

Dental Caries Prevalence of Children in Kerala: A Paradigm Shift Needed toward a Kerala Model of Health

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Abstract

Kerala state in India ranks high in the health-care indicators and is considered to be giving high importance in primary health care. This review of literature was done to know the the prevalence of dental caries in children below 16 years of age in Kerala State. Online search for articles in PubMed, Scopus, and Google Scholar fetched 15 articles. The prevalence of caries in those articles was reviewed and discussed with other studies and systematic reviews published recently on the dental caries in India. This review shows that the prevalence of dental caries in children is high. Considering the status of Kerala in health-care facilities and reach to the grassroots level, it is recommended that government can bring about new initiatives to decrease the prevalence of dental caries in Kerala.

Keywords: Caries prevalence, dental caries, early childhood caries

INTRODUCTION

The prevalence of diseases is of great interest and is a principal subject of many epidemiological researches. The dental caries, the microbial disease of calcified structures of the teeth, is prevalent all over the world and is considered to be pandemic.^[1] The prevalence of dental caries varies from different areas and population. This disease is of multifactorial etiology and many variables play an important part as the risk factor.

The best predictor of future caries is past caries, which means that children affected by caries are likely to have more caries in the future. The Global Burden of Disease Study^[2] in 2017 estimated that oral diseases affect about 3.5 billion people across the globe, with caries of permanent teeth being the most common condition. It is estimated that 2.3 billion people suffer from caries of permanent teeth and more than 530 million children suffer from caries of primary teeth.

Many epidemiological studies are being conducted all over India to check the prevalence of dental caries. The last National Oral Health Survey^[3] conducted in India by the Dental Council of India in 2002–2003 shows that the prevalence of dental caries in children aged 5 years to be 50% with mean decayed, missing, and filled teeth (DMFT) of 1.9. Among the 12-year-old children, the caries prevalence was 52.5% with

DMFT of 1.8, and in 15-year-old children, the prevalence was 61.4% with DMFT of 2.3.

India with a population of over 1.3 billion was divided into 29 states and 7 union territories. In India, health care is managed at the state level with varying levels of success in health outcomes. The south Indian state, Kerala, with a population of about 35 million people has consistently been a prominent outlier with excellent health outcomes in a number of areas compared to most states in India. In 2011, Kerala attained the highest Human Development Index of all Indian states based on its performance in key measures such as low infant mortality rate, high female-to-male ratio, and negative population growth.^[4] According to the latest government of India Niti Aayog Health Index report,^[5] Kerala is having the best health indicators in the country.

Keeping this fact in mind, a literature review was done to find the changes in the prevalence of dental caries in Kerala state according to the published data.

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METHODS

A literature search was conducted in PubMed and PubMed Central and Google Scholar databases for the following Mesh and free-text terms: “Dental Caries,” “Early Childhood Caries,” and “Kerala.” The search period was from March 1, 2020, to March 31, 2020. Inclusion criteria were studies based on the prevalence of dental caries in children below 16 years in Kerala state. Studies on tooth hypoplasia and other deformities were excluded.

After online screening of the articles, 15 articles were found eligible for participation in this review [Table 1]. Full text of the included studies was retrieved by electronic and manual search from the library.

DENTAL CARIES IN PRESCHOOL CHILDREN

The present literature search based on the inclusion and exclusion criteria showed 6 studies based on caries in preschool children in Kerala [Table 2]. A study done by Kuriakose and Joseph^[6] on 600 preschool children showed the prevalence to be 57%. The authors of the study concluded that socioeconomic level had a negative association with caries status. In 2003, a study by Jose and Joseph^[7] in children between age groups 8–48 months showed the prevalence of 44%. The results of this study showed that the groups at high risk from dental caries lesions were those with poor oral hygiene status, those who consume snacks and are given sweets as rewards, and

those belonging to a lower socioeconomic class. A study by Retnakumari and Cyriac^[8] in 2008 found the prevalence of dental caries to be 50.6% with a severity of early childhood caries (ECC) significantly related to child frequency of tooth brushing and oral hygiene status. Kuriakose *et al.*^[9] in 2014 found the prevalence of ECC among preschool children in Trivandrum to be 54%. Furthermore, a positive association was obtained between ECC and age of the child, location of residence, dietary habits, and oral hygiene habits. A study among 36–60 months old children in Kannur by Sreedharan *et al.*^[10] showed that the prevalence rate of ECC among 500 children surveyed was 56.3% with feeding practices and improper oral hygiene measures supporting the promotion of ECC. In 2018, Suchitra *et al.*^[11] conducted a study about dental caries experience in preschool children and its relation to the sociodemographic factors and found that the prevalence of ECC to be 59.6% and children belonging to lower socioeconomic data are prone to caries.

