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Original Article

Assessment of Relationship between Body Mass Index and Severity of Early Childhood Caries among Preschool Children in Arpookara Panchayat, Kerala: A Cross-sectional Study

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Abstract

Introduction: Early childhood caries (ECC) results from a chronic imbalance between multiple risk factors and the relationship between ECC and nutritional status is often controversial. The purpose of this cross-sectional study was to describe the body mass index of children with severity of ECC.

Purpose: The purpose of the study was to explore the relationship between body mass index (BMI) and severity of ECC among preschool children (3–6 years).

Materials and Methods: The present study was conducted to assess the relation between BMI and severity of ECC among preschool children in Arpookara Panchayat. Study sample consisted of 373 children from various schools. BMI percentile for age and sex was plotted on growth charts developed by Centers for Disease Control and Prevention. Dental caries was measured using def index method. The data were analyzed using Chi-square test.

Results: The prevalence of dental caries was found to be 48.5%. There was a significant positive association between ECC and BMI of children. Among the study participants, 14.7% of children were underweight, 77.2% of children were normal weight, 5.1% of cases were overweight, and 2.9% of cases were obese. Among underweight children, 7, 26, and 6 children were affected by mild, moderate, and severe form of caries, respectively.

Conclusion: Findings from the study demonstrated that there was an association between higher def scores and severe ECC in underweight children.

Key words: Body mass index, Centers for Disease Control and Prevention growth charts, Early childhood caries

INTRODUCTION

"Oral health is a mirror of general health" and good general health is vital for normal psychological development of the child. Any factors affecting the general health also affect the oral health and vice-versa,[1] thus, oral health and overall health and well-being are inseparably related.

The role of nutrition in the maintenance of health, growth, and also its relation to the dental caries is well known. Dental caries and childhood overweight/underweight are increasing rapidly worldwide[2] and are one of the most serious public health challenges of this century.[3] They are described pandemic due to their global distribution.

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Dental caries is one of the most prevalent diseases of childhood. Even though the caries prevention is possible, it still continues to be a major public health problem worldwide. Early childhood caries (ECC) is defined as the presence of one or more decayed (non-cavitated or cavitated), missing (due to caries), or filled tooth surfaces in any primary tooth in a child under the age of 6. In children younger than 3 years of age, any sign of smooth surface is indicative of severe ECC (S-ECC). From ages 3 through 5, one or more cavitated, missing (due to caries), or filled smooth surfaces in primary maxillary anterior teeth or a decayed, missing, or filled score of >4 (age 3), >5 (age 4), or >6 (age 5) surfaces constitute S-ECC.[4]

Snacking between meals, consuming drinks containing high sucrose and dependency on readymade food items are associated with an increase in dental caries and also gaining overweight or obese condition.[5] On the other hand, underweight or wasting is associated with enhanced caries susceptibility due to reduced salivary secretion as well as compositional changes as a result of salivary gland hypofunction or atrophy.[6] Enamel hypoplasia and impaired tooth mineralization due to poor eating habits may increase the risk of caries.

Thus, dental caries and body mass index (BMI), both measure, diet-related health outcomes, and the relationship between the both are relevant in the present scenario. As studies suggesting the relationship between caries status and BMI are limited in Kerala population, this study is taken up to bridge the gap in the literature.

MATERIALS AND METHODS

A cross-sectional epidemiological study was conducted to assess the relationship between BMI and severity of ECC among preschool children (3–6 years) in Arpookara Panchayat. The ethical approval for the study was obtained from our Institutional Review Board with ethical committee number IEC/M/14/2017/DCK. Children from both private and government schools were included in the study. The study sample consisted of 373 children from both the sex and various socioeconomic backgrounds. Before starting the study, the purpose of the study was explained to the respective authorities and official permission was obtained from the heads of the institution where the survey was being conducted. Informed consent was also obtained from the parents of the children included in the study before examination of each subject.

The clinical examination was carried out under adequate day light. Examination was done by single examiner to avoid interexaminer variability. Children were weighed (in kilograms) on digital weighing machine (Omron HN 283). Height was measured (in centimeters) using Stature meter. BMI was calculated using the following formula: BMI= Weight in kg/Height in meter^2

For 2–20 years old, BMI is combined with age and gender and expressed as percentile. The BMI for age and sex was plotted on the growth chart developed by Centre for Disease Control (CDC),[7] and the children were categorized to classify into four weight groups based on their BMI percentiles.

