

Association Between Dental Caries And Body Mass Index Of 12 And 15 Year School Going Children of Lucknow City, Uttar Pradesh

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Abstract: Introduction: The connection between ingestion of refined starches, particularly sugars, and the prevalence of dental caries is very well documented in the writing. So, the present study was carried out with an aim to determine if there is an association between body mass index (BMI)-for-age and dental caries in children and to find out the role of diet with respect to BMI-for-age and dental caries.

Methodology: A cross sectional study was conducted on 1000 school going children of 12- and 15-years age group. A cluster random sampling method was used to obtain the desired sample. Intra examiner reliability was observed using kappa statistics. Clinical examination was conducted in the school premises after obtaining informed consent from parent and permission of school authority. WHO 1997 proforma was used for recording dental caries. Body Mass Index was calculated The obtained data Was analyzed using SPSS version 22.0 using Pearson correlation and linear regression test was used keeping $p < 0.05$

Result: A negative correlation was obtained between Dental Caries and Body Mass Index of 12- and 15-year-old school going children.

Conclusion: The assumption that “overweight/obesity correlates with more caries” cannot be statistically proven. This study showed higher percentage of children was in the underweight category of BMI. Further, higher percentage of underweight children was in government schools as compared to private schools. Correlation analysis showed BMI had a negative correlation with DMFT. Many of the children can have a poor health status due to lack of knowledge about general and oral health. Continuous education and motivation of parents and children can help to some extent to improve their health status.

Keywords: Dental caries, body mass index, dmft, DMFT, cross sectional study, BMI

INTRODUCTION

The connection between diet and nutrition and oral wellbeing and infection can best be depicted as a synergistic 2-way road. Diet locally affects oral wellbeing, essentially on the integrity of the teeth, pH, and composition of the saliva and plaque. Nutrition, nonetheless, systemically affects the integrity of the oral cavity, including teeth, periodontium (supporting tissue of the teeth), oral mucosa, and alveolar bone. Adjustments in supplement intake secondary to changes in diet consumption, retention, digestion, or discharge can influence the integrity of the teeth, encompassing tissues, and bone just as the reaction to wound mending[1].

Dental caries happens because of demineralization of enamel and dentine by natural acids produced by microorganisms in dental plaque through the anaerobic digestion of sugars from the diet[2]. At the point when sugars or other fermentable carbohydrates are ingested, the subsequent fall in dental plaque pH brought about by natural acids increases the solubility of calcium hydroxyapatite in the dental hard tissues and demineralization happens as calcium is lost from the tooth surface. The pH at which demineralization happens is frequently alluded to as the basic pH and is around 5.5. Saliva is one of the mouth's natural defenses against this interaction. Salivation promotes remineralization, i.e., it is capable of saving mineral in permeable regions where demineralization of enamel or dentine has happened. Saliva is super-immersed with calcium and phosphate at pH 7; this inclines toward the deposition of calcium. If a

demineralized lesion is formed it will be remineralized; although this is a slow interaction that competes with factors that cause demineralization. In the event that the pH in the mouth stays sufficiently high for adequate time, complete remineralization of enamel might happen. However, if the acid challenge is too great, demineralization overwhelms and the enamel turns out to be more permeable until at last a carious lesion forms[3]. In India, the issue of obesity has been insufficiently investigated even in the princely populace groups[3]. Obesity seems to impact the overall wellbeing just as the oral health of an individual, and especially in youngsters, it increases the risk of subsequent morbidity, with increased prevalence of hypertension, type 2 diabetes mellitus, dyslipidemia, left ventricular hypertrophy, non-alcoholic steatohepatitis, obstructive sleep apnea, and muscular and psychosocial issues, accelerates dental development, and diminishes masticatory performance[4-8].

The connection between ingestion of refined starches, particularly sugars, and the prevalence of dental caries is very well documented in the writing. One of the etiological factors of obesity is diet which likewise plays a similarly significant part in the caries interaction. Very little writing is accessible to know whether there is any immediate connection among obesity and dental caries in children. So, the present study was carried out with an aim to evaluate the association between Body Mass Index (BMI) and Dental Caries among 12 and 15-year school going children in Lucknow city, Uttar Pradesh.

