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Original Research

Significance and correlation of body mass index and oral health status in south Indian population: an Institutional based cross-sectional study

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ABSTRACT:

Background: With increasing rates of obesity and oral health issues, understanding the relationship between Body Mass Index (BMI) and oral health is crucial. This study aimto evaluate the correlation between BMI and oral health parameters—including dental caries, periodontal status, and oral hygiene—in a South Indian population. **Methodology**: A cross-sectional study was conducted at a dental institution. Participants' BMI was recorded using standard anthropometric measurements. Clinical oral examinations assessed dental caries, periodontal status, and oral hygiene. A structured questionnaire captured data on dietary habits and oral hygiene practices. Statistical analysis was performed to determine correlations between BMI categories (underweight, normal, overweight, and obese) and oral health indicators. **Results**: Of the total participants, 47% were classified as overweight or obese. A high prevalence of dental caries (74.5%) was observed, with only 25.5% of individuals being caries-free. Additionally, 16% had at least one missing tooth, and 4% had five or more missing teeth. A statistically significant correlation was found between higher BMI and increased occurrence of dental caries and missing teeth. **Conclusion:** This study demonstrates a significant association between elevated BMI and poor oral health outcomes, particularly dental caries and tooth loss. These findings emphasize the importance of considering BMI in oral health assessments and promoting interdisciplinary approaches to patient care.

Key words: BMI, Oral Health, Obesity, Dental Caries, Missing teeth, oral lesions.

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INTRODUCTION

Obesity, global problem represented by increased body fat, that increases probability of illness and has become increasingly common. It results from an imbalance between energy intake and expenditure, leading to significant fat accumulation, increased adiposity, and a high overall body mass [1]. In modern times, one of the primary community health issues is the rising number of overweight and obese individuals. This trend is largely driven by the consumption of fast food and sugary drinks, along with a lack of physical activity and exercise [2]. Obesity has been linked with many health conditions, like heart disease, musculoskeletal issues, hypertension, Type II Diabetes, and several types of cancer, such as breast, prostate, liver, and colon cancer, as well as poor oral health. However, the connection between obesity and oral diseases remains a subject of debate [4]. Obese people are more likely to have gum diseases, tooth decay, and tooth loss than people with a healthy weight.

Body Mass Index (BMI) is a distinct anthropometric measure used that determine the proportion of body fat in an individual. Various diseases and conditions are linked to individuals who are underweight, overweight, or obese [3]. Body Mass Index (BMI) is a straightforward measure of weight relative to height and is widely used to classify individuals as overweight or obese. According to the WHO classification, BMI is categorized into four groups: Underweight (<18.5 kg/m²), Normal weight (18.5-22.9 kg/m²), Overweight (23-24.9 kg/m²), and Obese (

>25-29.9 kg/m²). Obesity can severely impact an individual's quality of life, making them more susceptible to serious, life-threatening diseases, and can worsen preexisting health conditions [5]. The quantity and quality of food consumed contribute to an increase in an individual's weight. Obese patients often experience compromised oral health, which can be particularly difficult to manage. A systematic review by Hayden et al. on obesity and dental caries found a notable link between obesity in young age and dental caries, with the association seen for permanent teeth than for primary teeth [5].

Dental health plays a significant role in a individual's overall well-being. Various factors contribute to oral diseases, which can impact individuals of all ages, races, genders, and ethnicity. Occupation is one of the key factors contributing to social disparities in oral health [6]. To cope with stress at work and endure long workdays, many individuals resort to habits such as smoking or using smokeless tobacco. These behaviors not only harm oral health but are also major contributors to potentially life-threatening oral cancers. Additionally, periodontitis can affect overall health and is independently linked to most chronic non-communicable diseases [7]. Aim of this study was to examine the connection of BMI with oral health indicators, which includes DMFT, problems of periodontal tissues, variations in oral (soft) tissues, and oral lesions [4]. The ICMR-INDIAB study of 2015 found that the prevalence of obesity starts from 11.8% - 31.3%, while central obesity from 16.9% - 36.3% [8]. The factors that affect oral health-related quality of life include: (i) inconsistent brushing, (ii) mental well-being and self-perception, (iii) behavioral factors like poor eating habits, and (iv) physical disabilities, such as visual impairment [9].

Oral conditions like dental caries, periodontitis, gingival enlargement, abnormalities of tongue and oral mucosa may be associated with systemic diseases, which results due to obesity, examples like diabetes mellitus, hypertension, any immunocompromised diseases. According to the literature, a statistically significant relationship exists between BMI and several oral soft tissue conditions, [5] and in the studied group of dental patients, there is no statisticallysignificant connection was found between obesity and periodontal health or dental caries experience. However, an increased BMI may serve as a predictor of gingival bleeding [10]. This study is done to find the relationship and correlation between oral health status with the body type associated with any oral lesions, smoking and food habits.

