Review Article

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Reduced Proportion of Children Aged 3-5 Years who have Dental Caries Experience in their Primary Teeth in India

Applu Atrey[1*] Rohan Bhatt[2] Jay Dave[3]

[1]Senior Lecturer, Department of Conservative Dentistry and Endodontics, Karnavati School of Dentistry, Gandhinagar, Gujarat, India.
[2]Assistant Professor, Department of Pedodontics, Karnavati School of Dentistry, Gandhinagar, Gujarat, India.
[3]Post Graduate Student, Department of Oral Pathology, College of Dental Sciences, Bopal, Ahmedabad, Gujarat, India.

ABSTRACT

Background: Early childhood caries (ECC) is a serious public health concern especially for socially disadvantaged groups, in both developed and developing worlds. Yet, it remains relatively unexplored and poorly defined in many developing countries. The presence of high levels of ECC, despite a reduction in permanent-dentition caries through fluoridation of water and use of fluoridated tooth- pastes, begs for a broader look at social and behavioral factors that correlate with this form of the disease. All untreated Dental Carious lesions may not be detrimental to the general health; however, it significantly influences the QoL and dietary intake of children. Patterns of behavior learnt in early childhood are deeply ingrained and resistant to change and mother has an important role in this respect. Interventions found effective in preventing ECC in other populations has shown no demonstrable long- term or sustainable benefit in most communities.

Keywords: Child, Dental caries, Primary teeth, Quality of life.

INTRODUCTION

American Academy of Pediatric Dentistry (AAPD) describes Early Childhood Caries as 'the presence of one or more decayed (non cavitated or cavitated lesions), missing teeth due to caries or filled tooth surfaces in any primary tooth in a child of age 71 months or younger. The study of dental caries in primary dentition is important not only for the resulting deterioration in quality of life of young children, but also because dental caries in primary dentition is one of the best predictors of caries in the permanent dentition. ECC is a serious public health concern especially for social disadvantaged groups, in both developed and developing worlds. Yet, it remains relatively unexplored and poorly defined in many developing countries[1]. India is no exception for the list.

A very few prevalence studies have been done in India[2]. There is a lack of definite data on prevalence of ECC both at national and local levels[3]. Several studies done have found prevalence of dental caries as follows: 70%, 53%, 25%, 50.8% and 51.46% in the age group of 5-6 years in Bangalore (Urban), Davangere (Urban), Davangere (Rural) Andra Pradesh (Rural) and Kerala (Rural) respectively. Few other investigations have also demonstrated varied prevalence in the same age group range[4,5]. The mean dmft increases as age advances[6]. Several studies have claimed that all children are not at equal risk of developing dental caries. High risk group children with primary teeth decay should be identified and categorized which in turn is useful to determine needs for restorations and to implement primary preventive procedures in the targeted group[7]. Although dental caries has been declining globally in general population, more so among older children, the caries prevalence in younger ones has not shown a significant decline. Most of surveys are targeted at school going children because of their easy accessibility which is

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***Correspondence**: **Dr. Applu Atrey**
Department of Conservative Dentistry and Endodontics, Karnavati School of Dentistry, Gandhinagar, Gujarat, India.
E-mail: applu_scorpion@yahoo.com

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not so in preschool children[4]. The study of dental caries in primary dentition is important not only for the resulting deterioration in quality of life of young children, but also because dental caries in primary dentition is one of the best predictors of caries in the permanent dentition.

Decayed component being the major part of dmf (Decayed Missing Filled) score suggests the large unmet treatment needs. This may be due to lack of oral awareness in parents, oral hygiene practices, high cost of dental treatment and limited accessibility and availability of dental services[3].

About 94.3% of children with ECC showed severe ECC and all the dmft were due to untreated caries. There was not a single filled tooth and all the children required treatment. And another important finding is that all children in the 24-35 months age group who had caries, presented with severe ECC. This is indicative of a total lack of awareness about oral health among parents, lack of accessibility, and affordability for oral health care in this section of people. This is quite alarming, especially in a city like Bangalore with wide options for oral health care, including government hospitals and more than a dozen dental colleges. A larger and more detailed study with equal sample size in each group could help in getting an insight into the relationship between dental caries and ethnic groups. It is possible that real differences in caries experience may exist between ethnic groups, but even if they do, they are masked by and are of secondary importance to the social and cultural factors in the environment[8].