CARIES AMONG SCHOOL CHILDREN

Online search shows 9 publications on studies in caries in school children in Kerala [Table 3]. In 1999, Retnakumari^[12] studied the prevalence of dental caries and risk assessment among primary school children of 6–12 years. The prevalence of dental caries was 68.5%. The highest caries prevalence was found among 10-year age group (75.9%) and lowest in the 8-year age group (63%).

Table 1: Published data of prevalence studies done in Kerala children

Journal	Year	Topic
Journal of Indian Society of Pedodontics and Preventive Dentistry	1999	Prevalence of Dental Caries and Risk Assessment among Primary School Children of 6-12 Years in the Varkala Municipal Area of Kerala
Journal of Indian Society of Pedodontics and Preventive Dentistry	1999	Caries Prevalence and Its Relation to Socio-Economic Status and Oral Hygiene Practices in 600 Pre-School Children of Kerala-India
Journal of Pediatric Dentistry	2003	Early Childhood Caries Lesions in Preschool Children in Kerala, India
Journal of Indian Society of Pedodontics and Preventive Dentistry	2003	Prevalence of dental health problems among school-going children in rural Kerala
International Journal of Pediatric Dentistry	2005	Dental caries and associated factors in 12-year-old school children in Thiruvananthapuram, Kerala, India
International Journal of Pediatric Dentistry	2009	Has urbanization become a risk factor for dental caries in Kerala, India: a cross-sectional study of children aged 6 and 12 years
Journal of Contemporary Clinical Dentistry	2012	Childhood caries as influenced by maternal and child characteristics in preschool children of Kerala –An epidemiological study
SRM Journal of Research in Dental Science	2013	Dental caries prevalence and treatment needs of school-going children in Kannur District, Kerala
Journal of Dentistry and Medical Research	2015	Oral health status of 5, 12, and 15-year-old school children in Tiruvalla, Kerala, India
Journal of Contemporary Clinical Dentistry	2015	Prevalence of early childhood caries among preschool children in Trivandrum and its association with various risk factor
Journal of International Archives Medicine	2016	Dental caries and calculus status in children studying in Government and Private Schools in Malappuram, Kerala, India
International Journal of Dental Research	2016	Feeding Practices and Prevalence of Early Childhood Caries among Preschool Children in Urban and Rural Areas of Kannur district
Contemporary Clinical Dentistry	2018	Do Children of Working Mothers Experience More Dental Caries?
IOSR Journal of Dental and Medical Sciences	2018	Dental caries experience in preschool children of Thiruvananthapuram, Kerala: Is it related to the sociodemographic factors
International Dental Journal	2019	An epidemiological study of dental caries and associated factors among children residing in orphanages in Kerala, India: Health in Orphanages Project (HOPe)

Table 2: Early childhood caries prevalence in Kerala

Author	Year of study	Place	Age group	Number of participants	Prevalence (%)
Kuriakose S Joseph E	1999	Trivandrum	Preschool children	600	57
Jose B, King NM	2003	Ernakulam	8–48 months	530	44
Retnakumari N, Cyriac G	2012	Trivandrum	12–36 months	350	50.6
Kuriakose S, Prasannan M, Remya KC, Kurian J, Sreejith KR	2015	Trivandrum	2–5 years	1329	54
Sreedharan A, Faizal C P, Chandru TP	2016	Kannur	36–60 months	500	56.3
Suchithra MS, Sreedharan S, Thomas V, Bindhu R N	2018	Trivandrum	2–6 years	531	59.6