METHODOLOGY

The present cross sectional study was carried out on 12 and 15 year school going children of Lucknow city. The inclusion criteria for the study was School children who have completed their 12 years of age at the time of study, School children who have completed 15 years at the time of study while medically compromised and those children who refused to participate were excluded. Ethical clearance was given by the Institutional Ethical committee of Babu Banarasi Das College Of Dental Sciences. Pilot study consisting of two classes of 12-year-old and 15-year-old children consisting of 50 children each, in local schools was carried out. Examiner calibration and training of recording clerks has been done at the same time. The team of the survey consisted of administrators, coordinators, examiners and recorders participated in the pilot study. The sample size was calculated based on previous literature⁷ using the formula $n = Z^2P(1-P)/d^2$. The sample size was estimated to be 720, which was increased to 1000 for generalizability of the study. (Where $Z=1.96$, $p= 21\%$, margin of error= 5%) To allow detection and correction of this tendency, the examiner performed duplicate examinations on 5–10% of the sample (no fewer than 25 subjects) in the actual survey. The inter rater reliability calculated using kappa statistics was found to 0.91 i.e in perfect agreement. Lucknow city was divided into 5 geographical regions, North, South, West, East & Central zone. The study was conducted in the government and private schools of Lucknow city. Schools from each region was randomly selected to obtain the desired sample size, such that there is an equal representation from each of the five zones. In the second stage, eligible school children were stratified according to age and gender, and randomly selected in proportion to the total number of 12 and 15-years old students to reach sample size of 1000 students. Verbal Informed consent was obtained from the participating population, written consent from the parents and permission was taken from the school authorities. The collection of data was carried for 6 months between October 2019- February 2020. As a guideline, a basic examination of a child usually takes about 10 minutes. Daily and weekly schedules were prepared. The schedule was made available to school authorities. The examination was carried in the class room or field of the school premises with consistent lighting. The procedure for diagnostic criteria was those recommended by the World Health Organization (2013) for assessment of dental caries by Type III clinical examination recommended by ADA. Body weight was recorded to the nearest 100-gram using a standard beam balance scale with the subject barefoot and wearing light dresses. Body height was recorded to the nearest 0.5 cm without shoes, heels together and head touching the ruler with line of sight aligning horizontally. Body Mass Index (BMI) was calculated using the standard formula – Mass (Kg)/ height ²(m). All the children were clinically examined for Dental Caries. The data collected were entered in IBM SPSS statistics 20. Descriptive analysis of qualitative variable is shown as number and percentages. Descriptive statistics represents the total number of participants, gender wise distribution, types of school: government or private. Inferential statistics used are ANOVA, co- relation and t test. A Pearson product correlation was run to determine the relationship between BMI and dental caries. p value less than 0.05 was considered statistically significant. All the data were reported with exact p-values and 95% confidence intervals (CI) and 5% margin of error (z).

RESULT

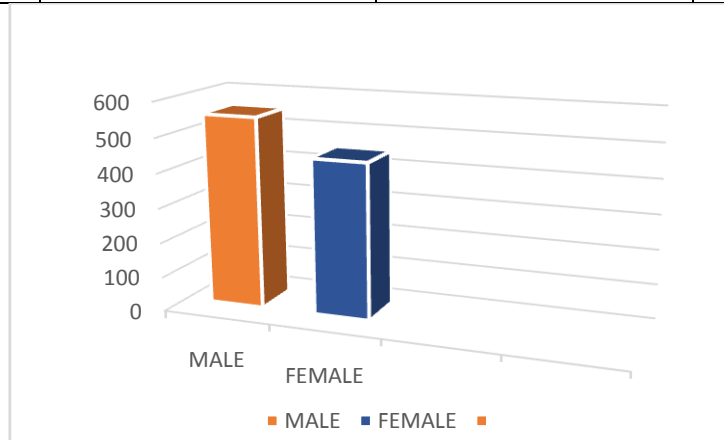
Table 1 shows the demographic data of the participants of the study. Out of 1000 participants 449 consisted of 12-year-old school going children, where as 551 consisted of 15-year-old school going children.

Among 12 year there were 223 male participants and 226 female participants, while there were 329 males among 15 years old and 222 females.

The total male participants in the study were 552 and 448 females.

