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Original Article

Association between early childhood caries and age and gender specific height, weight and mid upper arm circumference of school children in puducherry- "a comparative study"

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ABSTRACT

Background: Caries is an infectious disease that is induced by the diet. Despite its decline in all age groups on a worldwide basis, it is still a serious public health problem in Indian children and its control should be a priority. It has been demonstrated that ECC can gradually reduce the children's weight, which can be reversed after complete oral rehabilitation.

Aim: The purpose of this study was to find out whether there is an association between ECC and age and gender specific height, weight and mid upper arm circumference (muac).

Materials and Method: A study was conducted in a total of 450 children belonging to the age group of 4-6 years attending pre schools in Puducherry. Oral health status was assessed by using decayed extractedfilled teeth index (deft). Weight assessment was done using Akai weighing scale and height was measured using height measuring scale, while MUAC was measured using measuring plastic tape. The obtained data was collected and statistically analyzed.

Results: Statistically, there was no significant association between height, weight and MUAC when compared with ECC (p=0.946,0.955,0.909) respectively. No Significant association was found when gender and ECC were compared (males p=0.222) (females p=0.272),but girls were found to be more prone to ECC than boys.

Conclusion: In our study, we found that there was no significant association between early childhood caries and age. When gender was compared with ECC, a significant association was found stating that girls are more prone to ECC than males. Overall, When ECC was compared with age and gender specific height, weight and MUAC, there was no significant association found.

Key words: Early childhood caries, Height, Weight, Mid upper arm circumference, Socio economic status.

INTRODUCTION

Oral health is related to general health of an individual. One of the most common oral health issue faced by a child is ECC (Early Childhood Caries) which is defined as the presence of one or more decayed, missing, filled tooth surface in any primary tooth in 71 months of age or younger. Etiology of ECC being multi factorial in origin, prevention and its management still remains a challenging task for the practitioners.Studies have proved that dental caries could affect growth indirectly by altering the correct trend of auxological parameters in childhood, such as weight and height.[1]

BMI is widely used as a surrogate measure for obesity because it correlates for an individual's height in relation to weight and is a commonly used indicator for nutritional status. Assessment of obesity in children for BMI (Body Mass Index) is not a recommended method for 4-6 year old children instead, MUAC assessment is done. MUAC is often used as a measure for finding Severe Acute Malnutrition (SAM) in under-five children for the purpose of mass screening and community based diagnosis. It is also proved as an indicator for obesity in children and has been used as a measure to assess the nutritional status of a child.[2]

Compared to the recent past, with the lack in physical activity and high energy dense diet, there is an alarming rise in the number of obese children. Studies have proven a relation between diet and ECC, especially due to intake of sugars at night time. A plausible explanation for increased caries incidence in obese can be attributed to their changing dietary habit and life style. Association between ECC and height, weight and MUAC was conducted in Brazil, Iran and Canada. In India, studies were done in Himachal Pradesh, Shimla, Andhra Pradesh, etc.[20,21,23] Till date there are no study which investigated the relationship between ECC and age & gender specific height, weight and mid-upper arm circumference of school children in Puducherry. Thus this study was

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planned with the aim to find out whether there is an association between ECC and age and gender specific height, weight and mid upper arm circumference (MUAC).

The objectives of the study were;

- To find the association between early childhood caries and age & gender specific height
- To find the association between Early Childhood caries and age & gender specific weight
- To find the association between early childhood caries and age & gender specific mid upper arm circumference(MUAC).
- To find the association between early childhood caries and socio economic status

Materials and Methodology

Among 5 private schools, 3 schools were selected for the study after obtaining prior permission. The study was conducted after the approval from Institutional Ethical Committee, (IGIDSIRB2014PEDO). Prior to the study,informed consent from parents and school officials and assent from children were obtained.

