



Correlation of Dental Caries Status with BMI in School Children of Age 3 - 16 Years - An Institutional Study

Ramadasu Uma Sahithya^{1*}, Vasamsetti Divya Bhavani², Devaki Talluri³, Nijampatnam PM Pavani⁴, Parveen Sultana Shaik⁵ and Suresh Chand Yaddanapalli⁵

¹Under Graduate Student, Sibar Institute of Dental Sciences, Guntur, India

²Professor, Sibar Institute of Dental Sciences, Guntur, India

³Reader, Sibar Institute of Dental Sciences, Guntur, India

⁴Post Graduate student, Sibar Institute of Dental Sciences, Guntur, India

⁵Assistant Professor, Sibar Institute of Dental Sciences, Guntur, India

*Corresponding Author: Ramadasu Uma Sahithya, Under Graduate Student, Sibar Institute of Dental Sciences, Guntur, India.

Received: May 07, 2021; Published: December 27, 2021

Abstract

Aim: The study investigates the relationship between BMI and dental caries status in children aged 3 to 16 years old in Guntur (Urban).

Background: Obesity is a rising global health epidemic. Dental caries have been the predominant disorder in modern society. Obesity and dental caries are major health problems with multifactorial characteristics and similar risk factors, such as diet. Various studies have documented diverse outcomes linked to BMI and dental caries.

Materials and Methods: A cross-sectional study was implemented on 756 participants. The DMFT index has been used to assess the prevalence of dental caries. Information on the study participants' height and weight was reported using a standardized measuring scale and weighing machine; after that, the BMI was measured. SPSS version 22 was used to analyze the data.

Results: Among the study participants, 475 (62.8%) were boys, and 281 (37.2%) were girls. The mean DMFT of the study participants in normal-weight children was 2.3. There was a positive correlation between the status of BMI and dental caries. This was significant of value 0.27.

Conclusion: Diet counselling and regular dental check-ups should be prescribed to prevent dental caries from occurring and monitor children's healthy weight. Balanced nutrition needs to be provided to children by school authorities and parents.

Keywords: Body Mass Index; DMFT; School Children

Introduction

Dental caries has been the most chronic, terrifying disease affecting individuals in every corner of the world for decades. It's seven times more prevalent than seasonal allergies. It is a multifactorial disease due to modifiable risk factors such as dietary factors, water fluoride levels, tooth brushing frequency, and non-modifiable risk factors such as socioeconomic status and previous caries experience [1]. The emphasis is now transferred to modifiable factors, primarily dietary, in the prevention of dental caries [2]. Excessive body weight in children is a major public health problem. According to National Family Health Survey (NFHS), obe-

sity has reached epidemic proportions in India, affecting 5% of the country's population [3]. The Body Mass Index (BMI) is a person's weight in kilograms divided by the square of height in meters. A high BMI can indicate an increase in body fat content [4]. The planet is experiencing a growing number of overweight individuals due to the consumption of fast food and soft drinks combined with a lack of fitness and exercise. Overweight individuals are associated with excessive exposure to carbohydrates [5]. The Scientific Advisory Committee on Nutrition stated that higher free sugar intake was associated with dental caries. Consumption of sugar-sweetened drinks further contributed to a higher weight gain and increased BMI.

According to WHO, obesity is characterized as irregular or excessive fat accumulation that may affect health. There is no cut-off point for excess fats attributable to overweight or obesity in teenagers or children. Energy balance is the underlying concept that governs weight gain or loss. By consuming more energy than is required for physical activity and basal metabolism, the body can store fat, and the opposite is true [6]. A recent study recorded that the prevalence of overweight among children in Riyadh was 19.5 percent for males and 20.8 percent for females. Unfortunately, being overweight or obese between 14 and 19 years of age has increased mortality due to chronic diseases [7]. Some researchers indicate a positive correlation between BMI and DC [7,8]. Yet, there aren't other researchers.

Aim of the Study

This study aims to evaluate the correlation between Body Mass Index (BMI) and Dental caries status in children aged 3 - 16 years.