TABLE 1: DISTRIBUTION OF STUDENTS AGE AND GENDER WISE

Age	Male	Female	Total
12	22.3% (223)	22.6% (226)	44.9% (449)
15	32.9% (329)	22.2% (222)	55.1% (551)
Total	55.2% (552)	44.8% (448)	100% (1000)



GRAPH1: GENDER WISE DISTRIBUTION OF OVERALL STUDENTS

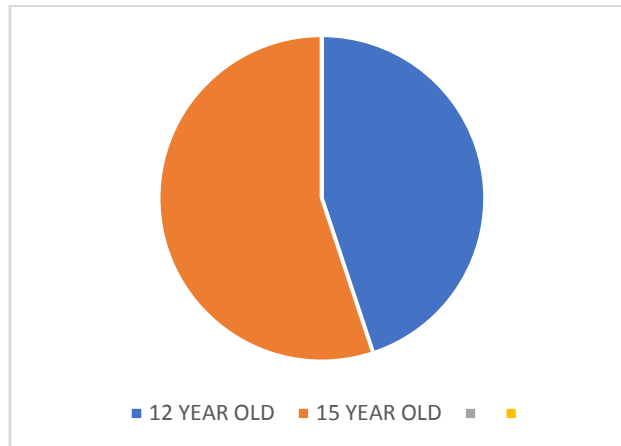


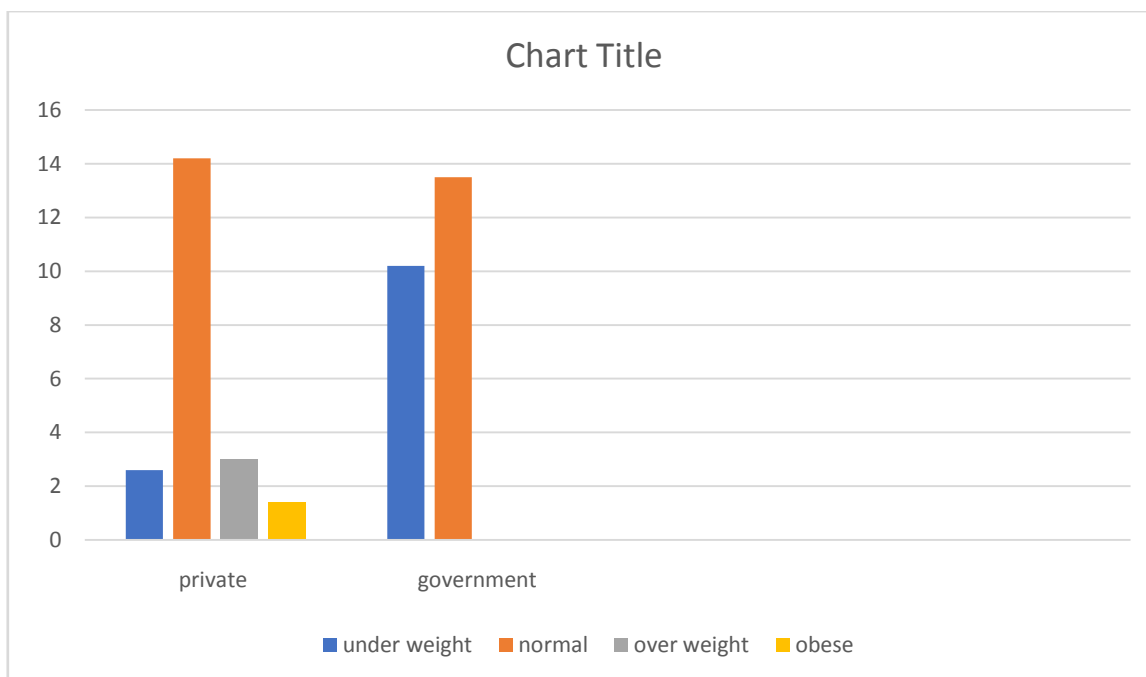
FIGURE 1 : AGE WISE DISTRIBUTION OF PARTICIPANTS

Out of the total 12-year-old who attended government school 102 were found to be underweight whereas Only 26 of private school children were found to be underweight. 135 students of government school, 142 students of private school children were in the normal Body Mass Index. There were no overweight students from government school or obese group whereas 30 participants of private schools were over weight and 14 were obese.(table 2, graph 2)