The recording sheet consisted of details of demographic measures such as age, sex and parental education along with height, weight and MUAC (Mid Upper Arm Circumference) with deft index. The subjects were selected for the study based on the inclusion and exclusion criteria. Height assessment was done with the help of a height measuring tape by asking the patient to stand in upright position towards the wall. Weight assessment was done with the help of a standard AKAI weighing scale, which has maximum weighing load up to 120 kg and asking the patient stand on it in an upright position. MUAC measurements were taken in centimeters with non-elastic tape to the nearest 0.1 mm on the upper left arm (halfway between the acromion process and the olecranon process).

Caries in the mixed dentition was assessed according to the guidelines given by WHO (1997) using plain mouth mirror and explorer under natural daylight. Decayed, extracted and filled teeth (deft) due to caries were recorded for each individual. The obtained data was entered in a excel sheet and subjected to statistical analysis. Chi square test was used to test the association between early childhood caries and age and gender specific height, weight and mid upper arm circumference.

RESULTS

Association between age and def

Among 160 children in the age group of 4 years, 65 children had a score of 1 def, 74 children had a score of 2 def, whereas 20 children had a score of 3 def and there was only 1 child with a score of 4 def. Among 146 children in the age group of 5 years, 57 children had a score of 1 def, 63 children had a score of 2 def, 25 children had a score of 3 def and there was only 1 child with a score of 4 def. In the age group of 6 years, 55 children had a score of 1 def, 65 children had a score of 2 def, 22 children had a score of 3 def and 2 children with a def score of 4 def. When chi square analysis was done to find the association between age and def scores, the p value was found to be 0.920, which was not statistically significant. Hence, there was no association between age and def scores in these children (Table 1).

Association between sex and def

Among 208 male children, 78 children had a def score of 1, 94 children had a def score of 2, 35 children had a def score of 3 and only 1 child had a def score of 4. Among 242 female children , 99 children had a def score of 1, 108 children had a def score of 2, and 32 children had a def score of 3 and 3 children had a def score of 4. When chi square analysis was done to find out the association between sex and def scores, the p value was found to be 0.564, which was not statistically significant. Hence, there was no association between sex and def scores of these children; but girls were more prone to ECC than boys (Table 2).

Association between socio economic status and def

Socio economic status was assessed using Kuppusamys socio economic scale and we found that children in Upper class were 240, upper middle was 192 and middle and lower middle was 18. Among 240 children of upper SES class, 90 children had a def score of 1, 113 children had a def score of 2, 35 children had a def score of 3 and 2 children had a def score of 4. Among 192 children of upper middle class, 80 children had a def score of 1, 79 children had a def score of 2, 31 children had a def score of 3 and 2 children had a def score of 4. Among 18 children of middle and lower middle class, 7 children had a def score of 1, 10 children had def score of 2, and 1 child had a def score of 1. Combining the upper class, upper middle class, middle and lower middle classthere was 177 children with a def score of 1, 202 children with a def score of 2, 67 children with a def score of 3 and 4 children had a def score of 4. When chi square analysis was done to find out the association between SES and def scores, the p value was found to be 0.774, which was not statistically significant. Hence, there was no association between SES and def scores of these children (Table 3).

Association between height, weight and MUAC with def

Table 4 illustrates the association between def and height, weight and MUAC and was analyzed using chi square analysis. The association between def and height was not significant (p = 0.326).The association between def and weight was not significant (p = 0.516). The association between def and MUAC was not significant (p = 0.434).

At the age group of 4 years, the association between def and height was not significant (p = 0.946). The association between def and weight was not significant (p = 0.955). The association between def and MUAC also was not significant (P = 0.909).

At the age group of 5 years, the association between def and height was not significant (p = 0.459). The association between def and weight was not significant. (p = 0.457). The association between def and MUAC also was not significant (P = 0.273).

At the age group of 6 years, the association between def and height was not significant (p = 0.257). The association between def and weight was not significant (p = 0.917). The association between def and MUAC also was not significant (p = 0.407) (Table 4).