METHODOLOGY

The research proposal was approved by Institutional Review Board and Ethical Committee, approval No.: ECR/1742/APDCHOMR-05/TN/2024

The study was conducted in Adhiparasakthi Dental College and Hospital outpatient in the Oral Medicine and Radiology department. The time span of data collection was from April to May 2024. Patients and their attenders were eligible for this study. Exclusion criteria include people those who are under 18 years of age, pregnant and lactating women, patients with underlying systemic diseases. This study is conducted using - questionnaires (vocal) and through clinical examination.

The interview and dental clinical examination were conducted by first requesting participants to step on a standardized weight and height scale while wearing no shoes. Height was measured with a ruler touching the head of participants while standing vertically. BMI was calculated as Kg/m^2 and recorded for each participant's examination sheet. Individuals were classified according to WHO criteria as follows: Underweight (<18.5 Kg/m2), Normal weight (18.5-22.9 Kg/m2), Overweight (23-24.9 Kg/m2), Obese (>25-29.9 Kg/m2).

A clinical examination was conducted to assess the dental status of participants, focusing on decay, missing teeth, and filled teeth (DMFT), as well as periodontal health, in the absence of systemic conditions. The examinations were performed in the OMR department of APDCH using dental chairs, mirrors, probes, and explorers under proper lighting.

An accurate estimate determined a sample of 200 participants. Individuals who are participating were requested to sign the consent forms in advance to clinical examinations. All OP and attender waiting areas in the hospital were addressed and patients were selected according to inclusion criteria. Data was collected about dental caries, missing teeth, filling in teeth, any oral lesions (geographic tongue, aphthous ulcer), vegetarian and non-vegetarian, smokers and non-smokers were included.

Collected data was entered, cleaned, and analyzed. Analyses consists of the following: A) Chi-square analyses to assess the relationship between other categorical parameters of oral health, medical conditions, physical activities, dietary habits with BMI, B) Descriptive statistics including number, means and percentages, C) One-way analysis of variance to assess the difference in means of DMFT and periodontal pockets among BMI categories

RESULTS

Table 1 Reprsents the descriptive statistics based on demographic details of the study population

Parameter	Options	Frequency	Percentage
AGE IN YEARS	**0-25**	7	3.5
	2650	93	46.5
	51-75	88	44.0
	76-100	12	6.0
GENDER	**Female**	112	56.0
	Male	88	44.0
BMI	**Underweight**	13	6.5
	Normal	93	46.5
	Overweight	59	29.5
	Obese	35	17.5

Table 2 Reprsents the descriptive statistics based on the study parameters

Parameter	Options	Frequency	Percentage
DENTAL CARIES	0	51	25.5
	1	27	13.5
	2	36	18.0
	3	27	13.5
	4	30	15.0
	5	15	7.5
	6	7	3.5
	7	4	2.0
	8	2	1.0
	10	1	.5
MISSING	0	119	59.5
	1	32	16.0
	2	19	9.5
	3	10	5.0
	4	7	3.5
	5	3	1.5
	6	3	1.5
	8	5	2.5
	10	1	.5
	11	1	.5
FILLING	0	148	74.0
	1	16	8.0
	2	22	11.0
	3	2	1.0
	4	7	3.5
	5	4	2.0
	9	1	.5
TOBACCO SMOKING	NON SMOKERS	178	89.0
	SMOKERS	22	11.0
ORAL LESIONS	ABSENT	198	99.0
	PRESENT	2	1.0
DIET	NON VEG	164	82.0
	VEG	36	18.0

Table 3 Represents the association between the factors in the study with bmi by using a chi square test

Parameter	Factor	Chi square	Sig
BODY MASS INDEX			
Underweight Normal Overweight Obese	DENTAL CARIES	56.891	0.015*
	FILLING	3.267	0.452
	MISSING	46.471	0.023*
	SMOKING HABIT	2.542	0.637

	ORAL LESIONS	49.571	0.000*
	DIET	2.113	0.715

***P value less than or equal to 0.05 is considered statistically significant different**

Interpretation of Table 3: Association Between Factors and BMI Using Chi-Square Test

This table examines how various factors are associated with different BMI categories (Underweight Normal, Overweight, Obese) using the Chi-square test (A) Dental caries: A significant association ($p = 0.015$) is observed, indicating the occurrence or severity of dental caries varies significantly across BMI categories. (B) Filling: No significant association ($p = 0.452$) is found between dental filling and BMI categories, suggesting that the number of dental fillings is not influenced by BMI and vice versa. (C) Missing teeth: A significant association ($p = 0.023$) is observed, this implies that tooth loss may be linked to BMI, potentially due to factors such as nutritional deficiencies in underweight individuals or periodontal disease in overweight/obese individuals. (D) Smoking habit: No significant association ($p = 0.637$) is observed between smoking habits and BMI, indicating that smoking status does not vary significantly. (E) Oral lesions: A highly significant association ($p<0.001$) is found between oral lesions and BMI, suggesting that individuals with oral lesions are more likely to fall into specific BMI categories, possibly due to underlying systemic health issues, poor oral hygiene, or dietary habits. (F) Diet: No significant association ($p = 0.715$) is observed between diet type (vegetarian or non-vegetarian) and BMI, indicating diet does not have a meaningful statistical relationship with BMI categories in this study population.