Table 2: Distribution of subjects according to BODY MASS INDEX among 12-year-old

Age	BODY MASS INDEX	Private	Government
12	Under weight	2.6% (26)	10.2% (102)
	Normal	14.2% (142)	13.5% (135)
	Over weight	3% (30)	0
	Obese	1.4% (14)	0

P<0.000. BODY MASS INDEX: Body Mass Index

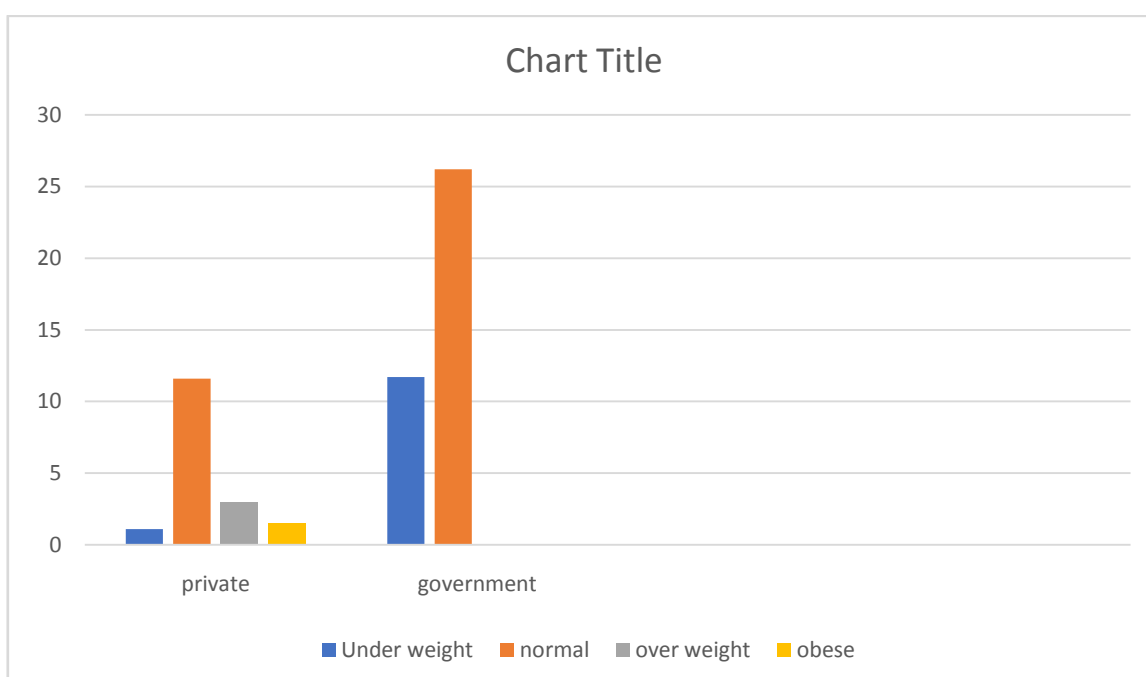


GRAPH 2: school wise distribution of B.M.I of 12 year old school going children

Table 3, graph 3 shows the Body Mass Index of 15-year-old, 117 participants attending government schools were found to be underweight where as the number for private school were 11. 262 government school children were normal while this number for private school were 116. There were 28 overweight students and 17 obese students in private schools while none was found in government schools.

Table 3: Distribution of subjects according to BODY MASS INDEX among 15-year-old

Age	BODY MASS INDEX	Private	Government
15 year old	Under weight	1.1% (11)	11.7% (117)
	Normal	11.6% (116)	26.2% (262)
	Over weight	2.8% (28)	0
	Obese	1.7% (17)	0



GRAPH 3: school wise distribution of Body Mass Index among 15 year old

Table 4 shows result on continuous measurement present as mean +/- SD. The mean DMFT was found to be significant in respect with 12-year-old school going children.

Table 4: Mean DMFT according to gender

Age	Gender	Mean dental caries	SD	P value
12 years	Male	0.533	0.939	0.006*
	Female	0.799	1.126	
15 years	Male	0.997	1.341	0.212
	Female	1.142	1.591	

DMFT: Decayed missing filled teeth,

SD: Standard deviation.

*Statistically significant

The highest mean Dental Caries (0.721+/- 1.001) was seen in under weight category and the lowest mean dental caries was reported in over weight category (0.021+/-0.164) of Body Mass Index at the age of 12 years but the difference was not statistically significant. At the age of 15 years also underweight category had highest mean Dental Caries as compared to other categories and the difference was statistically significant shown in table 5.