BMI for age was classified as follows:

- Underweight: BMI for age <5th percentile
- Normal weight: BMI for age ≥5th percentile and <85th percentile
- Overweight: BMI for age ≥85th percentile and <95th percentile
- Obese: BMI for age ≥95th percentile

Oral health status of children was recorded by type-III examinations as recommended by American Dental Association and adopted by the World Health Organization (WHO), 1999, was used to carry out the intraoral examination. The children were examined in adequate natural daylight so as to receive maximum illumination.

Clinical examinations were carried out using sterilized mouth mirrors and probes, and the oral health status of children was measured using decayed, extracted, and filled (def) index proposed by Grubbel in 1944.[8]

The data entered into Microsoft Excel sheet and analyzed using statistical software SPSS version 16.0. To elucidate the associations and comparisons between different parameters, Chi-square (χ^2) test was used as a non-parametric test.

RESULTS

The study sample included 186 male children (49.9%) and 187 female children (50.1%). The prevalence of ECC was 48.5% [Figure 1].

Distribution of children according to BMI categories was observed that out of 373 children, 55 children (14.7%) were underweight, 228 children (77.2%) were having normal weight, 19 children (5.1%) were overweight, and 11 children (2.9%) were obese [Table 1].

Distribution of the prevalence of ECC according to BMI categories was among 55 underweight children, 39 children

(70.9%) were affected with caries, and 16 children (29.1%) were caries free. Out of 288 normal weight children, 138 children (47.9%) were having ECC and 150 children (52.1%) were free of caries. Among 19 overweight children, 3 children (15.8%) were affected with caries and 16 children (84.2%) were caries free. Out of 11 obese children, only 1 child (9.1%) showed presence of caries and 10 children (90.9%) were caries free [Figure 2]. Pearson Chi-square test showed a highly significant ($P<0.05$) association between prevalence of ECC and BMI ($P = 0.000$). Hence, it can be inferred that as the BMI decreased, there was a significant increase in number of caries.

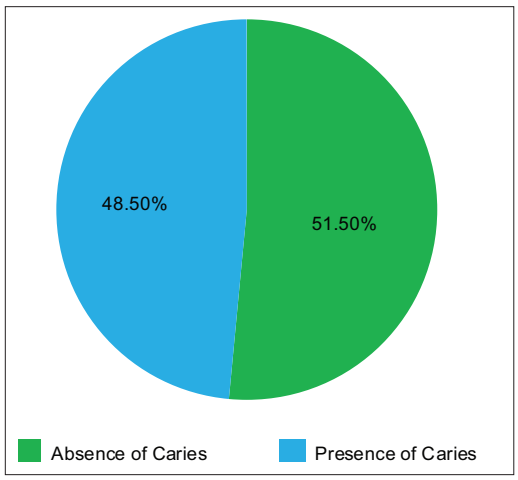

Figure 1: Pie diagram showing distribution of prevalence of early childhood caries

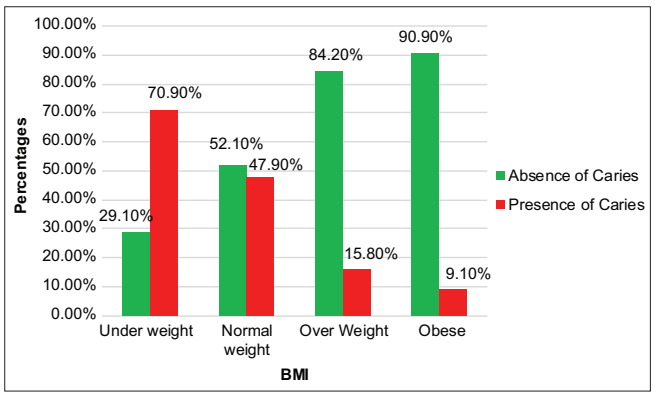

Figure 2: Distribution of prevalence of early childhood caries according to body mass index categories

Table 1: Distribution of children according to BMI categories

BMI category	Count	%
Underweight	55	14.7
Normal weight	288	77.2
Overweight	19	5.1
Obese	11	2.9

BMI: Body mass index

DISCUSSION

Oral health is an essential component of total well-being and it affects numerous aspects of a person's health status, quality of life, including self-esteem, learning, employment, and other levels of routine activities. ECC is the most common chronic disease of childhood. Most of the times, the children do not receive dental care until they reach 3 years of age. By this time, more than 30% of the children belonging to lower socioeconomic strata already get caries.[9]

Nursing caries has received little attention from the health professionals other than pediatric dentists. The dental health of preschool children in whom nursing caries is evident has largely been ignored. The reason for this is that the primary teeth are not considered as important as the permanent teeth.[10] Besides, this population is relatively inaccessible because the disease occurs at such a young age, and it is very difficult to record the prevalence of the problem on a true population basis.

