level and the prevalence of dental caries. These findings are in agreement with results of our study. However, these findings were in contrast to that reported by Katageri et al.[29] and Mohebbi et al.[30]

Occupation

Dental caries experience was higher among the children whose mothers were professionals and attributing reason may be lack of parental time leading to less care of their children and lower utilization of preventive health services which is in contrast to studies done by Narang et al.[19] and Jahani et al.[27]

SES and Dental caries

Modified Kuppuswamy scale 2015 (Oberoi SS 2015)[8] with readjustment of the per capita income to suit the present levels was used for classifying the individuals into different SES categories. This study demonstrated that children belonging to higher SES and children with higher family income had higher dental caries experience, and it was found to be statistically significant (P < 0.05). The possible influences of socioeconomic status on dental health may be a consequence of differences in dietary habits and the role of sugar in the diet.

This finding is similar to the trend observed in other developing countries where caries prevalence was directly proportional with increasing socioeconomic status. Woodward and Walker[31] attributed this to an increase in sugar consumption in those developing countries in

CAST index[9] was used to assess caries status as this index measures premorbid and morbid stage of dental caries. Furthermore, CAST also distinguishes dentinal carious lesions that can be restored from those that are beyond treatment with a restoration alone. However, there is a paucity of literature on CAST index, so we converted CAST to DMFT scores, making our study comparable to the existing studies. The mean DMFT based on CAST scores in the present study was 0.60 ± 1.13 with D (Decayed teeth) as the main contributor. Similar results were obtained by studies done by Shailee et al.[14] and Mohammadi et al.[15] and not in concordance with that reported by Sharma et al.,[16] Goel et al.,[17] and Dhar et al.[18] Prevalence of caries among 12 years was 24.2% which is less compared to that reported in Shailee et al.[14] (32.6%), Das et al.[19] (49.2%), and Grewal et al.[20] (36.3%).

Association of sociodemographic factors

Age

The present study showed no significant relationship between dental caries and age. Similar findings were reported by Khan et al.[21] and Goyal et al.[22] and in contrast to studies conducted by Mohammadi et al.[15] Sharma et al.,[16] and Saravanan et al.[23]

### Table 4: Relationship of parent’s occupation with dental caries experience of the study participants

| Occupation         | Mean DMF±SD | P     |
|--------------------|-------------|-------|
|                    | Father      | Mother|
| Unemployed         | 0.38±1.03   | 0.56±1.02 | 0.38 (father) |
| Unskilled          | 0.67±1.26   | 0.80±1.58 | 0.00 (mother) |
| Semi-skilled       | 0.65±1.17   | 0.48±0.89 |
| Skilled            | 0.41±0.87   | 1.25±1.83 |
| Clerical, shop owner, farmer | 0.17±0.38   | 0.30±0.67 |
| Semi-profession    | 0.71±1.17   | 4.00±2.82 |
| Total              | 0.60±1.13   | 0.60±1.13 |

DMF=Decayed, missing, and filled, SD=Standard deviation

### Table 5: Relationship of the family income with dental caries experience of the study participants

| Monthly income (Rs) | Mean DMF±SD | P     |
|---------------------|-------------|-------|
| 1932-9633           | 0.47±0.97   | 0.03* |
| 9634-19,290         | 0.46±0.99   |       |
| 19,291-38,600       | 0.68±1.22   |       |
| Total               | 0.60±1.13   |       |

*P < 0.05. DMF=Decayed, missing, and filled, SD=Standard deviation

### Table 6: Relationship of socioeconomic status with dental caries experience of the study subjects

| SES        | Mean DMF±SD | P    |
|------------|-------------|------|
| Upper      | 0.69±1.21   | 0.03*|
| Middle     | 0.48±1.01   |      |
| Lower      | 0.45±0.88   |      |
| Total      | 0.60±1.13   |      |

*P < 0.05. DMF=Decayed, missing, and filled, SD=Standard deviation, SES=Socioeconomic status
addition to limited access to fluoride and other dental caries preventive measures. According to Seyedein et al.,[32] developing countries such as Kenya, Iraq, and Lebanon have Westernized their dietary habits which have resulted in an increase in their caries prevalence. Pontigo-Loyola et al.[33] concluded that the greater the SES, higher the dental caries.

This highlights the need for assessing the individual components of DMFT separately between the SES categories rather than just comparing the DMFT scores altogether. The assessment of individual components only can highlight the difference between different SES categories. Klein and Palmer,[34] in their landmark study on caries epidemiology also found no difference in the distribution of overall DMFT score between different SES groups. This fact is not corroborated with the results that are obtained by Narang et al.[5] and Elfaki et al.[6] who stated that there is a strong relationship between socioeconomic status and dental health condition.

SES demonstrated considerable variability in the results of the association with dental caries. It is possible that the classifications used for this variable might have affected this finding. Although SES is generally classified as high, medium, or low, this subjective classification depends on the researcher’s assessment.

Limitations of the study

This was a cross-sectional study and hence limits the ability to identify causative factors. Longitudinal designs would increase the knowledge on the determinants of dental caries. In addition, no information was available about nutritional factors and other contributing factors. It is most appropriate to consider such factors in the future studies. Furthermore, numerous questionnaires and variables had missing values related to socioeconomic factors.

The potential ecological fallacy is that the social level evident within the social environment where the individual resides may not apply to every person. This may not only weaken the potential relationship between SES and health or other outcomes but could lead to conclusions about individuals that are valid only at an aggregate.

Conclusion

High socioeconomic status of parents was significantly associated with increased dental caries experience among children. To protect and preserve children’s oral health, more attention should be paid to health promotion policy, which considers social, economic, and environmental factors affecting child’s dental status.

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Conflicts of interest

There are no conflicts of interest.

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