Table 5 shows dental caries compared to different Body Mass Index categories.

Age	Body Mass Index	Mean dental caries	SD	P value
12-year-old	Under weight	0.721	1.001	0.091
	Normal	0.713	1.191	
	Over weight	0.021	0.164	
	Obese	0.063	0.131	
15year old	Under weight	1.128	1.413	0.113
	Normal	0.978	1.371	
	Over weight	0.714	0.530	
	Obese	0.712	0.513	

Table 6 depicts correlation between BODY MASS INDEX and dental caries of 12-year-old school going children. The result was found to be significant (p=0.00) with a Pearson correlation to be 0.444.

Table 6: Correlation analysis between strata of BODY MASS INDEX and dental caries.

Pearson's correlation coefficient	Decayed teeth
R	-0.412
P value	<0.01

DISCUSSION

The prevention and control of dental caries and its related variables stays an overwhelming task to the medical care professional because of its multifactorial nature. Throughout the timeframe, adjustments in way of life and diet have been sped up by industrialization, urbanization, monetary turn of events, and market globalization. The present study was conducted to know the relationship between Body Mass Index and dental caries.

In the previous many years, these progressions in way of life and diet have been affecting nutrition and oral wellbeing, quite through higher sugar intake and lower physical work levels, especially among the younger members from the populace[9].

Children with underweight Body Mass Index were found to have more dental caries. The numbers were prominent in government school as compare to private schools. The reason can be because of poor oral hygiene status and knowledge among the parents of the participants.

However, when it came to students with private school the underweight students with working mothers are found to be fussy eaters, they eat more chocolates and cariogenic food. The school have rules regarding diet plan, junk food is prohibited in the tiffin only one day is assigned for junk food in tiffin, even the tuck room in school don't keep junk food. Underweight children were given more diet and number of meals by grandparents and caretakers so to increase weight as malnutrition is a major concern of parent of growing children.

The role of diet is significant in the development of obesity and dental caries. The two conditions share some common diet-related danger, which impacts the rate of both obesity and dental caries. These diet factors incorporate poor food decisions, dietary propensities, recurrence and high usage of fermentable carbs, consumption of sweetened junk foods and fatty and cariogenic diet[10,11].

Way of life attributes that might assume a part in the advancement of the two conditions incorporate reduced physical work, expanded utilization of snacks, and expanded time spent watching TV and utilizing new interactive media innovations[12,13,14].

Furthermore, it has been recommended that the two conditions are prevalent in some specific communities because of unhealthy food, lower parental education levels, and inability to acquire adequate medical care services[10,15,16]. In spite of the fact that sugar is one accepted risk factor for obesity and dental caries, the converse relationship may likewise be owing to dietary patterns. Obese kids and young people may eat more greasy food varieties, fried food varieties, and crude starches, however not really more food varieties high in sugar and refined carbs. This could build obesity, however not necessarily have an immediate connection to dental caries [17-19].

Further to the diet itself, the process of mastication has also been reported to be affected by dental caries, which in turn could lead to reduced nutritional intake by children and young people. Gilchrist et al. [20] reported that some children with caries may have restricted diets for lengthy periods of time, relating to difficulty eating hard foods, and getting food stuck in their teeth.

In the present study, most of the children in both the age groups i.e 102 in 12 year group and 117 in 15 year old, were in the underweight category which may be due to poor socio- economic strara and diet. Further higher percentage of overweight and obese children was found in private schools in both the age groups which was also reported by Swati Tripathi (19.1%),[21] Prashant ST,[22] Ana F Granvile-Garcia et al.,[23] and Partrica vasconcelos leitao moreira[24]. This may be explained by low-intensity physical activities together with consuming high-energy value food among the higher socio economic levels (private schools) as compared to lower socioeconomic levels (Govt. schools)[25].

It is a general concept that people with high BMI will tend to have more caries as compared to people with lower Body Mass Index, but in the present study an inverse correlation was found among the participants. A mean DMFT of 1.128+-1.413 was found among the underweight participants of 15-year-old school going children which was also highest among the underweight students of 12-year-old with a mean DMFT of 0.721+- 1.001. The observation was found to be non-significant when done in between group comparison.