Discrepancies within and between studies may occur because there is no universally accepted definition of nursing caries and no suitable epidemiologic index for nursing caries has been developed[2]. Interview of caregivers of children revealed that only 11.4% children had previously been to a general dentist. None of them knew about Pedodontics as a specialty[9] Epidemiologic measures such as the decayed- missing-filled teeth (dmft) index do not adequately portray the effects of ECC on children, families, society and the health care system. The consequences of symptomatic ECC are multiple and significant and that broader surveillance of the disease's impact is needed[10]. The presence of high levels of ECC, despite a reduction in permanent-dentition caries through fluoridation of water and use of fluoridated toothpastes begs for a broader look at social and behavioral factors that correlate with this form of the disease. Various additional research efforts support a relationship between ECC and these behavioral, environmental and social factors[11].

Thus, dental caries management in many countries has shifted toward a largely preventative and preservative approach rather than surgical treatment and the importance of Pediatricians' Role in the intervention. Children who live in poverty are three times more likely to have dental decay.

Preschool children from low Socio Economic Status families have 4.8 times more decayed teeth than children from high SES families[12]. 75 percent (cumulative) of dental caries in the primary dentition is found in 8.3 percent of children aged 2-5 years. This shows that dental caries is still a public health problem for an unfortunate subpopulation, a subpopulation that somehow missed the benefits of health promotion efforts that were enjoyed by the rest of the population[13].

EARLY CHILHOOD CARIES

Caries is the most prevalent affliction of children. Despite credible scientific advances and the fact that caries is preventable, the disease continues to be a major public health problem. In developing countries, changing life-styles and dietary patterns are markedly increasing caries incidence. While mortality from the direct sequence of dental caries is very low, it contributes towards loss of productivity[8].

Children with severe caries weighed less than controls and after treatment of decayed teeth there was more rapid weight gain and improvements in their quality of life. This primarily could be due to improved dietary intake as pain affected the quantity and variety of food eaten and more over chronic inflammation from caries related pulpitis and abscesses is known to suppress growth through a metabolic pathway and to reduce hemoglobin as a result of depressed erythrocyte production[14].

The short-term consequences of untreated decay in children's teeth include pain, with up to 12% of 5-year-olds reported to have experienced

toothache, systemic infection and abscesses. Long term follow-up reveals that children who experience Early Childhood Caries (ECC) are much more likely to develop further dental problems as they grow older. In addition, poor dental health has a significant impact on the growth and cognitive development of child by interfering with nutrition, concentration and subsequently school participation. Increasingly, dental caries if left untreated is being recognized as a part of the more general phenomenon of child neglect. This is particularly appropriate, given that psychosocially, poor oral health can affect not only speech development, communication and self-image but also social functioning and hence further impact an infant's quality of life. The presence of caries in the primary dentition is the strongest predictor of caries in permanent dentition[15].

Children with ECC can weigh less than those without it[16]. It can also have a major impact on their physical, mental and overall systemic health. It increases their susceptibility for iron deficiency anemia, by lowering the serum ferritin levels. It had a negative impact on quality of life (QoL) of children and if left untreated may affect the weight of children. All untreated dental caries may not be detrimental to the general health; however, it significantly influences the QoL and dietary intake of children, especially when it is associated with pain and discomfort. Disturbed sleep as a result of pain can affect glucosteroid production in the body and thereby the growth[17]. Another possible mechanism of impact could relate to chronic inflammation from pulpitis and dental abscesses. Both of these conditions alter the metabolic pathways resulting in increased cytokine production. Cytokines like interleukin- 1 (IL-1) inhibit the process of erythropoiesis in bone marrow. The resultant reduced levels of hemoglobin may lead to anemia of chronic disease[18].