DISCUSSION

Early childhood caries occurs mostly due toincorrect diet, especially the intake of sugars at nighttime to aid the child's sleep. These substances adhere to the dental surface when the salivary clearance is reduced and thus create favorable conditions for the organization of the plaque responsible for dental caries (Bruerd *et al*., 1996; Danila *et al*., 2007). Obesity has become an epidemic in many parts of the world. It is not only a problem found in the adult population but has also become an increasing problem in childhood. In India, the problem of obesity has been scantily explored even in the affluent population groups. It appears to influence the general health as well as the oral health of an individual, particularly.[11]

This study was conducted to find out the association between early childhood caries and age and gender specific height, weight and MUAC in primary school children in Puducherry. This study was conducted among primary school children aged 4 to 6 years as these age group children are more prone to ECC and according to the American Academy of Pediatric Dentistry, ECC is defined as the presence of 1 or more

Table 1: Association between specific age and deft scores

		deft						
		1.00	2.00	3.00	4.00	Total	Chi Square	P- Value
AGE	4 years	65	74	20	1	160	2.001	.920
	5 years	57	63	25	1	146		
	6 years	55	65	22	2	144		
Total		177	202	67	4	450		

Table 2: Association between specific gender and deft scores

		deft						
		1.00	2.00	3.00	4.00	Total	Chi Square	P- Value
SEX	Male	78	94	35	1	208	2.039	.564
	Female	99	108	32	3	242		
Total		177	202	67	4	450		

Table 3: Association between socioeconomic status and deftscores

		DMF						
		1.00	2.00	3.00	4.00	Total	Chi square	P value
SES	Upper class	90	113	35	2	240	3.275	.774
	Upper middle	80	79	31	2	192		
	Middle/lower middle	7	10	1	0	18		
	Total	177	202	67	4	450		

Table 4: Association between age and gender specific height, weight and mid upper arm circumference with deft scores:

Age			Height	Weight	Muac
4	deft	Pearson Correlation	.005	-.004	.009
		Sig. (2-tailed)	.946	.955	.909
		N	160	160	160
5	deft	Pearson Correlation	.062	-.062	-.091
		Sig. (2-tailed)	.459	.457	.273
		N	146	146	146
6	deft	Pearson Correlation	.095	.009	.070
		Sig. (2-tailed)	.257	.917	.407
		N	144	144	144

decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a 71 months of age or younger child.[5]

Similar studies have been done in Italy, Iran, Canada, China, Japan, Bangladesh etc. to find out the association between obesity and dental caries. In India most of the studies are done in North India like Shimla, Himachal Pradesh, Assam, Lucknow etc. In south India very few studies have been done in Bangalore, Chennai, Nellore to find out the association between obesity and dental caries. Till now there are no studies reported from Puducherry. Therefore this study was planned in Puducherry preschools.[22-24]

Demographic measures including age, sex, and socioeconomic status were tabulated in the case sheet for each child.Height assessment was done with the help of a height measuring tape, stature meter (200 cm/ 78 inch) wall mounted , making the patient stand in upright position. Weight assessment was done with the help of a standard AKAI weighing scale, which has maximum weighing load up to 120 kg, by making the patient stand in an upright position**.** The most commonly used weighing scale is the single calibrated scale, same scale has been used by Chenna *et al* in their study, where they found an association between dental caries and anthropometric measures.[3,6]

MUAC is an indicator to measure the mid upper arm circumference. This measurement can be taken quickly, at less cost. It requires neither sophisticated equipment nor anything but the most basic literary level to carry out. It is an excellent indicator of nutritional status and is frequently used for screening purposes. MUAC measurements can be taken in centimeters with non-elastic tape to the nearest 0.1 mm on the upper left arm (halfway between the acromion process and the olecranon process). Shayan *et al* recorded MUAC as values for mid upper arm circumference of primary school children. MUAC values differ from country to country and supports local standard in this regard.[7-9]

