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ASSOCIATION OF NUMBER OF MISSING TEETH WITH BODY MASS INDEX AMONG PARTIAL OR COMPLETE EDENTULOUS PATIENTS

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ABSTRACT

Objective: To determine the association between body mass index (BMI) and number of missing teeth remaining unreplaced during a period of at least last 2 years.

MaterialsandMethods: This cross-sectional descriptive study was conducted at Bacha khan Medical College Mardan on 113 patients by consecutive, non-probability sampling technique. The study included adult individuals of both genders (age range: 20-80 years) who had lost a minimum of 10 teeth and had not received any replacements for a minimum period of 2 years. Patients with diabetes mellitus and those who had been smoking for the last one year were excluded from the study. A detailed history and oral examination, including inspection, were performed. Additionally, height and weight measurements were recorded to calculate the body mass index (BMI). The association between missing teeth and obesity was assessed using the chi- square test.

Results: Males were 66.4% and females were 33.6%. The mean age was 63.22 ± 7.40 years. The most common BMI class observed was normal weight (43.36%), followed by overweight (33.62%) and obese (23.01%). The relationship between age and BMI classes was not significant (P>0.05). Females were more obese than males (P<0.001). BMI classes has no statistical association with the number and pattern of missing teeth (P>0.05).

Conclusion: Most partial edentulous participants had normal weight. Age did not significantly impact BMI distribution. A higher proportion of females were obese compared to males, but no significant relationship was found between obesity frequency and the number of missing teeth.

Keywords: Body mass index, edentulism, missing teeth, obesity

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INTRODUCTION

In recent decades, there has been a significant rise in the prevalence of obesity worldwide, leading the World Health Organization (WHO) to declare it a global epidemic in the 1990s.¹ It is well-established that general health and oral health share common causal and behavioral factors, and there is a strong correlation between an individual's oral health and their overall well-being.^{1,2} The oral health plays a crucial role in maintaining good chewing function, which directly impacts food choice and nutritional status. When teeth are missing, it can adversely affect the individual's ability to chew properly, leading to compromised digestive capacity and nutritional status.³ As a result, the individual may face challenges in selecting a well-balanced diet rich in fiber and protein. The decreased masticatory capacity due to tooth loss can limit their intake of these essential dietary components.⁴

Unhealthy physical conditions can lead to imbalanced food choices, contributing to the development of obesity.⁴ One of the most common oral health issues among

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the elderly population is partial or complete edentulism (tooth loss), which significantly affects their oral health-related quality of life, including changes in eating habits.⁵ The number of natural teeth and functional tooth units have a positive correlation with chewing ability, and a lower number of posterior occluding teeth pairs is associated with reduced nutrient intake in older adults.⁵

Studies^{6,7} have shown that older individuals with a higher number of missing teeth tend to rely more on solid fats, alcohol, and added sugars to meet their energy needs. Consequently, tooth loss can have an impact on both dietary intake and nutritional status in these individuals.⁶

Existing evidence suggests that in older individuals, possessing 20 or more natural teeth is regarded as a marker of satisfactory oral health and functional dentition, leading to optimal nutritional intake.8 Furthermore, maintaining a healthy body mass index (BMI) has been associated with having a healthy and properly functioning occlusion.⁸

A study by Ostberg et al.⁹ elucidated the relationship between tooth loss and obesity in a specific Swedish population. Among participants under 60 years old, the association between tooth loss and general obesity (OR 2.17, 95% CI 1.51–3.12) remained statistically significant independent of age and gender.

It has been reported that completely edentulous people less frequently consume vegetable, fruits and fibers as compared to dentate patient. A positive association was reported by Bernardo CO et al10 in a study between increased BMI and the presence of less than 10 teeth in at least one arch. The individual having less than 10 teeth in at least one arch had general

obesity were 24.9% (CI 95% 19.5-30.3). According to criteria established by the WHO for the diagnosis of nutritional status according to BMI is classified as normal weight (18.5-24.9 kg/m2), over weight (25-29.9 kg/m2), obese (\geq 30 kg/m2).³

There are limited data associating tooth loss with obesity among adults. This is concerning because prevention and early detection programs may help reduce potential damage of tooth loss and related health effect later in life. To our knowledge, this is the first study carried out in Pakistan that determined the frequency of obesity in patients with 10 or more missing teeth remaining unreplaced during a period of 2 years. This study provides data for Pakistani population

The primary objective of this study was to determine the association between body mass index (BMI) and number of missing teeth remaining unreplaced during a period of at least last 2 years. The secondary objective was to determine the frequency of obesity in patients with missing teeth and relation with age groups and genders.

