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CORRELATION OF DENTAL CARIES INDEX WITH BODY MASS INDEX IN EGYPTION CHILDREN

Ahmed S. Waly* and Yasser R Sorour * *and* Odai H. Rizq **

ABSTRACT

Background: Childhood obesity is posing a significant health concern due to a sedentary lifestyle and altered dietary patterns and so has changed the dental caries pattern across the world. There are inconsistent reports regarding the association between dental caries and body mass index (BMI) worldwide. The present study aimed to determine the presence of any connection between BMI and dental caries incidence in Egypt of Assuit region.

Materials and methods: Demographic data, caries indices (DMFT and deft) and BMI of 254 children were collected after clinical examination and recording weight and height respectively.

Results: There was a significant correlation of BMI with DMF/def in all children and girls (136) but not in boys (118). Comparisons of mean BMI and mean DMF/def among four subgroups [healthy (144), overweight (12), obese (30) and underweight (68)] were statistically highly significant. However, correlation of BMI and DMF/def was statistically significant in overweight children only ($p<0.00512$).

Conclusion : There was a significant correlation of BMI with caries index in these children. The Strong relation between caries activity of overweight children and BMI suggests that alteration in food patterns during weight gain period may pose an increased risk for caries.

KEYWORDS: Body mass index, Dental Caries, children

INTRODUCTION

Dental caries has a myriad of etiology, and its risk can be assessed by analyzing and combining several contributory elements such as fluorides, plaque, bacterial and salivary activity. Further, behavioral factors related to social life and diet are also associated with dental caries [(1)]. Sedentary lifestyle and altered dietary patterns due to change in lifestyle and financial growth have led to obesity, this has reflected in childhood overweight and obesity, and has become a great public health worry all over the world. There is data that exhibits association of dental caries with both high and low body mass indices (BMI). While the exact

* Lecturer of Pediatric Dentistry and Dental Public Health, Faculty of Dental Medicine, Al-Azhar University Assiut branch. Egypt

** Dental Intern, BMC.

cause of their relationship remains indistinct, it is possible that different factors are implicated in the emergence of dental caries in children with high and low BMI [2, 3].

Some shreds of evidence support the association of dental caries with irregular dietary habits and quality. Thus unhealthy nutritional intake has been related to the development of obesity at a young age that can be a possible link between dental caries and weight [4]. Further, the caries prevalence of Egypt population present a high decayed, missing, and filled teeth score in the adult and young people. The prevalence of caries in the permanent dentition of 12- and 15-year-old school children is 51.4% and the corresponding D2MFT and D3MFT scores were 1.5 and 0.8, respectively while in primary dentition at ages ranged from three years to six years the caries prevalence was 60.4% with the mean dmf value 3.31 [5-7]. With the previous view in mind, the present study was put forth wherein the potential relationship between dental caries and body mass index and obesity to be evaluated.

MATERIALS AND METHOD

The present study was conducted in Outpatient Department of Al Azhar University, Faculty of Dental Medicine Assuit. Total of 254 children was selected for the study and were permanent residents. The parental questioning took the medical history of the children, and their written consent was obtained before including the child in the study.

Body weight was recorded on a standard balance scale with the subject barefoot and wearing light dresses. The balance was calibrated at frequent intervals, and body height was recorded to the nearest 100 grams. Body height was recorded with no shoes, heels together and the head was touching the ruler with the line of sight aligned horizontally. For subjective errors avoidance, all the measurements were conducted by the same person and by one observer to the nearest 0.5 cm. Body mass index was calculated by using the formula weight/height2 wherein weight is in kilograms and height in meters. Body mass cut-offs were used according to Cole TJ et al. [8]. After careful clinical examination, DMFT and deft scores were recorded for all the children. Every child was examined for dental caries, and the data was recorded. Disposable diagnostic tools that were used for examination were: plane mouth mirrors, dental explorers, tweezers, gauze pads and cotton rolls. For every child, a complete set of diagnostic instruments were used and then discarded, and a new one was used for the next child. Dental caries was assessed according to WHO recommendations.

A tooth was considered to be carious if:

1. There was a lesion with a detectably softened floor.
2. The tooth has one or more filled surfaces, and caries present around the filling.
3. The tooth contained temporary filling and was requiring further treatment.

Indices used: deft for primary teeth and DMFT for permanent teeth.

Deft for the child = the sum of d, e and f wherein d- decayed, e- extracted due to caries and f - filled primary tooth.

DMFT for the child = the sum of D, M and F wherein D- Decayed, M-missed due to caries and F-filled permanent tooth.