Materials and Methods

The cross-sectional study was conducted on 756 participants who attended the Out-patient Department (OPD) of the Department of Pedodontics and Preventive Dentistry at the SIBAR Institute of Dental Sciences aged 3 - 16 Guntur (Urban) during the period from March 2019 to December 2019. The approval was obtained from the Institutional Ethics Committee and informed written consent was obtained from the participants' parents. Convenience sampling was carried out by including children from the out-patient department. The sample population's age group is 3-16 years of age. Structured questions about specific daily eating circumstances, oral hygiene habits, and routine dental check-ups were created, and they proved to be important for a higher caries risk. The standard way to document the anthropometric measurement of BMI is to use a digital scale of 150 kg and 200 cm of tape to calculate the height according to the World Health Organization (WHO). The body weight was recorded using the standard beam balancing scale, with participants wearing light dresses and bare-foot. The body's height is registered with subjects not wearing any shoes and the head touching the ruler with the line of sight horizontally aligned. The BMI formula is $\text{Weight (kg)}/\text{height (m}^2\text{)}$. The interpretation of scores as per WHO is underweight (< 18.5), average weight (18.5 - 24.99), overweight (> 25), obese (> 30).

Inclusion and exclusion criteria:

- All healthy children with regular physical activity of both sexes were included.
- Children suspected of having some disease with chronic medical conditions (continuous use of sugar-containing medications is a compulsion), who were not physically involved and had enamel/dental abnormalities other than dental caries were excluded.

Procedure for recording dental caries

Diagnosis of dental caries was developed using a non-invasive technique based on the WHO approach and criteria. The children were seated in chairs and examined visually with optimum lighting, a CPI probe, and disposable mouth mirrors were used. For the primary tooth, the deft index was recorded. The DMFT index was used to measure dental caries in permanent dentition.

Data analysis

Data was collected and tables and graphs were created to represent it. The BMI and dental caries groups were evaluated with chi-square, t-test and linear regression model using the 22 version of SPSS computer software. The significance level was set to $p < 0.05\%$.

Results

Overall, 756 children were recruited into the present study. Of these, 318 children were between 3-8 years and 438 children were between 10 - 15 years. Among the study participants, 475 (62.8%) were boys and 281 (37.2%) were girls. The majority of the children (79.3%) had a BMI falling within the underweight category. Around 1.4% of the children were either overweight or obese. The rest of the children were normal weight (17.9%). The majority of the children (66%) had a fair OHI-S index, 32% had good and remaining 2% had a poor OHI-S (See table 1).

Table 2 shows a statistically significant relationship between BMI categories and subjects' OHI-S (Chi-square test, $P = 0.001$).

The mean DMFT of male and female subjects was 2.71 and 1.5 respectively which was statistically significant. There was no significant relationship found between age groups (Figure 1).

Variables		Frequency	Percent
Age group	3 - 8 years	318	42.1
	10 - 15 years	438	57.1
Gender	Female	281	37.2
	Male	475	62.8
BMI Index	Under weight	599	79.3
	Normal weight	135	17.9
	Over weight	11	1.4
	Obese	11	1.4
OHI-S Index	Good	242	32.0
	Fair	499	66.0
	Poor	15	2.0

Table 1: Distribution of study subjects by age, gender, categories of Body mass index and OHI-S.

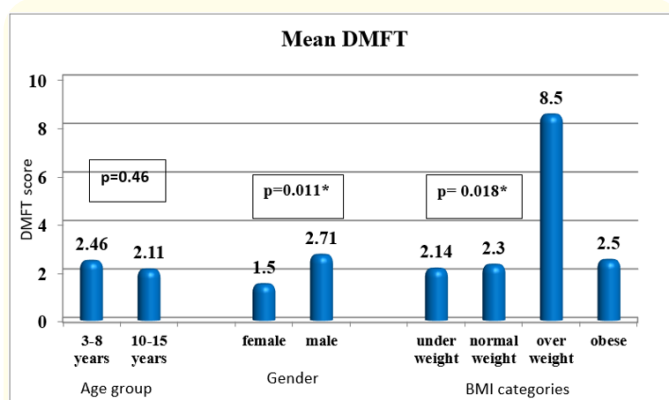


Figure 1: Bar chart showing association between age, gender, BMI, and the dependent variable DMFT. Independent t-test, One way ANOVA, *: Statistically significant.