METHODOLOGY

This cross-sectional descriptive study was conducted at the Department of Prosthodontics, Bacha Khan Medical College Mardan and the duration of data collection spanned from 30th June 2022 to 1st January 2024. The sample size was determined to be 113 individuals using the WHO software for sample size determination, with a confidence level of 95%, a margin of error of 8%, and a prevalence rate of obesity among partial edentulous cases 24.9%.¹⁰ The sampling technique employed was consecutive non-probability sampling. In terms of selection criteria, the study included adult male and female patients aged 20-80 years and who had lost a minimum of 10 teeth and had not received any replacements in the past two years. Exclusion criteria consisted of patients with diabetes mellitus, and smokers within the past one year.

Body Mass Index was defined as the ratio of weight in kilograms to height in meters squared. The diagnostic criteria for diabetes mellitus followed the guidelines set by the American Diabetic Association (ADA), which included fasting plasma glucose levels exceeding 126 mg/dL or random plasma glucose levels surpassing 200 mg/dL along with symptoms such as polyuria, polydipsia, and unexplained weight loss.¹¹ The World Health Organization (WHO) criteria for nutritional status classification based on BMI were adopted, where normal weight

ranged from 18.5 to 24.9 kg/m², overweight from 25 to 29.9 kg/m², and obesity was defined as a BMI equal to or exceeding 30 kg/m^{2.12}

The study obtained approval from the ethical committee of the hospital before proceeding. Individuals who met the inclusion and exclusion criteria were invited to participate, and a comprehensive explanation of the study's purpose, procedures, and potential risks and benefits was provided to them. Informed consent was obtained, ensuring their willingness and active involvement in the study. Participants were assured that their personal and collected data would be kept confidential. Subsequently, a detailed history and oral examination, including inspection, were conducted. The number of existing teeth and posterior occluding pairs (both natural and replaced teeth) were recorded. Height and weight measurements were taken to calculate the body mass index (BMI), using a spring weighing scale (Japan incorp.) to measure weight and a height measuring board for standing body height without footwear, with a precision of 0.5cm. The relevant data pertaining to BMI and missing teeth were meticulously documented in the data collection proforma.

Data analysis was conducted using SPSS version 22. Percentages and frequencies were calculated to analyze qualitative data such as gender, different BMI classes (normal, overweight, and obese), and age groups. The association between BMI classes and the number of missing teeth was assessed using the Chi-

square test. A significance level of $p \le 0.05$ was considered statistically significant.

RESULTS

The mean age was 63.22 ± 7.40 years (range 34-75 years). males ere 75(66.4%) and females were 38(33.6%). rest of details about age and missing teeth are given in Table 1. BMI were classified into three classes e.g. normal, overweight and obese. Most common class of BMI was normal (43.36%) followed by overweight (33.62%) and obese (23.01%). The details of frequencies are given in Fig 1. The distribution of gender differs significantly between weight categories, with a higher proportion of males in the normal weight group compared to overweight and obese groups (p < 0.001). Age distribution does not show significant differences across weight categories (p = 0.097). (Table 2)

The association between BMI classes and the number of missing teeth groups was not statistically significant (p=0.428). (Table 3) The association between BMI classes and the pattern of edentulism was also not statistically significant (p=0.441). (Table 4).

TABLE 1:	DESCRIPTIVE	STATISTICS FOR	AGE AND	GENDER.	BMI AND	MISSING TEETH
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Variable	Characteristics	n(%)
Caralan	Male	75(66.4)
Gender	Female	38(33.6)
	31-40	4(3.5)
A ()	41-50	3(2.7)
Age group (yrs)	51-60	15(13.3)
	61-75	91(80.5)
Age(years)	Mean±SD	63.22±7.40
Number of Missing Teeth	Mean±SD	26.34 ± 8.81
BMI (Kg/m ²)	Mean±SD	26.20 ± 4.34



Fig 1: Frequency of BMI classes

DISCUSSION

This study provides insights into the relationship between BMI classes and gender, as well as the number and pattern of missing teeth among partially edentulous patients. While significant associations were found between BMI classes and gender, no statistically significant associations were observed between BMI classes and age groups, the number of missing teeth groups, or the pattern of edentulism.

Several previous studies have highlighted the significant relationship between tooth loss and morbidity like nutritional deficiencies among the elderly population.¹³ One of the contributing factors to tooth loss is periodontitis, a condition characterized by the inflammation of the subgingival environment.¹⁴ It is hypothesized that the microbial flora present in the subgingival region is influenced by this environment, triggering an inflammatory response in the host and leading to the transition from a healthy state to a diseased state, Various factors, including bleeding, deep probing, increased clinical attachment level, and bone loss, ultimately contribute to the loss of teeth.¹⁴

TABLE 2: ASSOCIATION OF BMI CLASSES WITH GENDER AGE GROUPS AMONG PARTIALLY EDENTULOUS PATIENT

variable	Characteristics	Normal weight	Overweight	Obese	p-value*	
Condon	Male	38 (33.6)	29 (25.7)	8 (7.1)	<0.001	
Gender	Female	11 (9.7)	9 (8.0)	18 (15.9)	<0.001	
	31-40	0 (0)	3 (2.7)	1 (0.9)		
Age Groups	41-50	1 (0.9)	1 (0.9)	1 (0.9)	0.007	
(years)	51-60	5(4.4)	8 (7.1)	1 (0.9)	0.097	
	61-75	43 (38.1)	25 (22.1)	23 (20.4)		

