ORIGINAL RESEARCH

Dental Caries Relationship between Body Mass Index and Social Well-being in Children of 4–7 Years

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ABSTRACT

Introduction: Early childhood caries (ECC) is a multifactorial disease that affects children in pre-school age. The consequences of caries on quality of life include pain, decreased appetite, chewing difficulties, weight loss, and change in behavior, and poor performance in school. The purpose of this study was to assess the relation of dental caries between body mass index (BMI) and social well-being in children of age 4–7 years.

Methodology: A randomly selected sample of 600 of the age 4–7 years underwent a clinical oral examination for assessment of dental caries. The samples were divided into two groups: Group A was caries-free children and Group B was assigned to children with ECC. BMI was calculated for children in both the groups. Data were analyzed for association between caries, BMI, and social well-being.

Results: Results showed that in Group A, 1.3% had normal BMI and 98.7% were underweight. In Group B, 0.7% children had normal BMI and 99.3% were found to be underweight. 28.3% of children with ECC had a problem eating food, 39% missed school whereas 31% were ashamed to smile.

Conclusion: There is no significant correlation seen between BMI and prevalence of dental caries in children within the age group of 4–7 years. However, it was seen that ECC had a severe impact on the social well-being of the child.

Keywords: Body mass index, Early childhood caries, Quality of life, Social well-being, Social well-being.

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INTRODUCTION

Oral disease is a universal problem. However, it is often a low priority for primary health workers because it is rarely life threatening. However, oral disease can have a significant impact on both growth and social well-being of an individual's life.[1]

Dental caries is the most common chronic childhood disease in oral health; several factors such as food low in fermentable carbohydrates, oral hygiene techniques, adequate fluoride supplementation, as well as regular dental examinations have to be taken into consideration.[2]

Early childhood caries (ECC) is the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child under the age of six. It has been reported that ECC is particularly concentrated in socially disadvantaged children and it has been described as a social, political, behavioral, medical, psychosocial, economical, and dental problem.[3] The prevalence of ECC is reported to be as high as 70% in developing countries.[4]

Diet plays an important role in dental caries as dietary habits in children have suffered major changes in the past 30 years. Current research in dental medicine trends toward exploring the link between oral health and systemic health, an effective way of underscoring the public health impact of oral care and influencing health-care policy.[5] Oral disease can have a significant impact on both the social and the psychological aspects of an individual's life. Oral health problems can affect an individual's quality of life by impairing physical and social functioning, as well as their self-esteem.[1] There is increased interest in the relationship between caries and growth in young children and mechanisms whereby caries may affect growth. Evidence linking caries in primary teeth and children's anthropometric outcomes in cross-sectional studies is contradictory in terms of both the presence and the direction of the association. Some studies report a relationship between caries and poor growth. Two theories may explain this relationship. The first theory is that the direct impact of extensive untreated caries and associated pain and inflammation on the child's ability to eat may result in undernutrition and growth impairment. The second theory includes the indirect effects of untreated caries and different body responses to chronic dental infection.[6]

There is disagreement on the relationship between nutritional status and the occurrence of dental caries. Some claim that being overweight is linked to caries, whereas others report that caries is more common in

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underweight children.[7] The aim of the study is to assess the relationship of dental caries between body mass index (BMI) and social well-being in children of 4–7 years.

MATERIALS AND METHODS

A cross-sectional survey was conducted among 4–7-year-old school children of Mangalore city. Ethical clearance was obtained from Yenepoya University, Mangalore. Convenient sampling technique was used until the sample size of 600 was achieved. Sample size calculation was based on effect size 0.23; level of significance 5% and power 80%. Minimum 300 children per group were considered to be optimum for the study. The consent form was obtained from the parents and questionnaires were given in English and translated in the local language for those who did not understand English, for data collection. The questionnaire was regarding dental caries affecting the social well-being of the child (parental-caregiver perception of the oral health-related quality of life of children (P-CPQ).[1]

Questions asked included information about daily activities such as going to school, playing, and eating. The parents were asked if the child missed school due to toothache, if the child felt embarrassed about smiling or if he or she faced difficulty while eating certain kinds of food. It was also asked if the child hesitated from playing with other children.