Severe ECC can lead to the loss of the child's front teeth at an early age. The child may suffer further developmental setbacks involving speech articulation as these years are critical for speech development. Children with ECC can also experience delays in physical development, especially in height and weight. The pain caused by ECC may lead to a decrease in appetite, ultimately resulting in malnutrition[19] The relationship between ECC and neglect is well -established, but only recently have child maltreatment experts included dental caries in their listing of health conditions that predispose children to maltreatment[20].

FACTORS

Traditionally, children's oral health research has focused on a handful of biological and environmental factors, with poor predictive results. Water fluoridation was the focus of this research which contributed to an increase in fluoridation prevalence and a decrease in caries prevalence. Still, more than half of children have or have had caries; a greater burden of oral health disease is borne by children of disadvantaged socioeconomic status or race/ethnicity other than the majority group[21].

In developed countries the primary risk factor is considered to be the use of a nap time bottle that contains a fermentable carbohydrate food such as milk, milk with sugar, sweetened milk formula, fruit juice, sugar solution or other sweetened solutions. Whereas in the developing countries other factors such as linear enamel hypoplasia of primary teeth associated with malnutrition may contribute to the prevalence of this condition. Complex interactions between the use of sweetened pacifiers, nursing on demand, neglected oral hygiene, Streptococcus mutans, maternal education and dental knowledge, family structure, family income, single marital status and social status make its etiology complex. Possible contributing factors may include crowded living conditions, diet and lack of access to oral hygiene supplies like toothbrushes and toothpaste. Duration of breastfeeding increases the number of children with nursing caries. There is a strong and significant relationship between the severity of nursing caries and the degree of feeding abuse. Also, children from low socioeconomic status have increased early childhood caries[1, 2, 21-25].

When the number of siblings is high, the attitude shown by the parents varies significantly in terms of their ethnic origin. The mother, unequal to the task of coping adequately with the overlarge household, has no time, therefore to cuddle her latest born. She resorts to bottle or the pacifier to calm the child and to give him pleasure[2].

On account of its association with ECC, milk-bottle feeding at night should be limited, whereas prolonged breastfeeding appears to have no such negative dental consequences[24]. Sarnat H et al studied the maternal attitude towards dentistry and oral health status of their children. The results showed that more the positive attitude of mother towards her child's oral health, the less caries the child had[7].

Patterns of behavior learnt in early childhood are deeply ingrained and resistant to change and mother has an important role in this respect. Attempts at changing the behavior at later stage of development may be difficult because of earlier indoctrination at home. The control of dental caries in young children is a continuing problem and it is easier to manage if groups of population with greatest needs are identified. Several studies have claimed that all children are not at equal risk at developing dental caries[26].

The children of the mothers with a high level of education are reported to have lower level of dental caries[27]. Social class may influence caries risk in several ways: individuals from lower SES groups experience financial, social and material disadvantages that compromise their ability to care for themselves, obtain professional healthcare services and live in a healthy environment[28]. The high rate of unmet treatment needs among the study subjects might be attributed to (a) a lack of awareness in the community regarding the early prevention and treatment of caries, and/or (b) parental indifference and belief that primary teeth are replaceable by permanent teeth[29]. ECC is strongly associated with vulnerable subpopulations, including children of impoverished, minority, immigrant, migrant and homeless families whose social and economic capital is limited. Loss of a job, loss of income for time spent taking a child to multiple dental appointments, the cost of transportation, taking time to find a willing dentist and financing care are real and significant issues for these families, exacerbated in today's chaotic economy. Parents delay care because of finances and access-to-care problems and the child's condition continues to worsen until it becomes so acute as to demand intervention regardless of the effect on the family's resources. Finally, the cycle is perpetuated as ECC predisposes children to future caries in primary and permanent teeth[30].

INTERVENTIONS

Community water system fluoridation, attempts to improve children's diets and oral hygiene and more recently, application of fluoride varnish and use of xylitol gum etc. have resulted in little or no long-term improvement in ECC prevalence or severity. Thus, interventions found effective in preventing ECC in other populations has shown no demonstrable long-term or sustainable benefit in most communities[31].