Table 3: Prevalence of caries in school children in Kerala

Author	Year of study	Place	Age group	Number of participants	Prevalence
Retnakumari N	1999	Trivandrum	6–12 years	750	68.5%
Jose A, Joseph MR	2003	Ernakulam	12–15 years of age	1068	54.3%
David J, Wang NJ, Astrom AN, Kuriakose S	2005	Trivandrum	12 year old	838	27%
Christian B, Evans RW	2009	Kollam	6–12 years	876	6 years - 47% 12 years - 10%
Peedikayil FC, Kottayyi S, Kenchamba V, Jumana MK	2013	Kannur	5–14 years	2930	49.44%
George B, Mulamootil VM	2015	Thiruvalla	5,12, and 15 years	5688	5 years - 41.5% 12 years - 36.9% 15 years - 43.4%
Abraham A, Pullishery F, Raghavan R	2016	Malappuram	12–13 years	761	Girls - 66.37% in private schools; and 87.58% in government schools Boys - 64.47% in private schools and 71.98% in government schools
Baiju RM, Peter E, Narayan V, Varughese JM, Varghese NO	2018	5 districts (name not mentioned)	15–18 years	1065	59.8%
Christian B, Ummer-Christian R, Blinkhorn A	2019	Districts not mentioned	6 years and 12 years	1137	6-year-old - 77% 12-year-old - 44%

Jose and King *et al.*^[13] in 2003 studied the prevalence of dental caries among school-going children in the age group of 12–15 years in rural Kerala and found that the prevalence was 54.3%. David *et al.*^[14] in 2003 in a study in 12-year-old school children found the prevalence of dental caries in the permanent dentition to be 27%. The study also indicated that urban living conditions were associated with more dental caries.

Christian^[15] in 2007 conducted a cross-sectional study on 6 and 12 years and found that the prevalence of caries in the 6-year-old to be 47% and in the 12-year-old to be 10%; the study concluded that urbanization is not a risk factor for dental caries. In 2013, Peedikayil *et al.*^[16] studied the dental caries prevalence and treatment needs of school-going children and found that the prevalence of dental caries was 49.44%. The study also revealed that caries component of DMF/deft index was high at 90.01%, indicating that many carious teeth were left untreated. Another study in 2015 by George and Mulamootil^[17] found that the caries to be 36.9% and 43.4% in 15 year old males and females. The study also showed a low high prevalence of dental caries in children from lower socioeconomic status. A study conducted in government and private schools in Malappuram, Kerala, by Abraham *et al.*^[18] found an overall prevalence of 72.2%. In

government schools, girls were shown to have a prevalence of dental caries of 87.58% as compared to boys with a prevalence of dental caries of 71.98%. The prevalence of dental caries in private schools among girls was 66.37% when compared to boys at 64.47%. Baiju *et al.*^[19] in 2018 found that the overall dental caries experience for the group was 59.8%. Mother's employment was the strongest predictor. In an epidemiological study conducted by Christian *et al.*^[20] in 2018 among children residing in orphanages in Kerala, it was found that in 6-year-old children, the prevalence of caries was 77%, and in 12-year-old children, the prevalence of caries was 44%.

DISCUSSION

Kerala state has a dentist population ratio of 1:2200, which is well within the prescribed ratio by the WHO (1:7500) and 26 dental colleges.^[21] The health care is managed through private and government setup. Government has three-tier system of health care with the primary health centers with subcenters, community health-care centers (CHCs), and taluk and district hospitals. Dental facilities are available in CHCs and taluk and district hospitals.^[22] This together with 8000 odd private sector clinics cater the dental health-care needs of the state.

