



## **Association of Dental Caries with Body Mass Index in Patients Attending Dental OPD of Tertiary Care Hospital, Pakistan: A Cross-Sectional Study**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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### **ABSTRACT**

**Background:** Dental caries area public health problem. Its prevalence is about 60% in the Pakistani population.

**Purpose:** The purpose of this study was to correlate the association between decayed, missing, and filled teeth (DMFT) score and its body mass index in patients visiting the Dental Department of Liaquat University of Medical and Health Sciences, Jamshoro.

**Materials and Methods:** This cross-sectional study was conducted from January 2021 to May 2021 at the Department of Operative Dentistry Liaquat University of Medical and Health Sciences. Patients with age 16 to 70 years with presence of at least 15 to 18 permanent teeth were included in the study. Patients having primary teeth were set in exclusion criteria. For Dental caries status, decayed, missing, and filled teeth (DMFT) index was used. Height and weight were measured using digital scales. BMI was calculated according to the formula weight in kilograms/height in centimeters. Data were analyzed for descriptive statistics. One Way ANOVA test was used for association. The statistical significance level was evaluated at  $p < 0.05$

**Results:** We were able to obtain the data of a total of 203 patients of which 57% were female. The mean age was  $36.7 \pm 13.8$  ). The mean DMFT score was  $5.7 \pm 3.7$ . In association of BMI with DMFT score, females BMI was statistically significant with DMFT score with  $p = 0.039$  and in overall was also significant  $p = 0.002$

**Conclusion:** DMFT score was higher in overweight and obese individuals and it was significant statistically. However, large community based studies are required to confirm the association.

*Keywords: Body mass index; caries; decayed; missing; filled.*

## 1. INTRODUCTION

Dental caries or tooth decay is a chronic oral health condition caused by the destruction of the tooth by turning sugars into acid by certain bacteria [1]. Around 2.5 billion individuals are thought to be affected by this condition, with 60–90 percent of children and almost 100 percent of adults having dental cavities, which can cause pain and suffering [2]. Although it is preventable in children. The prevalence of dental caries in Pakistan is estimated at 60% in the general population [3].

The etiology of dental caries is multifactorial and one of the causes of tooth decay is the daily intake of sugary foods that's also responsible for the development of obesity. The role of body weight and development of dental caries has been investigated in many studies in North America and European countries as obesity prevalence is nearly 50% in these countries and many health issues associated with obesity and the development of dental caries may share a common etiological pathway through dietary behaviors [4].

Although there is no snipped level for excessive fats of overweight or adiposity in adolescents or children, obesity is a kind of malnutrition caused by excessive food consumption.<sup>5</sup> Energy equilibrium is the fundamental factor that governs body weight increase or reduction. The system will retain fat if we ingest more calories than we require for physical activity and basal metabolism, and the contrary is also accurate [5].

The BMI is computed by multiplying a people's weight in kilogrammes by the square of their height in metres ( $\text{kg}/\text{m}^2$ ). This is the greatest

reliable weight-for-height index, so it is often utilized to categorise overweight and obesity [6]. Some of the studies have shown that increased body weight is associated with a higher prevalence of tooth decay [7]. Some studies have shown the opposite that malnutrition or underweight is also associated with greater caries experience [8,9]. Several studies did not find any association. Even though the overall prevalence of dental caries decrease in developed countries, caries continue to be an important public health problem in most developing countries [10]. Participants aged 20–34 years had 85.58 percent DMFT, 35–50 years had 94.30 percent DMFT, and 50–64 years had 95.62 percent DMFT, according to a wide scale research of the National Health and Nutrition Examination Survey (NHANES) performed in the United States from 1999 and 2004 [11]. The purpose of this study was to evaluate the relationship between DMFT Index and BMI in patients attending Outpatient Department of Operative Dentistry, Liaquat University of Medical And Health Sciences Jamshoro.