*chi-square test

TABLE 3: ASSOCIATION BETWEEN BMI CLASSES AND NUMBER OF MISSING TEETH GROUPS

	Μ			
BMI classes	10-20	21-25	26-32	p-value*
	n(%)	n(%)	n(%)	
Normal weight (n=49)	11(22.45)	1(2.04)	37(75.51)	
Overweight (n=38)	10(26.31)	2(5.26)	26(68.48)	0.097
Obese (n=26)	10(38.46)	0(0.0)	16(61.54)	

*chi-square test

DMI alagaag	Pattern of		
DMI Classes	n(%)	n(%)	p-value*
Normal weight	12(35.3)	37(46.8)	
Overweight	12(35.3)	26(32.9)	0.441
Obese	10(29.4)	16(20.3)	

*chi-square test

The current study revealed that 75 individuals (66.4%) were males, while females accounted for 38 individuals (33.6%). There are possible reasons for these findings. Firstly, it may be attributed to the fact that in our country, males are more likely to engage in outdoor work and have greater financial independence, resulting in easier access to dental treatments. Secondly, it could be due to the higher level of oral hygiene awareness among females, leading to a lower incidence of natural tooth loss and consequently less need for prosthodontic treatment.^{15,16}

The mean age was 63.22 ± 7.40 years. The age was ranged from 34 to 75 years. This shows that in our population the individuals loses their teeth very early and sort prosthodontic treatment to restore oral function and esthetics. The early loss of teeth is due to lack of awareness about oral hygiene. Poor oral hygiene leads to periodontal disease and dental caries and as results tooth loss.¹⁴But we included more than ten teeth missing so the mean age is quiet older. Pilotto et al.¹⁷ conducted a study on Brazilian population to determine association between tooth loss and overweight/obesity and reported mean age of 40 ± 8.2 years. The difference may due to the reason that in our study we included patients having more than ten teeth missing while Pilotto et al.¹⁷ also included patients having one or two teeth missing.

The mean BMI in this was 26.20 ± 4.34 Kg/m2. The range was from the

20.03 to 39.3 Kg/m2. These results are in consistent with the Mack et al.¹⁰

In this study, the most common class of BMI was normal (43.36%) followed by overweight (33.62%) and obese (23.01%). Similar results are reported by another study.¹⁷ Our study showed that the effect age on BMI classes was not statistically significant (P>0.05). Similar results were reported by international study¹⁸ but that

study was conducted on normal children and adults with no mention of missing teeth.

The present study revealed that females (15.9%) were more obese than males (7.1%). This was statistically significant (P<0.05). Low et al.19 reported that a higher proportion of women are obese than men. Low et al.¹⁹ support current results.

Our findings suggest that higher BMI is associated with fewer missing teeth; however, this relationship was not statistically significant. One explanation could be that tooth loss leads to a shift towards a soft diet, causing nutritional imbalances and weight loss. Alternatively, tooth loss might increase calorie intake, contributing to obesity. Despite extensive research on the link between tooth loss and obesity, the evidence remains inconclusive, and the causal relationship is uncertain. Several epidemiological studies^{17,20-22} have demonstrated the existence of a shared set

of risk factors that contribute to various chronic diseases.¹⁷ On the contrary, certain authors²² have proposed a correlation between obesity and tooth loss, attributing it to decreased saliva flow in individuals with obesity. This reduction in saliva flow can contribute to the development of dental caries, thereby mediating the connection between obesity and tooth loss.²¹ Powers et al.²² have found no positive association. Additionally, Chaffee et al.²⁰ have reported a modest link between obesity and periodontal diseases, further influencing the connection between obesity and tooth loss.

The limitations of this study include its cross-sectional design, which prevents the establishment of a cause-effect relationship between variables. Additionally, the study's reliance on a single assessment may not capture long-term changes or account for potential confounding factors. Furthermore, the sample size and demographics may limit the generalizability of the findings to broader populations. The study's reliance on self-reported data may introduce recall bias or inaccuracies. Finally, the study may not have considered other relevant factors or potential confounders that could influence the observed associations.

CONCLUSION

The results of this study indicate that the most of the partial edentulous participants had normal weight. Age did not significantly impact the distribution of BMI categories. Higher proportion of females exhibited obesity compared to males. However, when examining the association between the frequency of obesity and the number of missing teeth, no statistically significant relationship was observed.

These finding suggest that the presence or absence of natural teeth did not have a significant impact on the frequency of obesity among the study participants. Further research is needed to explore additional factors that may contribute to the complex relationship between BMI and tooth loss.

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