Correlation between BMI and Prevalence of Dental Caries in 6-12 year old school going children in Ghaziabad District.

Ankita Sharma[1], Rishabh Kapoor[2], Kapil Gandhi[3], Ritika Malhotra[4]

[1](Post Graduate, Department of Pedodontics and Preventive Dentistry, Inderprastha Dental College, India)
[2](Senior Lecturer, Department of Pedodontics and Preventive Dentistry, Inderprastha Dental College, India
[3](Professor and Head, Department of Pedodontics and Preventive Dentistry, Inderprastha Dental College, India)
[4](Reader, Department of Pedodontics and Preventive Dentistry, Inderprastha Dental College, India)
Corresponding Author: Kapil Gandhi

Abstract: *Dental caries is a multifactorial disease with irregular dietary pattern being one of the major causative factors. Also it has been established that there is a direct link between obesity, malnourishment and irregular diet pattern and quality of the diet. It can be hypothesized that physical status (as per BMI) is related to occurrence of dental caries in an individual. The aim of this study is to establish correlation between prevalence of dental caries and body mass index in 6-12 year old school going children in Ghaziabad district. A sample of 400 school going children in the age group of 6 – 12 years were randomly selected from different schools. Body weight and height were measured and BMI was calculated. On the basis of BMI, children were categorized as normal, malnourished or obese. DMFT index was calculated and the data was statistically analyzed. Correlation analysis showed BMI had a negative correlation with DMFT (p < 0.01). Body mass index did not reveal any significant association with prevalence of caries in 6 to 12-year-old school children of Ghaziabad district. The relationship between dental caries and physical status should be further explored by longitudinal studies as they both have common risk determinants.*

Keywords: *Caries, Body mass index, Obesity, Overweight*

Date of Submission: 28-02-2019   Date of acceptance:18-03-2019

I. Introduction

Caries is one of the most common diseases of childhood.[1]The disease is not self-limiting and without adequate intervention, the process can continue until the tooth is destroyed. There is association between poor dietary practices (meal fragmentation, missed breakfast, low fruit, and higher carbohydrate intake) and caries. Furthermore, there is no single test that takes into consideration all the risk factors and can accurately predict an individual's susceptibility to caries.[2]

Childhood obesity is known to be linked with the intake of high refined sugar. Obesity and overweight are basically as having an excess of body fat related to lean mass, with multifactorial conditions involving psychological, biochemical, metabolic, anatomic and social alterations.[3]Excessive body weight in children is a major public health problem. According to National Family Health Survey (NFHS), obesity has reached epidemic proportions in India, affecting 5% of the country's population.[1]

Children who are at risk for being overweight during preschool years carry a greater probability of being overweight by age twelve.[4]Weight status in children is measured by assessment of body mass index (BMI) corresponding to gender and age-ranked percentages.[5]

High sugar intake is reported to be more common among overweight and obese children/adolescents than those with normal weight. Also, the frequency of sugar intake is a documented risk factor for dental caries. Given that the strong evidence supporting the relation between dental caries with indiscriminate dietary intake has been linked to the development of obesity at a young age, a link between dental caries and weight is biologically possible.[1,5]So, the present study was done to establish correlation between prevalence of dental caries and body mass index in 6-12 year old school going children in Ghaziabad district.

II. Material And Methods

Ethical permission from institution's ethical committee was taken before the commencement of study. The present study was carried out during school health camps conducted under the Department of Pedodontics and Preventive Dentistry, Inderprastha Dental College and Hospital, Ghaziabad after due approvals. A sample of 400 healthy school going children in the age group of 6 – 12 years were randomly selected from different schools during school dental camp and examination was conducted.

All examinations and data collection were done by a single examiner and proforma was filled by a recording assistant after standardization. The examination of study subjects was carried out in their school premises using natural light, ordinary chair, plain mouth mirror and WHO probe for dental caries, and explorer.

Dental caries: Clinical recording of dental caries, was done according to WHO diagnostic criteria and dmft/DMFT index was calculated.

Anthropometric measurements were carried out. Body weight (in kilograms) of study subjects was measured using standardized electronic weighing machine and their height (in meters) was measured using measuring tape. Subsequently, the BMI of each individual was calculated and children were categorized as normal, obese, thin and severely thin by comparing with published scales as per the WHO criteria.

BMI = Weight (in kg)/ (height)^2

Statistical analysis

The data obtained was analysed using SPSS version 21.00 for windows. The statistical tests used were t- test and Pearson's correlation analysis was done to check the association between BMI and dmft/DMFT.

III. Result

Descriptive statistical analysis showed out of the total 400 study subjects, 196 were females and 204 were males. The subjects were classified according to their body mass index and it was found that 36.5% of the females belonged to the normal category followed by overweight (7.25%) and obese (2.75%). Similarly, in males, 34.5% subjects were normal followed by 8.25% overweight and 5.75% obese children.

Table no 1 shows WHO classification for BMI for age was used to classify patients as obese, overweight, normal thin and severely thin. This was dependent on age and gender of the patient.