In the present study, the mean DMFT at 12 years and at 15 years was 0.62 and 1.06 respectively which was also reported by Naidu R[26] and Peterson PE[27] Females had a significantly higher mean DMFT value than males. This is in line with the findings of Al Shammery et al[28], Salapatal et al[29], Dummer[30]. This may be due to the fact that teeth erupt earlier in females than males which leads to prolonged exposure of the teeth to the oral environment in females.

The study result had a significant correlation with respect to the age which was in accordance with a study done by Parkar et al[31]. It was observed that there was an inverse relation between Body Mass Index and Dental Caries. which was also reported by Prashant S[32], Mojard[33], Sheiham A[34], Kantovitz KR[35], and Macek and Mitola[36] Bhayart et al[37].

Chauhan et al.[38], Alghamdi and Almahdy et al[39], Fernández et al.[40], and Sharma B[41]. This may be because the underweight children would have acute or chronic nutritional stress due to poor socioeconomic status and lack of knowledge about general and oral health.

On the contrary, Kenan Cantekin[42] on a sample of 12 yrs in Turkey reported a positive relationship between BMI and mean DMFT. Another Swedish study of 15-year-old children revealed a significant positive correlation between DMFS indices and relative BMIs in the obese group[43], High caries experience and higher BMI have also been shown by Hilgers et al.[44], Willershausen.[45], Li et al[46], Qadri et al[47], Basha et al.[48]. The literature has also suggested that positive associations between obesity and dental caries may be the result of other shared contributing factors, such as those relating to lifestyle.

Few studies showed no association between Body Mass Index and dental caries i.e Kottayi et al.[49] and Kumar et al.[50]. Some investigators found no correlation between obesity and dental caries. One possible explanation for this stems from the fact that both obesity and dental caries are multifactorial in etiology, and various genetic and

environmental factors have an impact on them. Consequently, the many confounding factors, including age, gender, and lifestyle, might determine the development of these conditions. Nonetheless, the literature suggests that dietary factors, oral hygiene practices, and socioeconomic status are more significant risk factors for dental caries than for the development of obesity[41,33,21].

Moreover, as stated previously, obesity can be due to an increased intake of dietary fats, which has less influence on the development of dental caries than a diet high in sugar [43].

On the other hand, a study by Ochoa et al.[51] found that children who consume sugar-sweetened beverages have a 1.74 times greater risk of being obese as compared with children who do not consume this type of beverage. Anita Alm et al.[52] showed that overweight and obese adolescents had more proximal caries than normal weight individuals and the frequent consumption of snacking products during early childhood was a risk indicator for caries at 15 years.

The dentists should be in the forefront in promoting good nutrition for general health and oral health by informing caregivers and parents about the importance of integrating healthful snack and meal patterns into their oral hygiene practices.

The limitations of the present study were that, No cause-effect relationship could be deduced from a cross-sectional design study such as this. Second, numerous confounding variables related to socio-economic factors, dietary pattern and oral hygiene practices among schoolchildren were not been taken into consideration, which may play a major role. Third, in India most of the people with lower socioeconomic group send their children to government school

CONCLUSION

It is assumed that obese or overweight individual will have more caries the study showed a significant negative correlation. In the present study majority of the school going children fell in underweight category of which most of the children were from the private school. It was found that Mean DMFT score was high in underweight school going children in comparison with other Body Mass Index groups. Pearsons Correlation was found to be negative and significant. This study proves Body Mass Index has an association with dental caries thus rejecting the null hypothesis. The prevailing health status among the children can be a result of poor knowledge regarding oral and general health. Parents and teachers should be motivated and educated for the same.

Utmost care should be taken to prevent caries formation. Dental caries can lead to serious problem in children. Unhealthy practice among children can be a major contributor to the existing health problem. The dental specialists should be in the forefront in promoting good nutrition for general wellbeing and oral wellbeing by illuminating caregivers and guardians about the significance of coordinating healthful snack and meal designs into their oral hygiene practices.

School health program by educating and training the teachers can be a beneficial in improving the health of school going children. For the purpose of diminishing the prevalence of both diseases it would be effective to strengthen and improve the knowledge of the health and educational work force, families, lawmakers and other key players.

To eradicate the present dental health problem suitable community dental health programmes should be conducted to improve the overall wellbeing of the population.

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CONFLICT OF INTEREST

None

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