			OHI-S			Total	R value	P value
			Good	Fair	Poor			
Age group	3 - 8 years	N	126	192	0	318	0.165	0.095
		%	39.6%	60.4%	0.0%			
	10 - 15 years	N	115	307	16	438		
		%	26.3%	70.1%	3.6%			
Gender	Female	N	85	196	0	281	0.006	0.360
		%	30.2%	69.8%	0.0%			
	Male	N	156	303	16	475		
		%	32.8%	63.8%	3.4%			
BMI Index	Under weight	N	222	377	0	599	0.274	0.001*
		%	37.1%	62.9%	0.0%			
	Normal weight	N	20	105	10	135		
		%	14.8%	77.8%	7.4%			
	Over weight	N	0	6	5	11		
		%	0.0%	54.6%	45.4%			
	Obese	N	0	11	0	11		
		%	0.0%	100.0%	0.0%			

Table 2: Statistical comparison of dental variables and BMI categories by age and gender
P value=Chi-square test, R value = Pearson's correlation, *: Statistically significant.

However, after taking the age and gender into consideration, the relationship between the dental variables and body mass index categories showed that the mean value of DMFT was significantly greater among overweight (8.5) compared with other age groups ($P < 0.018$) (Figure 1).

According to a linear regression model, there is a significant relationship between BMI and DMFT ($P = 0.04$). The DMFT score increases 0.624 times for every unit increase in BMI (Table 3).

	N	Mean	Std. Deviation	95% Confidence Interval for Mean	
				Lower Bound	Upper Bound
Under weight	599	2.14	2.760	1.64	2.64
Normal weight	135	2.30	2.643	1.25	3.34
Over weight	11	8.50	6.364	-48.68	65.68
Obese	11	2.50	.707	-3.85	8.85
Total	756	2.26	2.839	1.80	2.72

Coefficients ^a								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	1.482	.580		2.554	.012	.335	2.629
	BMI	.624	.427	.119	1.462	.046	-.220	1.468

Table 3: Linear regression model with BMI as predictor and DMFT as outcome variable.

a. Dependent Variable: DMFT.

Discussion

For ages, both Obesity and Dental Caries are alarmingly multidisciplinary aspects. There is a tremendous need to fix it until it takes its full form. In the Alghamdi study [8], about 32 percent of the study population was either overweight or obese, which is about 1.4 percent in the current study. The mean DMFT of the research participants was 2 ± 0.05 , which is very similar to 1.8 of the Jurgensen N study [9]. There is a positive correlation between BMI and dental caries, with a P-value of 0.001. Similarly, it is significant for BMI and age groups, i.e. overweight and obese children in the 3 - 9 years age group, which is 2.3% in the 10 - 16 years age group, which is quite similar to Tubert Jeannin S., *et al.* that there is an increasingly growing risk to the health of populations in an increasing number of countries. Diet has a significant impact on the individual's caries.

As fiber-containing food decreases the accumulation of plaque, preventing tooth decay. Carbohydrate-rich diets, on the other hand, facilitate the destruction of teeth. A statistically significant

positive association between dental caries and BMI was found in this study, which contradicts the study of Ahmed Abdullah Alghamdi and Ahmed Almahdy. According to a systematic review, 48 percent of the studies found no association between dental caries and BMI, 35 percent found a positive correlation, and 19 percent found a negative association. High BMI and DCs are closely linked to lifestyle; for example, low consumption of sugar, frequent brushing, and regular oral dental check-ups can help improve general health. In 2006, Macek and Mitola [10] found that normal-weight children had more dental caries experience in both primary and permanent dentition. Similarly, Narksawat., *et al.* [11] found that overweight children were less likely to have dental caries in primary (OR = 0.6) and permanent dentition (OR = 0.5) than normal-weight children. It was also found that underweight and normal-weight schoolchildren were more likely to have dental caries at least 1.94 times and 2.22 times, respectively, compared to overweight and obese children who are 12 - 14 years old. Honne., *et al.* [12] found a positive correlation between obesity/overweight status and dental caries, similar to the current study. Bailleul-Forestier., *et al.* [13] found that

the extremely obese children (n = 16) had a high incidence of caries. There was a significant association between BMI and DMFT indices (p = 0.01) in the obese group. The mean DMFT of overweight 8.5 ± 0.5, which is 3.03 ± 4.25 in the study by Sede MA., *et al.* [14] we found that students who are obese have a higher risk of developing dental caries than normal-weight subjects, which is similar to the study by Costacurta M [15]. The mean DMFT of the study participants among normal-weight children was 2.3. There was a positive correlation between BMI and dental caries status. This could be due to higher sugar consumption, as well as low physical activity in overweight candidates contributing to a high DMFT score.