Beelke *et al.* in the year 2003 reported the effect of dental caries on the growth of an individual. It was suggested that the complete destruction of the coronal portion of the tooth could lead to reduced mastication; continuous pain during night inhibits normal sleeping pattern with consequent stress or nervousness resulting in increase in glucocorticoid secretion and decreased growth hormone release.[11]

In the present study, dental caries prevalence was 48.5% [Figure 1] which was slightly higher than that reported by Jose and King (44%)[12] among the preschool children aged from 8 to 48 months in Kerala but it was lower than the study conducted by Retnakumari and Cyriac where they found that it was 50.6% in children aged 12–36 months in Trivandrum.[13]

When considering the distribution of prevalence of dental caries according to gender, the study sample included 49.9% of male children and 50.1% of female children. Out of total boys in the study, 89 children were affected with dental caries, and out of total girls, 92 children were affected with dental caries. There was no significant association between dental caries prevalence and gender which was in contradiction to the study conducted by Kumar[14] where they noticed higher prevalence of ECC among girls than boys. In another study by Shah *et al.*,[15] a higher prevalence among boys than girls was noticed, which did not reach significance. The study reported in children aged 12–36 months in the city of Recife, Brazil, by Rosenblatt and Zarzar[16] showed an increased prevalence of caries in girls. The greater risk for the development of caries among girls could be partly due to earlier growth and development.

In the present study, the results showed an inverse relationship between BMI and ECC, that is, an increase in caries prevalence is more in underweight children. The study conducted by Bhoomika *et al.* (2013) found that a positive relation between the BMI and S-ECC out of which 45% of S-ECC children were classified as underweight according to the CDC classification.[17]

According to Vania *et al.* (2011), in S-ECC, underweightness is attributed to chewing alteration as it is related to the dental pain due to caries and loss of tooth structure due to hard tissue breakdown.[18]

Literature has also reported that these patients had weight gain and improved quality of life after receiving the pertinent treatment.[1] The destruction of dental hard tissues and the pain elicited by contact with food may affect the masticatory abilities of the patient resulting in improper chewing of food. This improper chewing of food, in turn, impairs the absorption of micronutrients, which play an important role in the growth and development of the child. These chewing troubles lead to a change in the children's diet.[19]

The results of this study were in contradiction with the results of Willershausen *et al.* (2007)[20] who found that low BMI was linked with absence of carious lesions and a high BMI was linked to a high number of carious lesions. Moreover, in a longitudinal study, Ludwig *et al.* (2001)[21] also found that the increasing prevalence of obesity in children was linked to the consumption of sugar-sweetened drinks and junk foods whose consumption may result in an increased number of cariogenic microorganisms.

In the present study, an attempt was made to determine the relationship between BMI and ECC in 3–6-year-old children in Arpookara Panchayat, Kottayam, Kerala. This study concluded that BMI was related to ECC and also proved the prevalence of caries in underweight children.

Limitations of the study are cause and effect cannot be established because of the cross-sectional study design. The findings of the study cannot be generalized to the Kerala population as a whole because sample was recruited from selected schools only. Nutritional status and dental caries experience are multifactorial and their relationship is likely to be weakened by cofounding variables such as fluoride usage, which was not assessed in this study. Hence, further longitudinal studies with large sample size can determine whether there is a cause-and-effect relationship or any positive association between caries levels and nutritional status.

Parents can play a very important role in promoting good oral habits and by imbibing good habits themselves can positively influence their children. There is a need to create more awareness about the knowledge and importance of deciduous teeth and regular dental visits among the society. Health-care professionals need to educate expectant and new mothers about oral health care for infants, especially the use of nursing bottle at night and regular dental visits.

CONCLUSION

Results of this study showed that BMI was related to severity of ECC. Dental caries prevalence was highest among underweight children. Overall, the findings of this survey will form baseline data for the oral health assessment for children aged below 6 years in Arpookara Panchayat in Kottayam district, Kerala. This study sheds light on new dimensions regarding the role of pedodontic triangle in organizing dental health awareness programs for parents and the need to create more awareness and importance of first dental visit among the society. Thus, this study initiates a thought provoking response from dental health educators.

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