## 2. MATERIALS AND METHODS

This research which was cross sectional in nature included all patients who attended the outpatient department of Operative Dentistry between January 2021 to May 2021 at LUMHS, Jamshoro. This study included a total of 203 participants who were above 16 years or older. During the conduct of this study, there were no obvious issues that hinder routine patient care and did not directly involve any treatment. This study was approved by the department's head. Data on age and gender was collected through a structured questionnaire.

## 2.1 Caries Examination

Clinical examination was conducted by the principle investigator in the dental chair with a proper light source and wearing personal protective equipment (PPE) like caps, gloves, mask and the examination was carried out first drying the oral cavity with air-water syringe and detection by using mouth mirrors, and probe. Dental caries status was determined by using the WHO criteria for caries diagnosis i.e decayed, missing, and filled teeth (DMFT) Index. Teeth showing signs of cavitation, roughening, color change are considered as decayed. Teeth filled with restorations are considered as filled and the teeth that are missing due to caries are considered as missing. The number of DMFT of each patient was added to calculate DMFT score.

## 2.2 Anthropometric Examination

The height of each participant was measured on a Sonaris Touchless Sonar Stadiometer [12] without shoes. The body weight was measured using a digital weighing machine. The BMI was computed by multiplying the weight in kilogrammes by the height in centimetres.

The participants were divided into four groups depending on their BMI: underweight (BMI <18.5), normal (BMI 18.5-24.9), overweight (BMI 25-30), and obese (BMI >30).

## 2.3 Statistical Analysis

Data collected on performed case sheet was entered manually in MS Excel software and then was exported to SPSS for analysis. Using statistical software SPSS version 20, data were examined for descriptive statistics (mean and standard deviation) and a one-way ANOVA test was conducted to investigate the relationship between BMI and dental caries.

## 3. RESULTS

Data were collected on a total of 203 patients, of which 57.1% (n=116) were females (Table 1). The majority of patients fall in the age bracket of 15-30 years (38.9%). The mean age was 36.7±13.8 years. The mean weight was 70KG and the mean height was 161 cm. In BMI classification, very few were underweight (3%), 43.8% were of normal BMI and 29% were obese. The mean decayed teeth were 2.9±2.1 with median (25th-75th) were 2 to 4. Similarly,

the mean missing and filled teeth were 1.5±2.1 and 1.2±1.4 respectively. The mean DMFT index/score was 5.7±3.7 (Table 2). The prevalence of obesity in the male patients was 32% vs 26% in female patients. The mean DMFT score was higher in obese male and female patients (6.5±3.9 vs 7.5±5.2). In association of BMI with DMFT score, females BMI was statistically significant with DMFT score p=0.039 and in overall was also significant p =0.002 (Table 3).

**Table 1. Demographic statistics of participant (n=203)**

Characteristics	N=203
Gender	
Male	87 (42.9)
Female	116 (57.1)
Age	
15-30 Years	79 (38.9)
31-40 Years	49 (24.1)
41-50 Years	36 (17.7)
>50 Years	39 (19.2)
Mean±SD	36.7±13.8
Weight (Kg)	70.4±18.3
Height (cm)	161.3±12.4
Nutritional status from BMI	
Underweight (<18.5)	6 (3.0)
Normal (18.5-24.9)	89 (43.8)
Overweight (25.0-29.9)	49 (24.1)
Obese (>30)	59 (29.1)
Mean±SD	28.4±24.8

**Table 2. The scores of D, M, F, DMFT**

	N=203
Decayed	
Mean±SD	2.9±2.1
Median (25th-75th)	2.0 (2.0-4.0)
Missing	
Mean±SD	1.5±2.1
Median (25th-75th)	1.0 (0.0-2.0)
Filled	
Mean±SD	1.2±1.4
Median (25th-75th)	1.0 (0.0-2.0)
(Decayed + Missing + Filled)	
Mean±SD	5.7±3.7
Median (25th-75th)	5.0 (3.0-7.0)