Statistical analysis:

Means and standard deviations for age BMI, and combined DMFT and deft (DMF/def) were calculated. One way ANOVA was used for comparison of all parameters followed by Tukey's post-hoc HSD (Honestly Significant Difference) analysis to find a significant difference between groups. Pearson correlation was used to correlate DMFT and deft with body mass index in all the

groups and subgroups. Significance levels were tested at p-value 0.05 for ANOVA and Pearson's correlation.

RESULTS

Total children (n=254) included in this study comprised of 118 boys and 136 girls. All the children were subdivided into four groups as Healthy (n=144), overweight (n=12), obese (n=30) and underweight (n=68).

Mean and standard deviations for age, BMI and DMF/def were calculated for boys, girls and the total sample size. Comparisons between males and females concerning BMI, DMF/def and age were found to be statistically not significant (Table 1). Tukey's post hoc HSD analysis revealed no significant comparison in BMI, DMF/def between males or females, and between total sample and either males or females (Table 2).

Correlation of mean BMI and mean DMF/deft in total sample size and girls ($p<0.05$) were statistically significant. Boys exhibited a weak relationship between BMI and DMF/def but were statistically not significant ($p = 0.354536$) (Table 3).

Comparisons of mean BMI and Mean DMF/def between all four subgroups were statistically highly significant ($p<.00001$) (Table 4). Pair wise comparison in Tukey's post hoc HSD analysis was found to be significant when mean BMI of all four subgroups was analyzed ($p<0.01$). Mean DMF/deft was significant among obese and healthy children, obese and overweight children, and obese and underweight children (Table 5). Correlation of mean BMI with mean DMF/def was found to be not significant in healthy, obese and underweight children but was significant in the overweight subgroup ($p<0.00512$) (Table 6).

TABLE (1) Demographic Data

Parameter	Males (N=118)	Females (N =136)	Total (N=254)	ANOVA f-ratio value	p
Mean Age (years)	7.85±1.26	7.48±1.23	7.65±1.26	2.72968	0.06
Mean BMI (Kg/M²)	16.72±4.79	16.06±3.75	16.37±4.26	0.75005	0.47
Mean DMF/def	5.11±3.20	5.32±3.63	5.21±3.40	0.11345	0.89

TABLE (2) Tukey's post hoc analysis for male, female and total children

Parameter	Group	Females (N =136)	Total (N=254)
MEAN BMI(Kg/M²)	Males (N=118)	NS	NS
	Females (N =136)	-	NS
Mean DMF/def	Males (N=118)	NS	NS
	Females (N =136)	-	NS

TABLE (3) Pearson's correlation of mean BMI to mean DMF/def in males and females

Parameter	Males	Females	Total
Mean BMI (Kg/M²)	16.72±4.79	16.06±3.75	16.37±4.26
Mean DMF/def	5.11±3.20	5.32±3.63	5.21±3.40
R score	-0.0887	-0.3763	-0.2489
P Value	0.354536	< 0.05	< 0.05

TABLE (4) Comparison of mean BMI and mean DMF/ def in four subgroups (ANOVA)

Parameter	Healthy N=144	Overweight N=12	Obese N=30	Underweight N=68	F value	p
Mean BMI	15.94±1.93	19.69±1.57	24.90±6.03	12.91±1.15	181.00207	<.00001
Mean DMF/def	5.51±3.35	5.66±3.70	1.93±2.42	5.94±3.08	12.16231	<.00001

TABLE (5) Tukey's post hoc analysis in all parameters of subgroups

Parameter	Subgroups	Overweight	Obese	Underweight
Mean BMI (Kg/M²)	Healthy	P<0.01	P<0.01	P<0.01
	Overweight	-	P<0.01	P<0.01
	Obese	-	-	P<0.01
Mean DMF/def	Healthy	N/S	P<0.01	N/S
	Overweight		P<0.01	N/S
	Obese			P<0.01

TABLE (6) Pearson's correlation of mean BMI to mean DMF/def in subgroups

Parameter	Healthy N=144	Overweight N=12	Obese N=30	Underweight N=68
Mean BMI	15.94±1.93	19.69±1.57	24.90±6.03	12.91±1.15
Mean DMF/def	5.51±3.35	5.66±3.70	1.93±2.42	5.94±3.08
R score	-0.0086	0.7483	0.0998	0.1015
P value	0.92	0.005	0.59	0.41
Inference	NS	S	NS	NS

DISCUSSION

Variations in lifestyle and diet patterns have been accelerated by urbanization of population, and substantial economic and industrial development. They have a noticeable impact on health and nutrition markedly through higher carbohydrate intake and lower physical activity, particularly among the younger faction of the population [9]. Daily consumption of energy-packed food and drinks has significantly increased childhood obesity and has expanded caries experience in obese children. Numerous studies were performed to determine the associations between body mass index (BMI) and dental caries however the findings were inconsistent. While some studies showed a positive correlation between dental caries and BMI others established no such association [9-11].