Table no 1: Patient classification according to BMI as per WHO criteria

Gender	BMI for age	Count	Percentage
Female	Normal	146	36.5
	Obese	11	2.75
	Overweight	29	7.25
	Severely thin	0	0
	Thin	10	2.5
Male	Normal	138	34.5
	Obese	23	5.75
	Overweight	33	8.25
	Severely thin	2	0.5
	Thin	8	0.5

It was found that the mean dmft (2.52± 2.61) was highest in severely thin subjects compared to the normal and obese categories, suggestive of higher caries incidence in malnourished children. However, the mean DMFT in all the BMI groups was found to be invariably same.

Table no 2 shows Mean dmft was maximum for severely thin patients. (Table 2)This could be attributed to lack of proper nutrition and high stress.

Table no 2: Mean dmft/DMFT according to patient classification

BMI classification	Mean BMI	Mean DMFT	Mean dmft
Normal	15.95	0.23 ± 0.64	2.24 ± 2.61
Obese	23.38	0.08 ± 0.37	1.79 ± 2.23
Overweight	19.61	0.11 ± 0.40	2.03 ± 2.27
Severely Thin	11.78	0	**2.52 ± 3.53**
Thin	12.99	0.16 ± 0.51	1.16 ± 1.04

Independent sample t-test was conducted to compare the mean dmft and DMFT across genders and it was found that the mean dmft and DMFT were equal for both male and female at a significance level of 95% (Table no 3).

Table no 3: Comparison between mean dmft/DMFT

t- test for equality of means							
	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% Confidence interval of the difference	
						Lower	Upper
dmft	1.247	393	.213	.31327	.25126	-.18071	.80724
	1.254	376.256	.211	.31327	.24980	-.17791	.80444
DMFT	-.668	393	.504	-.03917	.05861	-.15439	.07605
	-.664	348.018`	.507	-.03917	.05903	-.15527	.07693

Pearson's correlation test was conducted for dmft/DMFT and BMI. It was found that a weak negative correlation existed between dmft and BMI at a significance level of 95% with the Pearson's correlation coefficient = -0.150. However, an insignificant correlation existed between DMFT and BMI. (Table 4 and Table 5)

Table no 4:Correlation between dmft and BMI

		dmft	BMI
dmft	**Pearson Correlation**	1	-1.50**
	Sig. (2-tailed)		.003
	N	400	400
BMI	**Pearson Correlation**	-1.50**	1
	Sig. (2-tailed)	.003	
	N	400	400

Table no 5: Correlation between BMI and DMFT

		BMI	DMFT
BMI	**Pearson correlation**	1	0.012
	Sig. (2-tailed)		0.807
	N	400	400
DMFT	**Pearson correlation**	0.012	1
	Sig. (2-tailed)	0.807	
	N	400	400

Also, it was found that in females, a weak negative correlation existed between dmft and BMI with the Pearson's correlation coefficient = -0.141, whereas, an insignificant correlation existed between DMFT and BMI.(Table 6 and Table 7)

Table no 6: Genderwise (Females) correlation between dmft and BMI

		dmft	BMI
dmft	**Pearson correlation**	1	-.141*
	Sig. (2-tailed)		.048
	N	196	196
BMI	**Pearson correlation**	-.141*	1
	Sig. (2-tailed)	.048	
	N	196	196

Table no 7: Genderwise (Females) correlation between DMFT and BMI

		BMI	DMFT
BMI	**Pearson Correlation**	1	-0.020
	Sig. (2-tailed)		0.781
	N	196	196
DMFT	**Pearson Correlation**	-0.021	1
	Sig. (2-tailed)	.781	
	N	196	196

Similarly, in males, a weak negative correlation was found between dmft and BMI at a significance level of 95% with the Pearson's correlation coefficient = -0.159, whereas, an insignificant correlation existed between DMFT and BMI. (Table 8 and 9)

Table no 8: Genderwise (Males) correlation between dmft and BMI

		BMI	dmft
BMI	**Pearson correlation**	1	-.159*
	Sig. (2-tailed)		.023
	N	204	204
dmft	**Pearson correlation**	-.159*	1
	Sig. (2-tailed)	.023	
	N	204	204

Table no 9: Genderwise (Males) correlation between dmft and BMI

		BMI	DMFT
BMI	**Pearson correlation**	1	.048
	Sig. (2-tailed)		.497
	N	204	204
DMFT	**Pearson correlation**	.048	1
	Sig. (2-tailed)	.497	
	N	204	204

IV. Discussion

The main objective of the present study was to establish correlation between prevalence of dental caries and body mass index in 6-12 year old school going children in Ghaziabad district. In the present study it was found that, most of the children in both the genders were in the normal category followed by higher percentage of overweight children in males as compared to females which is in contrast with the report of Swati Tripathi et al.[6]This may attributed to the topography of the state, method of data analysis and sample size of the study.