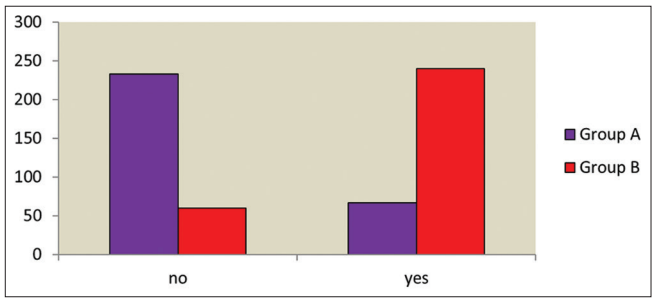
The oral status of the children was evaluated on the basis of a clinical examination which was conducted by a single examiner to select children with Severe ECC by dmft ≥ 6 and caries-free children. The examination was done with a plane mouth mirror and a probe in natural daylight. The anthropometric measurement of the children was recorded by a standard measuring scale and weighing machine. BMI was calculated by dividing weight and kilogram divided by the square of height in meters (weight kg/height m^2). BMI was compared with the dental caries status of the children.

RESULTS

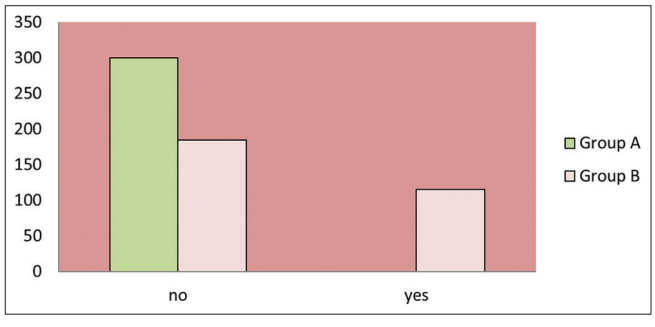
A total of 600 children who met the inclusion criteria were included in the study to assess the relation of dental caries to BMI and social well-being of children in the age group of 4–7 years. Of all the children examined, 315 (52.5%) were girls and 285 (47.5%) were boys, 300 (50%) had severe early childhood caries (Group B) and 300 (50%) caries free (Group A). Of the samples taken, 11.3% were 4 years old, 30.7% were 5 years old, 34% were 6 years old, and 24% were 7 years old in Group A. In Group B, 2.3% were 4 years old, 22% were 5 years old, 33.5% were 6 years old, and 40.3% were 7 years old. Mean height in the overall sample for boys was 110.52 cm and for girls was 108.06 cm. Mean weight in the overall sample for boys was 16.31 kg and for girls was 15.14 kg. The average BMI calculated for children in Group A caries group was 14.22 percentile and the average BMI calculated for children in Group B was 15.18 percentile. On the basis of the WHO reference values, 98.7% were underweight and 1.3% were normal in Group A and Group B, 99.3% were underweight and 0.7% were normal.

Among the parents or guardians in Group A, 22.33% reported that their children complained of toothache and other 77.6% reported otherwise. In the Group B, parents and guardians reported that 20% of children did not have toothache and 80% had [Graph 1]. In Group A, 97.7% said that their children did not miss school due to dental-related problems. However, 3% reported otherwise. In Group B, 39.3% missed school due to dental issues and 60.7% did not [Table 1]. In Group A, none of the children felt embarrassed about smiling due to their teeth. In Group B, 61.7% did not feel embarrassed about their smile and 38.3% felt embarrassed [Graph 2]. 86% of children in Group A did not have difficulty in eating certain kinds of food and 14% had difficulty. In Group B, 71.1% did not have difficulty in eating certain kind of food and 28.3% felt otherwise [Table 2].

However, none of the above reasons stopped them from playing with other children, which was statistically insignificant compared to Group A. When the correlation between BMI and dental caries was analyzed, it was found that there was no significant relationship between BMI and prevalence of dental caries in children between 4 and 7 years of age. However, it was seen that children with ECC had a negative impact on their social well-being.



Graph 1: Has your child ever had toothache?



Graph 2: Do you think that your child feels embarrassed about smiling because of his/her teeth?

