Assessment of Dental Caries Status and Oral Hygiene Practices among 6–10-year-old Rural and Urban Schoolchildren in South Bengaluru, Karnataka, India

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ABSTRACT
Dental caries is the most common disease affecting oral cavity. Despite credible scientific advances and the fact that dental caries is preventable, the disease continues to be a major public health problem.

Aim: To assess the dental caries status and oral hygiene practices among 6–10-year-old rural and urban schoolchildren in south Bengaluru.

Materials and methods: A total of 452 children from four schools which included one government school from rural and urban area and one private school from rural and urban area in south Bengaluru. Detailed pro forma was used, and information was recorded through an interview system. The examination for dental caries was made according to the dentition status and treatment needs as described by the World Health Organization (1997) using Community Periodontal Index Probe and Plane Mouth Mirror (type III examination), under natural day light in school premises. The examination was done by a single examiner and recorded by the trained personnel.

Results: Prevalence of dental caries was more in rural schoolchildren. More than five decayed teeth were documented in higher percentage of children in rural government school, while it was much less in children of other schools.

Conclusion: A comprehensive community-focused oral healthcare intervention that includes oral health education in elementary schools and homes is recommended to increase general oral health awareness.

Keywords: Dental caries, Oral hygiene practices, School children.

INTRODUCTION
Dental caries is one of the oldest and most common diseases affecting oral cavity and is a microbial disease of the calcified tissues of the teeth, characterized by demineralization of the inorganic portion and destruction of the organic substance of the tooth. The prevalence and incidence of dental caries in a population is influenced by a number of risk factors such as age, sex, ethnic group, dietary patterns, and oral hygiene habits.

Prevalence of this disease is declining in the developed countries, while there is slow rise in many developing countries. In India, a developing country, faces many challenges in rendering oral health needs. Majority of Indian population resides in rural areas of which more than 40% constitute children. Prevalence of dental caries in 5- and 12-year-old children in India has been reported to be low (50% and 52.5% in 5- and 12-year-olds, respectively) compared to many other parts of Asia.

Many industrialized countries have experienced a dramatic decline in dental caries which can be attributed to improve socioeconomic conditions, changing lifestyles, self-care practices, use of fluorides, and water fluoridation effective use of preventive oral health services. Behavioral practices feature prominently in the oral health literature reflecting the fact that much of the dental disease is preventable. Good oral hygiene wards off harmful microbes that may cause oral disease. Keeping good oral hygiene lowers the need to treat dental problems.

Treatment of dental caries involves restorative or pulp therapy which is not only expensive and time-consuming but also painful and demanding for the child. Considering these factors, prevention of caries and installing good oral hygiene measures seems to be the most acceptable and desirable option.

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Hence, the present study is undertaken to assess the dental caries status and compare oral hygiene practices in rural and urban schoolchildren in south Bengaluru.

**Materials and Methods**

A survey was conducted to assess dental caries status and oral hygiene practices among 6- to 10-year-old rural and urban schoolchildren in south Bengaluru. A total of 452 children from four schools, which include one government school from rural and urban area and one private school from rural and urban area in south Bengaluru, were included.

Before the examination, official permission was obtained from the concerned school authorities for participating students, and informed written consent was also obtained from the parents. Detailed proforma was used, and information was recorded through an interview system.

The examination for dental caries was made according to the dentition status and treatment needs as described by the World Health Organization (WHO) (1997) using Community Periodontal Index Probe and Plane Mouth Mirror (type III examination), under natural day light in school premises. The examination was done by a single examiner and recorded by the trained personnel.

**Results**

The association between school of study and the help/support they get to clean their teeth was found to be statistically significant (p value < 0.05) (Fig. 1).

Statistically significant association was observed between the school of study and material and method brushing, and higher number of samples using finger with any other materials were found in rural government schools compared to other schools (Fig. 2).

Statistically significant association was observed between the school of study and the frequency of cleaning (p value < 0.01). More children in rural private school and urban private school brush their teeth twice daily, whereas the same was very less in rural government and urban government schools (Fig. 3).