Nevertheless, most of the previous studies have been conducted in Western countries and the Indian subcontinent, limited evidence has been found to link dental caries and BMI in Egyptian children who are thought to exhibit different dietary habits and lifestyles.[12] With this view in mind, in this study, we aimed to investigate the dental caries status and its association with BMI in school children.

In the present study, a randomly selected sample of children at their initial visit in the dental institute, 254 children were examined to record their combined DMFT and deft indices; BMI was calculated depending on age and gender-adjusted published scales. Mean age of the children (age range = 5.5 to 11 years) included in the study was 7.65±1.26 (year ± SD). The comparison of mean age in the children was not significant (p=0.06). Also, comparison of mean BMI between males and females was not significant (p=0.47). Mean DMF/def in females was high as compared to males and total children but was statistically not significant (p=0.89). In contrast, Chukwumah et al. found high caries index in boys than girls although their comparison was not significant [13]. However, Floyd found contrary finding in mean indices and was statistically significant in Taiwanese children [14].

Correlation of mean BMI with DMF/def was significant in girls and among the total sample ($p<0.05$) while boys showed non-significant correlation (p=0.35). However, a non-significant association between the BMI and caries experience was noted by Chukwumah [13] and Sadeghi, [15, 16].

All the children were subdivided into four subgroups by their BMI as healthy (n = 144), overweight (n =12), obese (n =30) and underweight (n = 68). Mean BMI was highly significant among these subgroups ($p<0.00001$). Comparison of mean BMI between healthy and obese, healthy and underweight; and healthy and overweight children was significant. Further comparison of BMI in obese and underweight and obese and overweight children was also statistically significant ($p<0.01$). Mean DMF/def was highly significant among these subgroups ($p<0.00001$). Among these subgroups, mean DMF/def was highest for underweight children and lowest for obese children. However, Sadeghi et al. found high mean DMF among overweight children although the low index was recorded in children with normal BMI among Iranian children [15].

Comparison of DMF/def between all subgroups was significant in our study as was found in another study by Sadeghi et al. [15, 16]. Tripathi et al. compared DMF/def between obese and non-obese children and found a non-significant relation among private school student and significant association in government school students [17]. Mean DMF/deft was least among obese subgroup, and its comparison was statistically significant with overweight, healthy and underweight children. Mean DMF/deft were very high among other subgroups, and these findings were contrary to Elangovan et al. and Sadeghi et al. [2, 15].

The present study has revealed a positive association between the caries indices and the BMI.

Although underweight children showed high DMF/def while their obese counterpart had the lowest index, a high relation was found in the caries index only among overweight children. Thus our results are consistent and are in alliance with Tripathi et al.[17]. The results of a systematic review by Hooley at al. showed that there is noteworthy disagreement on the existence and nature of the association between dental caries and BMI. Nevertheless, the present study found a positive relationship between dental caries and BMI among all children and in overweight children. Thus it can be concluded that as the patterns of food habit alter, increase in caries activity is expected. For that reason, it can be proposed that the progression of caries activity during weight gaining period is considerably higher. The significance of such observation needs to be evaluated in light of future reports that will reproduce or support this conclusion.

The present study also found that no child in the underweight category had zero caries index and their high DMF/deft score among all subgroups suggests that caries experience was widespread in underweight children. The study showed an increase in mean DMF/deft scores from obese children to underweight children with higher caries scores in underweight children than in healthy children and overweight children. On contrary other studies found high caries activity in obese children as compared to normal and underweight children [2,13].

Numerous studies conducted in the past in different populations have shown varied results in caries experience and body mass indices or factors like obesity. Presence of confounding variables such as diet or the socioeconomic status or environmental variables, age, personal oral hygiene habits, and the quantity of fluoride in the diet, has resulted in an inability to come across a firm opinion in this regard [18]. Thus the present study is also no exception for these results.

CONCLUSION

The present study observed a significant correlation of dental caries with BMI between children of Assuit region. For further evaluation of stronger correlations study including parameters like dietary habits, socioeconomic status, oral hygiene habits and parental education will surely give convincing results to this social neglect. Thus longitudinal study designs would increase the knowledge on the determinant of dental caries.

Conflict of interest

None

Why this article is important to pediatric dentist

- Help pediatric dentists to identify children at risk of caries.
- Help pediatric dentists to provide information to parents about the importance of normal child weight and its role in caries incidence.
- Pediatric dentists can educate parents about body mass index and its correlation with caries to understand the impact of oral health on the general health of the child.

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