## 4. DISCUSSION

This study was conducted to find the correlation between dental caries and BMI in a sample of the Pakistani population. We found a statistically significant positive association between dental caries and BMI. The mean DMFT score was

**Table 3. Evaluation of DMFt according to BMI**

		(Decayed + Missing + Filled)			P-values <sup>1</sup>
		N	Mean ± SD	Median (25th-75th)	
Male	Underweight(<18.5)	3	2.3±1.5	2.0 (1.0-4.0)	0.051
	Normal(18.5-24.9)	34	4.6±3.1	4.0 (3.0-5.0)	
	Overweight(25.0-29.9)	22	5.1±2.5	5.0 (3.0-7.0)	
Female	Obese(>30)	28	6.5±3.9	5.5 (4.0-9.5)	0.039
	Underweight(<18.5)	3	2.3±1.5	2.0 (1.0-4.0)	
	Normal(18.5-24.9)	55	5.5±3.5	5.0 (2.0-7.0)	
	Overweight(25.0-29.9)	27	5.4±2.6	5.0 (4.0-7.0)	
Total	Obese(>30)	31	7.5±5.2	6.0 (4.0-12.0)	0.002
	Underweight(<18.5)	6	2.3±1.4	2.0 (1.0-4.0)	
	Normal(18.5-24.9)	89	5.2±3.4	4.0 (3.0-7.0)	
	Overweight(25.0-29.9)	49	5.3±2.5	5.0 (4.0-7.0)	
	Obese(>30)	59	7.0±4.6	6.0 (4.0-10.0)	

1.One-way ANOVA Test

higher in obese male and female patients. Previously, numerous studies linking obesity with dental caries were conducted on pre-school children and adolescents. But the number of studies on adults are limited. A systematic review by Hooley et al found that the majority of studies(48%) found no association between dental caries and BMI, 35% found a positive association and 19% found a negative association [13]. Another systematic review done by Yosef Faraj for studies conducted in adults in the Kingdom of Saudi Arabia found two studies having positive association while two studies with no association [14]. Khaled Alswat et al. performed a cross-sectional research on 385 people with an average age of 28.39 years, finding that 55.3 % were obese or overweight, with a DMFT score of 6.55. They discovered a positive connection among the BMI and the DMFT index after correcting for confounding variables [7].

Sakeenabi et al carried out a similar study and reported a significant positive correlation [15]. Verma et al [16]. undertook a research on 1125 people aged 25 to 44 years and found that 21.2 % were overweight or obese, with DMFT indexes of 4.39 and 5.53 in overweight and obese people, respectively. There was also a substantial positive association between the BMI and the DMFT index<sup>16</sup>, according to the researchers. These findings are comparable to what we found. The DMFT index of obese people was found to be greater than that of normal weight people (DMFT index 5.32;  $p = 0.001$ ) or overweight people (DMFT index 4.99;  $p = 0.001$ ) in this study. A ten-year population-based study on adults from Korea could no correlation between obesity and dental caries[17]. Since non-communicable diseases (type 2 diabetes and cardiovascular disorders) are more prevalent in Asian population with lower body weight, the BMI thresholds used in the study differed from those used in our study. In Korea, meanwhile, overweight people were classified as having a BMI of 23–24.9, whereas obese people had a BMI of 25 or more. As a result, analyzing trials with various BMI thresholds will be ineffective. In another cross-sectional study by Shahida Maqsood et al. reported less overweight individuals than those with normal BMI [18]; thus, the majority of high DMFT scores was among normal-BMI individuals.

## 5. CONCLUSION

Large community based prospective cohort studies are needed to explore the causal

relationship between dental caries and nutritional status (under and overnutrition), and also to study the long-term association with factors such as dietary habits and health behaviors.

## 6. LIMITATIONS

As this study was conducted in hospital setting and on a small sample size, so we cannot generalize its findings to the large population.

## DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

## CONSENT

All procedures and objectives of the study were explained to the patients and verbal informed consent was taken.

## ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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