Also, in the current research it was found that the mean dmft and DMFT are equal for both the genders. However, Al Shammery et al, Salapatal et al, Dummerfound that females had a significantly higher mean DMFT value than males which was atributed 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.[7,8,9]

The research depicted that the mean dmft was maximum for severely thin patients. This could be due to the fact that severely thin subjects are under nutritional stress.

No significant correlation was found between BMI and dental caries. This might be attributed to the fact dental caries is multifactorial in aetiology and various genetic and environmental factors have an impact on them.Tramini et al. found similar results showing no significant association between DMFT and BMI.[10] This finding is also consistent with the results from the prospective study by Pinto et al., where no correlation between dental decay and BMI was detected in a multiple regression analysis.[11]However, Swedish study of 15-year-old children revealed a significant positive correlation between DMFS indices and relative BMIs in the obese group which was not in accordance with the present study.[12]

The exact mechanism for the association of body weight and dental caries is not yet known. But it can be related to consumption of refined carbohydrates which might serve as a link between obesity and the onset of dental caries. Marshall et al found that children <5 years of age with dental caries had a higher soft drink intake than children without caries. They could not establish a relation between soft drink consumption and BMI levels. Ochoa et al 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.[13]

Recent systematic review and meta-analysis conducted by Hayedn et al. showed that, overall, there was a significant relationship between childhood obesity and dental caries.[14] However, this relationship was not significant for newly industrialized countries similar to present study conducted in Mathura, India.[1] Anita Alm et al showed that overweight and obese adolescents had more proximal caries.[15] Hence, the dentists should be in the forefront in promoting good nutrition for general and oral health.

V. Conclusion

Body mass index did not reveal any significant association with dental caries in 6-12-year-old school children of Ghaziabad district. The relationship between dental caries and obesity/ malnutrition should be further explored by longitudinal studies as they both have common risk determinants.

References

[1]. Gupta P, Gupta N, Singh HP. Prevalence of Dental Caries in relation to Body Mass Index, Daily Sugar Intake, and Oral Hygiene Status in 12-Year-Old School Children in Mathura City: A Pilot Study. Int J Pediatr. 2014;2014:921823.
[2]. Dye BA, Shenkin JD, Ogden CL, Marshall TA, Levy SM, Kanellis MJ. The relationship between healthful eating practices and dental caries in children aged 2-5 years in the United States, 1988-1994. J Am Dent Assoc 2004;135:55-66
[3]. Granville AF, DE Menezes VA, De Lira Pi, Ferreira JM, Leite-Cavalcanti A. Obesity and Dental Caries among Preschool Children in Brazil. Rev Salud Pública 2008;10:788-95.
[4]. Martorell R, Kettel Khan L, Hughes ML, Grummer-Strawn LM. Overweight and obesity in preschool children from developing countries. Int J ObesRelatMetabDisord 2000;24:959-67.
[5]. Gidding SS, Dennison BA, Birch LL, Daniels SR, Gilman MW, Lichtenstein AH, et al. American Heart Association dietary recommendations for children and adolescents: a guide for practitioners. Pediatrics 2006;117:544-59.
[6]. Swati T, Kiran K, Kamala BK. Relationship between obesity and dental caries in children - A preliminary study. J. Int Oral Health 2010;2:65-72.
[7]. Shammery A, Guile EF. Prevalence of caries in primary school children in Saudi Arabia. Community Dent Oral Epidemiol 1990;18:320-21.
[8]. Salapatta J, Blinkhorn AS, Attwood T. Dental health of 12 year old children in Athens. Community Dent Oral Epidemiol 1990;18:80-81.
[9]. Dummer MH, Addy M, Hicks R, Kingdom A. The effect of social class on the prevalence of caries, plaque, gingivitis and pocketing in 11-12 year old children in South Wales. J Dent 1987;15:185-190.
[10]. Tramini P, Molinari N, Tentscher M, Demattei C, Schulte AG. Associationbetween caries experience and body mass index in 12-year-old French children. Caries Res. 2009;43(6):468-73.
[11]. Pinto A, Kim S, Wadenya R, Rosenberg H. Is there an association between weight and dental caries among pediatric patients in an urban dental school? A correlation study. J Dent Educ. 2007 Nov;71(11):1435–40.
[12]. Larsson B, Johansson I, Weinehell L, Hallmans G, Ericson T. Cardiovascular disease risk factors and dental caries in adolescents: effect of a preventive program in Northern Sweden (the Norsjo project). ActaPaediatr 1997;86:63-71.

[13].   Marshall TA, Levy SM, Broffitt B, Warren JJ, Eichenberger-Gilmore JM, Burns TL, Stumbo PJ.Pediatrics. 2003;112:e184-91.
[14].   Hayden C, Bowler JO, Chambers S, Freeman R, Humphris G, Richards D, Cecil JE. Obesity and dental caries in children: a systematic review and meta-analysis. Community Dent Oral Epidemiol. 2013;41(4):289-308.
[15].   Alm A, Isaksson H, Fåhraeus C, et al. BMI status in Swedish children and young adults in relation to caries prevalenc Swed Dent J 2011;35:1-8.