No significant association was observed between the school of study and the practice of brushing before going to bed (p value > 0.05) (Fig. 4).

The association between school of study and the number of decayed teeth was found to be statistically significant (p value < 0.05) (Figs 5 and 6).

**Discussion**

Dental caries ranks among the most significant of human diseases mainly because of its high frequency of occurrence. Dental caries and its consequences together constitute a very realistic problem in human. Humanity has been plagued by the persistence of this very unique disease ever since prehistoric times. The increased rate of caries in children has been one of the major health problems in the developing countries.

Oral health care is generally a neglected health aspect in India. Priority to oral health care is low because of lower finance allocations and preference in dealing with other health problems over oral problems. The failure to provide quality oral health care has been further aggravated by lack or limited access to oral health care by the government. It becomes important to focus and implement preventive strategies for oral health care.

The impact of poor oral hygiene is observed at school and the workplace. Dental hygiene is poor in India with improper brushing of teeth, no washing of mouth after food intake, widespread addiction to tobacco, hyperacidity, and increased consumption of refined sugar and sweetened food. Improving oral health in especially rural children is still a dream in a developing country like India. Deprived communities suffer the most and so have the most need but receive the fewest resources. About 72% of the Indian population living in rural areas have no access to the private dental health sector. According to the Centers for Disease Control and Prevention (CDC), more than 19% of children have untreated cavities and approximately 41% of children have decay in their “baby teeth”.

In the present study, the schools were classified as urban and rural based on the fact that oral health care in rural areas is limited due to shortage of dental manpower, financial constraints, and the lack of perceived need for dental care. On the other hand, in urban areas, accessibility and awareness to dental treatment are better. These schools were further divided into government and private schools. Government schools are funded by government and private schools are funded by individual proprietors or nongovernmental organizations.

The reliability of the questionnaire data was controlled by use of closed ended structured questionnaire, and the only potential information bias may relate to the possibility that subjects would report acceptable rather than factual behavior, although teachers were not allowed while the students answered the questionnaire.

In the present study, among 452 (100%) children screened, 225 (49.7%) were boys and 227 (50.2%) were girls. Almost equal number of boys and girls were seen in our study (Tables 1 to 6).

In our study, we found children from private schools of both urban and rural area brush their teeth themselves, as they were already taught by their parents. Children who were brushing under supervision or with others help mainly belonged to urban schools. Results obtained can be due to more awareness of oral health among parents of private school children who were well educated. Parents monitoring is very important in maintaining children oral health. Teaching and reinforcing appropriate brushing technique by parents helps in maintaining good oral health.

The present study revealed that various oral hygiene tools were utilized by the children examined such as toothbrush and toothpaste, toothbrush and tooth powder, rangoli, charcoal,
Results showed that majority of the children using toothbrush and toothpaste belonged to urban area, which are the commonly used oral hygiene aids and materials. These findings were similar to the other studies conducted by Retnakumari, Saravanan et al., Okeigbemen, David et al.\textsuperscript{4,7–9} In our study, all children using finger and any other material like charcoal, salt, ash, etc belonged rural area; among them 9 (82%) children belonged rural government school and 2 (18%) belonged to rural private school. It was observed that the percentage of caries was high in children who used other materials when compared to children who used toothpaste and tooth powder. The findings was similar to the studies conducted by Kapoor et al., Sarvanan et al.\textsuperscript{8,10}
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Fig. 5: Frequency of changing of brush

Fig. 6: Decayed teeth

Table 1: Do they brush their teeth?

| School             | Themselves | Other's help | Under supervision |
|--------------------|------------|--------------|-------------------|
|                    | n (%)      | n (%)        | n (%)             | $\chi^2$ | p value |
| Rural private      | 113 26     | 0 0          | 0 0               | 14.387  | 0.026*  |
| Rural government   | 111 25     | 2 40         | 0 0               |          |         |
| Urban government   | 107 24     | 2 40         | 4 100             | 100      |         |
| Urban private      | 112 26     | 1 20         | 0 0               |          |         |
| Total              | 443 100    | 5 100        | 4 100             |          |         |