Dental caries is the most prevalent oral disease among children. Caries experience in early childhood has been linked to caries experience in the permanent dentition. Dental caries is a preventable infectious disease and can interfere with normal food intake, phonetics, growth, self-esteem, body weight, routine activities, and quality of life in preschool children. The burden of dental caries usually lasts a lifetime, because once the tooth structure is destroyed, it will usually require restoration and maintenance throughout life.^[23-25]

Caries below 6 years of age is termed as ECC based on the risk factors; the American Association of Pediatric Dentistry has defined ECC as the presence of one or more decayed (noncavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child under the age of 6 years.^[26] It is almost neglected in children as the caregivers think that these teeth will be replaced later. The disease starts in the maxillary anterior teeth and spreads to the other teeth also in a short span of time. Lower anteriors are not commonly affected by ECC.^[27]

The review of data from the existing literature shows that prevalence of dental caries in children below 6 years ranges from 44% to 59.6% with an average of 53.58%. The dental caries in children between 6 and 15 years of age shows a varied prevalence ranging with a ranging from 10% to 87 % in school-going children.

Studies in various parts of the world on ECC show that maximum prevalence and severity is in Far East Asia and Middle East Countries, reporting a range from 36% to 85%.^[28] A significant systemic review conducted by Ganesh *et al.*^[29] on the prevalence of dental caries in India shows the overall prevalence of ECC to be 49.6%. Andhra Pradesh was found to have the highest prevalence of ECC at 63%, and the lowest prevalence was reported in Sikkim at 41.92%. Kerala recorded at 51.42%, whereas the neighboring state like Karnataka has a prevalence rate of 48.70% and Tamil Nadu 55.73%. Another review by Mehta *et al.*^[30] on trends of dental caries in India in last 25 years shows that decline in caries prevalence in 2–5 age group. Caries trends show an increase in children between 6 and 10 years of age, whereas in children between 11 and 15 years of age, there was a downward trend in the prevalence, but in the last few years, there is an increase in the prevalence.^[30] Janakiram *et al.*^[31] in a meta-analysis shows that the mean prevalence of dental caries is almost similar at 5 years and 12 years at 49%, while it shows steady increase from 15 years.

In the last National Oral Health Survey,^[3] Kerala state shows a prevalence of 73% in 5-year-old children is with a deft of 3.3, in 12 year old the prevalence is 66.5% with DMFT of 1.7 and in 12 year old the prevalence of dental caries is 68% with a DMFT of 1.8.

On the evaluation of the data available, it can be said that despite the good health and education indicators, there is a deficiency in promoting oral health of children. Previous studies have also noted the deficiencies in health education.^[32]

The available data show a high prevalence of caries among preschool children with high DMF/ def and treatment needs. The data also show that there is no marked decrease in dental caries prevalence among children in the state in the last 20 years.

Kerala state has about 100% primary school enrollment, which usually starts by 4 years of age.^[33] Preventive dental education program from primary education level itself can reduce the incidence of caries in children.

Aardram,^[34] Kerala Government's project in the health-care sector, envisages radical changes to deliver patient-friendly, quality health-care services in government hospitals and to add specialty and superspecialty facilities in District and Taluk Hospitals.^[35] This project can be extended to provide dental facilities in the primary health centers in the state by posting dental surgeons.

The involvement of the local self-governments along with community participation of ASHA workers, Kudumbashree health volunteers, Angandiwadi and primary school teachers etc., can be utilized in conducting preventive dental programmes throughout the state. These initiatives along with National Oral Health Programmes can make inroads in providing preventive and interceptive health care and reduce the prevalence of dental caries in children.

RECOMMENDATIONS

Key findings in this review are that the prevalence rates of caries in Kerala children are high and there is a wide range of prevalence rates. The review also shows that most of the studies are concentrated in relation to South Kerala.

1. More prevalence studies have to be conducted by the teaching institutions in Kerala.
2. Kerala Children Oral Health Plan and Caries Mapping can be formulated by the government with the active participation of Indian Dental Association and specialty organizations such as Indian Society of Pediatric and Preventive Dentistry, Association of Pediatric and Preventive Dentists (Kerala), and public health associations.
3. Preventive dental programs have to be given very high importance with the active involvement of professionals and governmental and nongovernmental groups

CONCLUSION

Oral disease prevention has not received its due importance at the policy level in Kerala. The review of the data shows that there is a need for sustained efforts to reduce the incidence of dental caries of children in Kerala state. With the available resources, government should bring about new policies and strategies in relation to preventive dentistry. It should start from the grassroots level to make caries "less" Kerala model in dentistry.

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Conflicts of interest

There are no conflicts of interest.

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