Table 1: Distribution of children by groups according to questionnaire

Group	Has your child ever missed school because of her/his teeth?		Total
	No	Yes	
Group A			
Count	291	9	300
% within Group	97	3	100.0
Group B			
Count	182	118	300
% within Group	60.7	39.3	100.0
Total			
Count	182	418	600
% within Group	30.3	69.7	100.0

Table 2: Distribution of children by groups according to questionnaire

Group	Does your child have difficulty in eating certain kind of foods?		Total
	No	Yes	
Group A			
Count	258	42	300
% within Group	86.0	14.0	100.0
Group B			
Count	215	85	300
% within Group	71.7	28.3	100.0
Total			
Count	473	127	600
% within Group	78.8	21.2	100.0

DISCUSSION

The concept of health with regard to health promotion has expanded to include other issues, such as socioeconomic, environmental, and behavioral factors that interfere with individual and collective health. Thus, the concept of oral health now encompasses quality of life, as well as oral symptoms, functional limitations, emotional, and social well-being factors.[8]

In the present study association of BMI to dental caries was evaluated. Children in both groups, i.e., caries-free group (Group A) and caries group (Group B) were underweight. Miller *et al*. in their study pointed out that children with severe caries, who usually require multiple extractions, may be suffering from undetected malnutrition, which could be one of the reasons for being underweight.[9]

It was found in the study that dental caries group (Group B) had no relevant correlation with BMI. This result is in accordance with the studies done by Pinto *et al*., in 2008, Sadeghi and Alizadeh, in 2011, Hooley *et al*., in 2012, and Costa *et al*., in 2013.[10-13] In these studies, it was found that there was no association between BMI of the child and the presence of dental caries.

Contrary to this result, in another study done on 1290 elementary school children (648 boys and 642 girls) in Germany, it was demonstrated that there was a significant association between caries frequency and weight in school children.[14] Another research on Turkish school children revealed that children with low body weight were at a higher risk of developing dental caries than overweight/obese children.[2] A number of authors have found an association between dental caries and obesity in young children and adolescents.[15-21] However, not all the studies show the same strength of association, as some recognize that high weight is not *per se* an etiological factor in the development of caries or that the association between overweight and caries prevalence is weak.[22] In the present study, the majority (80%) of the parents or guardians of children with severe caries reported that their children suffered from a toothache. This is in accordance with the study done by Acs *et al*. in which they reported that pain and infection may be the primary effects of nursing caries.[23] Pain may be associated with other factors related to the severity of the disease, such as altered eating patterns and/or sleep habits.

It was found in the study that 39.3% of children with severe ECC remained frequently absent from school, 38.3% felt embarrassed while smiling and 28.3% had difficulty in eating certain kinds of food. Thus, it was found in the present study that ECC had a negative impact on the social well-being of children. This is in accordance with the study done by Low *et al*.[24] in which they found that dental caries had an impact on children's well-being.[10]

For children aged 4–6 years, it is expected that parents are not with them all the time, mainly due to their work as well as children being in nursery or school. This could account for some parents not having a complete picture of their children's oral health-related quality of life. Parental reports could provide valuable information in their own right, but this at a different level and distinct from the respective information provided by children themselves. Previous studies have shown that dental caries had a negative impact on children's oral health-related quality of life according to parent's proxy reports.[25] At present, there is evidence that children aged 4–6 years can also give reliable reports on more concrete domains of their own health-related quality of life, thereby questioning the over-reliance on parental proxy reports.[26,27] Therefore, it is essential to include both child and parental proxy reports when measuring the impact of oral diseases and disorders on oral health-related quality of life.

This is a limitation of the present study, in which the questions were limited to parents and children were not included. Another limitation of this study is that BMI was compared to the WHO data and it would be more relevant to compare the results according to the growth

chart given by Indian Association of Pediatrics which is specific to Indian children.

CONCLUSION

The results of this study found no significant correlation between BMI and dental caries. It was found that both children with caries and without were underweight. However, it was seen that severe ECC had a negative impact on oral health quality of life.

Future studies on larger sample size which should incorporate validated dietary assessment, socioeconomic status, oral hygiene compliance, and other factors that may act as confounders or modifiers.

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