Table 2: Oral hygiene practices

| School             | With toothbrush and toothpaste | With toothbrush and toothpowder | With finger and toothpowder | Finger with any other material |
|--------------------|-------------------------------|--------------------------------|-----------------------------|--------------------------------|
|                    | n (%)                         | n (%)                          | n (%)                       | n (%)                         |
| Rural private      | 109 25                        | 1 17                           | 1 17                        | 2 18                          |
| Rural government   | 100 23                        | 1 17                           | 2 33                        | 9 82                          |
| Urban government   | 108 25                        | 2 33                           | 3 50                        | 0 0                           |
| Urban private      | 111 26                        | 2 33                           | 0 0                         | 0 0                           |
| Total              | 428 100                       | 6 100                          | 6 100                       | 11 100                        |
Tooth brush is more effective for removal of plaque from the tooth surface. The low prevalence of dental caries in toothbrush users may be due to the fact that the bristles of a toothbrush could reach and clean those inaccessible areas of oral cavity that might not be accessible to the finger and other materials. This study revealed that children from urban area had positive attitude toward oral health and hygiene practices and also lower prevalence of dental caries compared to rural children. Urban areas provided easy access to toothbrushes and toothpaste and the use of this hygiene. It might also be possible that dentifrices deliver active ingredients such as fluoride, which lead to effective plaque control and prevention of caries. The higher level of parent’s education, easier access to information through the media and dentists, or other in urban areas may explain these differences.11

Substantial proportions of schoolchildren did not perform regular oral hygiene; in particular, oral hygiene practices were infrequent in rural areas. This variation in oral hygiene practices with location has been observed in many of the previous studies that can be attributed to low socioeconomic status, lack of dental information, and the cultural differences between urban and rural areas. Thus, there is an urgent need for establishing primary oral health services in the region through school dental health services to meet the basic dental care needs of people living in rural communities.

In present study 434 children were brushing only once daily, 11 (61%) urban private school children were brushing twice daily, and children were not brushing two times in rural government school. These results were in accordance with study conducted by Ingle et al., Shailee et al.12,13 Caries can be prevented by habit of cleaning of teeth twice daily with fluoride containing toothpaste which may have neutralized the potential damage. Statistically significant association was observed between the school of study and the frequency of cleaning (p value < 0.01). More children in rural private school and urban private school brush their teeth twice daily whereas the same was very less in rural Government and Urban Government schools. In both rural and private schools should reinforce good oral hygiene practice.

In our present study, 452 children were screened, 446 children belonged to both rural and urban schools did not brush their teeth before going to bed, 6 children brushed their teeth before going to bed, 4 (67%) belonged to urban government and 2 (33%) belonged to rural private school. No significant association is observed between the school of study and the practice of brushing before going to bed (p value > 0.05).

In the present study, majority of children in rural schools changed their brush between 3 and 6 months whereas most of children in urban schools used to change their brush when it used to wear out, i.e., between (2–3 months). This can be attributed to family income, parental education, parent’s dental knowledge, attitude, behavior of parents of urban children, and regular dental checkup.

The results of the study also showed that overall, more number of decayed teeth was seen in rural schoolchildren when compared to urban schoolchildren. Among the rural schools, higher no of govt. school children had more than 5 teeth decayed. The higher prevalence of dental caries among children in government schools could be due to lack of parental awareness/prioritization for care, affordability issues, issues of child neglect, etc. Results are in conformity with the studies reported by de Almeida et al. and Mahesh Kumar et al.14,15 and contradictory to those of Adekoya-Sofowora et al.16 Prevalence of caries is lower in private schools due to urbanization, socioeconomic status, availability of dental services, parental supervision while brushing, good oral hygiene practices and children were using toothpaste and toothbrush for cleaning of teeth. Results of our study is in contrast to the studies conducted by Irigoyen et al., Mandal et al., Yee et al. and Varenne B et al.,17–20 where the prevalence of dental caries was significantly higher among urban children compared to rural children. This difference was attributed to dietary and snacking habits among urban schoolchildren.