The eradication of ECC will depend upon the development of new policies that are science based and reflect individual and population variability, the role of parenting behaviors, the impact of changing organization and financing of dental care, the contribution of public and dental education and the need for integration with pediatric and public health efforts.

The following specific policy suggestions are made:

1) Health Care Finance Administration should require the same accountability for well child dental checkups as they do for well child medical checkups;
2) The Special Supplemental Nutrition Program for Women, Infants and Children should include an oral health component in the physical evaluation visit;
3) The Centers for Disease Control and Prevention should set up a surveillance system for ECC;
4) Continuing education courses should offer classes to health care workers in infant oral health; and
5) Research must be aimed at practical preventive and treatment modalities[32].

From a public health perspective the following suggestions are made:

1) Continue to promote community water fluoridation.
2) Evaluate the effectiveness of other public health oriented measures to prevent ECC.
3) Develop a national ECC and rampant caries registry.
4) Link oral health screening and easily implemented, low-cost interventions with immunization schedules and public health nursing activities.
5) Increase opportunities for community-based interventions conducted by dental hygienists.

6) Change insurance reimbursement schedules to provide incentives for dentists to prevent disease.
7) Include dentistry in new child health insurance legislation for children as well as parents of infants and preschool children[33].

Parents are decision-makers in matters of children health and healthcare, thus they play an important role in achieving the best oral health outcomes for their young children. Considering parent's important role in the well-being of young children, it is essential to explore their knowledge, attitude and beliefs as it affects the dental care children receive at home and their access to professional dental services[7].

Preventive dental care should start early in infancy, during the first year of child's life to ensure successful outcomes. Physicians are the first health professionals to come in contact with the expectant parents and parents of infants. Hence, integrating oral health disease prevention and promotion strategies into these healthcare professionals practice would improve access to dental care, especially for the poor and the minority children who suffer disproportionately from dental caries and who have limited access to dental care[34].

Dental caries is a complex disease and is caused by a complex interplay of risk factors encompassing tooth, mouth, family and community levels. It is not possible for one intervention to sustain long-term reduction in the disease. As a biofilm-initiated disease, preventing the development of the disease requires constant daily adherence to self-care at home and changing the biofilm ecology. Professional care is necessary but not sufficient for long-term prevention of dental caries. MI(Minimum Intervention) has been designated a promising effective method to prevent dental disease and can influence both self- and professional care behaviors related to dental caries. To fully develop this tool, there is a need to understand how best to customize MI to diverse clinical conditions and population group[35,36]. MI has also shown promise in helping parents decrease a child's risk of developing ECC.

Weinstein et al showed that children of parents receiving MI had fewer carious surfaces, more fluoride varnish applications and a lower likelihood of developing new lesions after 2 years than children of parents receiving a pamphlet and watching a video[37,38] However, simply having knowledge about healthy behaviors is often insufficient for changing unhealthy behaviors[28]. When a behavior is new or is executed infrequently, the execution of the behavior is guided by deliberate intentions, whereas when a behavior has become habitual, intentions have little effect on behavior. Because habits can be conceived as behavioral responses that are triggered by situational cues and that have been repeatedly reinforced by contingent positive outcomes, interventions to change or create habits can be targeted (i) at the situation, (ii) at the response and (iii) at relevant contingencies[25].

The tooth brushing promotion studied is an example of an "environmental intervention", i.e. the intervention was aimed more at facilitation of the healthy behavior than on convincing the children in the target population of the pros of tooth brushing. Habit theory predicts that repeating behavior over time increases the likelihood that this behavior will become habitual. However, habit theory also posts that environmental cues are needed to trigger habitual behaviors[39].

Another model that can be considered as a dual process model is a theoretical model of habit formation. This model postulates that initiation of health behavior is the result of a deliberate decision-making process that includes an evaluation of the perceived consequences of the behavior, the perceived social influences, and the perceived behavioral control. Because these individual decisions occur in a social and physical environment, environmental factors may also effect health behavior-related decisions. According to the model of habit formation, once the behavior is performed regularly, a more automatic process then develops which determines the behavior. Therefore, cognitions may then become less important and the behavior is more likely to be automatically activated by specific environmental cues[40].

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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