Caries was assessed using decayed, missing and filled teeth (deft) for primary teeth and DMFT for permanent teeth according to WHO guidelines (1997). Clinical examination was done using plain mouth mirrors and CPI probes under natural daylight.Our study examined the association of weight, height and MUAC with ECC in 4-6 year-old children in Puducherry. The results of our study demonstrated that there was no association between height, weight and MUAC with ECC. Earlier studies in developing countries also reported similar correlations between anthropometric measures (height, weight, and MUAC) and the number of untreated carious surfaces and caries experience of the children. Our study results were similar to results by Costa *et al*, who found no significant associations between dental caries and childhood obesity at 6 years of age. In contrast Mohammadi *et al* found an association between the body mass index and dental caries.[13] This is attributed to the fact that most of the children in our study were from the upper or middle class (private schools) and parents might be aware of the oral hygiene practices.

Socioeconomic status plays an important role in diet and ECC. There are already studies which found an association between dental caries and socioeconomic status. In our present study, there was no association

between the socioeconomic status and ECC. Ruhaya *et al* conducted their study among 12 pre schools in Malaysia, which resulted in no significant associations between early childhood caries (dmft) and socioeconomic status whereas in Mishu *et al* study, conducted his study in 6-12 years old children of Bangladesh, were an association between dental caries, weight, and height was independent of socioeconomic and behavioral factors.[6] The findings highlight the importance of oral health as an additional burden for children health in low-income countries. In our study, the schools selected were private schools and most of the parents were well educated which enhance the child to maintain a good oral hygiene status. Children with low body weight have a higher risk of developing dental caries than overweight-obese children, whereas overweight children aged 6-7 years had a significantly lower dental caries severity than children of normal BMI for- age.[16-18] For these reasons, the evaluation of nutritional status in children should be implemented in control programs for dental caries both on the community and individual levels. In our study, there was less number of obese and overweight children on screening; therefore our results found no association between weight and dental caries. These results are in correlation with Pinto *et al* and Chen *et al* studies, whereas in controversy Baktheyar *et al* found an association between weight and dental caries. In our study, all the students were day scholars; they used to get their food from home. The school management was strict in the rule that no student should eat from outside the school; therefore the amount of junk food and high calorie food consumption was less during the school time.

Traditionally, MUAC has been commonly used in the assessment of nutritional status. In 2003, de Almeida *et al* suggested that MUAC was an adequate alternative method for obesity screening in preschool children. In our study, MUAC assessment illustrated that there was no association between dental caries and MUAC; this was similar to results by Mazcoglu *et al* in children aged 6 to 17 years of Brazil. Age-related MUAC cut-offs have been reported for children in two countries, Brazil and Turkey. Nikhil *et al* in 2010 conducted a study among 6–12 year children in Bangladesh with the help of a MUAC measurement tape and concluded that MUAC is a potential anthropometric indicator of child nutrition. In our study the anthropometric measures like height, weight and MUAC was in the normal age percentile according to 4 to 6 years of age children.[5,7]

With respect to dental caries rates, girls were found to exhibit higher prevalence rates than boys. Higher caries prevalence among girls is often explained by earlier eruption of teeth in girls, hence longer exposure of girls' teeth to the cariogenic oral environment.

Caries if left untreated, will progress to the dental pulp and the child will repeatedly experience toothache and have trouble eating. Long-term effects of suffering from tooth decay may contribute to a child's impaired weight gain and slow growth rate. Furthermore, studies of the nutritional status of young children with severe caries have suggested that severe caries may be a risk marker for malnutrition. It has been known that children living in low socioeconomic conditions have high risk of malnutrition. Some findings have demonstrated that caries, mostly untreated lesions, had an impact on nutritional status, and a low percentile of BMI-for-age could signal a health problem that deserves attention.[14]

CONCLUSION

- In our study, we found noassociation between ECC and age.
- When gender was compared with ECC, no significant association was found but surprisingly found that girls are more prone to ECC than boys.
- There was no significant association between socio economic status and ECC.
- When ECC is compared with age and gender specific height, weight and MUAC, there was no significant association found.
- More longitudinal studies with higher sample size are needed to confirm this association between ECC and age & gender specific height, weight and MUAC.

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CONFLICT OF INTEREST

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