Economic challenges tend to have severe impact on rural people since they have limited financial resources. This is quite evident from this study as shown by limited availability of basic oral hygiene products, such as fluoride-containing toothpastes and the poor oral hygiene habits for cleaning teeth reported by rural children. It is reasonable to conclude that caries experience of rural children is worse than urban children. Poor oral hygiene practice significantly increases the risk of developing caries. Prevalence of caries is less in urban school children could be due to greater

### Table 3: Frequency of brushing

| School          | Once | (%) | Twice | (%) | χ²  | p value |
|-----------------|------|-----|-------|-----|-----|---------|
| Rural private   | 108  | 25  | 5     | 28  | 15.969 | 0.001*  |
| Rural government| 113  | 26  | 0     | 0   |      |         |
| Urban government| 111  | 26  | 2     | 11  |      |         |
| Urban private   | 102  | 24  | 11    | 61  |      |         |
| Total           | 434  | 100 | 18    | 100 |      |         |

### Table 4: Brush before going to bed

| School          | Yes | (%) | No  | (%) | χ²   | p value |
|-----------------|-----|-----|-----|-----|------|---------|
| Rural private   | 2   | 33  | 111 | 25  | 7.432 | 0.059   |
| Rural government| 0   | 0   | 113 | 25  |      |         |
| Urban government| 4   | 67  | 109 | 24  |      |         |
| Urban private   | 0   | 0   | 113 | 25  |      |         |
| Total           | 6   | 100 | 446 | 100 |      |         |
Table 5: Frequency of changing of brush

| School             | When it wears out | Every 6 months | Between 4–6 months | Don't know | χ²  | p value |
|--------------------|-------------------|----------------|--------------------|------------|-----|---------|
| Rural private      | 37 (13)           | 21 (57)        | 52 (49)            | 3 (21)     | 205.751 | <0.001* |
| Rural government   | 45 (15)           | 3 (8)          | 55 (51)            | 9 (64)     |      |         |
| Urban government   | 99 (34)           | 12 (32)        | 0 (0)              | 2 (14)     |      |         |
| Urban private      | 112 (38)          | 1 (3)          | 0 (0)              | 0 (0)      |      |         |
| Total              | 293 (100)         | 37 (100)       | 107 (100)          | 14 (100)   |      |         |

Table 6: Decayed teeth

| Decayed teeth (d) | Rural government | Rural private | Urban government | Urban private | χ²  | p value |
|-------------------|------------------|---------------|------------------|---------------|-----|---------|
| 1 tooth           | 14 (23)          | 12 (18)       | 14 (23)          | 21 (45)       | 26.012 | 0.038* |
| 2 teeth           | 14 (23)          | 19 (28)       | 17 (27)          | 8 (17)        |      |         |
| 3 teeth           | 7 (11)           | 5 (7)         | 7 (11)           | 5 (11)        |      |         |
| 4 teeth           | 11 (18)          | 17 (25)       | 7 (11)           | 11 (23)       |      |         |
| 5 teeth           | 5 (8)            | 8 (12)        | 8 (13)           | 0 (0)         |      |         |
| >5 teeth          | 11 (18)          | 6 (9)         | 9 (15)           | 2 (4)         |      |         |
| Total             | 62 (100)         | 67 (100)      | 62 (100)         | 47 (100)      |      |         |
awareness, more regulated toothbrushing, better accessibility and utilization of dental services.

CONCLUSION
Dental caries prevalence is more in rural schoolchildren. A comprehensive community-focused oral healthcare intervention that includes oral health education in elementary schools and homes is recommended to increase general oral health awareness. Establishment of a school-based oral health education program in rural schoolchildren, including parents and teachers, is recommended.

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