Conclusion

The investigation concludes that there are more underweight subjects than overweight and obese children. In the current research, the prevalence of caries in obese subjects is high relative to normal-weight subjects, which could be attributable to reduced physical activity in obese subjects compared to normal-weight children. Diet counselling and regular dental check-ups should be prescribed to prevent dental caries from occurring and monitor children's healthy weight. Balanced nutrition needs to be provided to children by school authorities and parents. It is proposed that newer and more comprehensive longitudinal research be performed in the future to provide useful insights into this relationship. Children should most significantly be provided with adequate education and knowledge of obesity and caries. This reinforcement would shield them from adverse effects. It also encourages them to have a safe and balanced lifestyle.

Bibliography

1. Rao A, Sequeria SP, Peter S. Prevalence of dental caries among school children in moodbindri. *Journal of Indian Society of Pedodontics and Preventive Dentistry.* 1999;17(2):45-8.
2. Shivakumar S, Srivastava A, Shivakumar GC. Body mass index and Dental caries; A Systematic Review. *International Journal Clinical Pediatric Dentistry.* 2018;11(3):228-232.
3. Prahlad Gupta, Nidhi Gupta, and Harkanwal Preet Singh 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. *International Journal of Pediatrics* 2014:1-6.
4. A Pinto, S Kim, R Wadenya, H Rosenberg. Is there an association between weight and dental caries among pediatric patients in an urban dental school? A correlation study. *Journal of Dental Education.* 2007;71(11):1435-1440.
5. DT Kopycka-Kedzierawski, P Auinger, RJ Billings, M Weitzman. Caries status and overweight in 2- to 18-year-old US children: Findings from national surveys. *Community Dentistry and Oral Epidemiology.* 2008;36(2):157-167.
6. EW Gerdin, M Angbratt, K Aronsson, E Eriksson, I Johansson. Dental caries and body mass index by socio-economic status in Swedish children. *Community Dentistry and Oral Epidemiology,* 2008;36(5):459-465.
7. M Alqarni SS. A Review of Prevalence of Obesity in Saudi Arabia. *Journal of Obesity Eat Disorder* 2016; vol 2:NO 2; 25.
8. Ahmed Abdullah Alghamdi and Ahmed Almahdy. Association Between Dental Caries and Body Mass Index in Schoolchildren Aged Between 14 and 16 Years in Riyadh. *Saudi Arabia Journal of Clinical Medical Research.* 2017;9(12):981-986.
9. N Jürgensen, P E Petersen. Oral health behaviour of urban and semi-urban school children in the Lao PDR. *Community Dental Health.* 2011;28(4):280-285.
10. Mark D Macek, David J Mitola. Exploring the association between overweight and dental caries among US children. *Pediatric Dentistry.* 2006;28(4):375-380.
11. Kulaya Narksawat, Utsana Tonmukayakul, Angsana Boonthum. Association between nutritional status and dental caries in permanent dentition among primary schoolchildren aged 12-14 years, Thailand. *The Southeast Asian Journal Tropical Medical and Public Health* 2009;40(2):338-344.
12. T Honne, K Pentapati, N Kumar, S Acharya. Relationship between obesity/overweight status, sugar consumption and dental caries among adolescents in South India. *International Journal of Dental Hygiene.* 2012;10(4):240-244.

13. Isabelle Bailleul-Forestier, Karine Lopes, Mourad Souames, Sylvie Azoguy-Levy, Marie-Laure Frelut. Marie-Laure Boy-Lefevre Caries experience in a severely obese adolescent population. *International Journal of Paediatric Dentistry*. 2007;17(5):358-363.
14. Sede MA, Ehizele A O. Relationship between obesity and oral diseases. *Nigerian Journal of Clinical Practice*. 2014;17:683-690.
15. M Costacurta, L Di Renzo, L Sicuro, S Gratteri, A De Lorenzo, R Docimo. Dental caries and childhood obesity: Analysis of food intakes, lifestyle. *European Journal of Paediatric Dentistry*. 2014;15/4:343-348.

Volume 5 Issue 1 January 2022

**© All rights are reserved by Ramadasu Uma Sahithya,
*et al.***