STATISTICAL ASSOCIATIONS

Dental caries, missing teeth and oral lesions, are significantly associated with BMI categories, finds a potential link between BMI and oral health, possibly influenced by systemic health conditions, lifestyle, and nutrition.

NON-SIGNIFICANT ASSOCIATION

Dental fillings, smoking habits and diet are not significantly associated with BMI in this study.

CLINICAL IMPLICATIONS

Oral health factors such as caries, missing teeth, and lesions should be considered in the context of weight management and vice versa. Individuals from extreme BMI values might benefit from targeted oral health interventions. Further research is recommended to explore causal relationships and potential confounding factors influencing these associations.

DISCUSSION

The study offers important insights into the demographic characteristics, oral health status, and possible links body mass index (BMI) and oral health. Most of the participants are adults aged 26-75, with a slight female predominance. This demographic is essential for analyzing health and oral health trends in middle-aged and older individuals. The discussion below emphasizes the key findings and their implications.

A study by Deshpande provided results as there was a strong correlation between obesity and periodontitis [11], which is like our study indicating obese people have more chances of developing periodontal problems. Study by Taghat N concludes that obese young women are at higher risk of caries than normal weight women, similar to our study [12]. Study by Sonali Halder in school children about BMI and oral health concludes that there is significant relationship between oral health status with obesity [13]. Study by R Nayak results that there was a strong correlation between the BMI and dental health of obese humans. The oral hygiene of these patients were poor when compared to that of normal people [14]. There was a significant association between BMI and oral health among rural and urban population of Rajasthan, study by P Verma [15]. Dental caries, periodontitis, and tooth loss may be linked to higher BMI or obesity, while better oral health may correlate with a lower BMI. It is important to promote both general and oral health together, as they share common risk factors that can be addressed simultaneously [4]. A study conducted in Udipi district by HM Thippeswamy concludes that there was a significant correlation between obesity/overweight and oral health status [17]. Dental caries were more in children with low weight than in normal weight and overweight-obese children and was statistically significant, concluded a study by VP Reddy [18]. Participants with a higher BMI apparently had higher DMFT score, particularly when they had low education, edematous gingiva, smoked, or had a medical condition [3]. A compromised periodontal health status was strongly associated with obesity. However, dental health status appeared to be nearly identical among individuals with varying BMI levels [1].

Studies that contradict this study include Sede MA who studied about the Relationship between Obesity and Oral disease, came to a conclusion that there is no significant correlation between obesity and periodontal health and dental caries, but may cause gingival bleeding [10]. Dental caries showed no association with BMI; however, age significantly affected the DMFT index, and gender was linked to a higher number of missing teeth results by M Idrees [16].

CONCLUSION

To conclude, oral health factors such as dental caries, missing teeth, were competitively higher in obese

individuals than individuals with normal weight. The oral health status of the study population reveals mixed findings. On the one hand, a significant proportion of the population (74.5%) reports having at least one dental caries, indicating a widespread issue of untreated dental decay. While the relatively high percentage of caries-free individuals (25.5%) is encouraging, the prevalence of dental caries suggests a pressing need for preventive dental care and public health interventions. Poor oral hygiene practices, along with dietary factors like sugar consumption, may contribute to this high rate of dental caries.The results regarding missing teeth are also noteworthy. Despite most participants retaining their teeth (59.5%), there is a considerable proportion (16%) with at least one missing tooth, and a smaller but significant number (4%) with five or more missing teeth. This finding points to a need for both preventive care to maintain tooth retention and restorative dental services for individuals with significant tooth loss.In contrast, the low number of dental fillings (74% of participants have no fillings) suggests that either individuals are not seeking dental treatment for restorative procedures or that dental issues are not being addressed in a timely manner. This could reflect a lack of access to dental care or a preference for conservative management of dental conditions.

The smoking rate is relatively low in this population, with 89% of individuals being non-smokers. This is a positive health behavior, as smoking is a significant risk factor for periodontal disease, oral cancers, and tooth loss. However, the 11% of smokers still present in the population highlights the need for continued smoking cessation programs, particularly within vulnerable groups.The presence of oral lesions in only 1% of participants suggests generally good oral health, but this should not diminish the need for early detection of oral health pathologies, as lesions may signal underlying systemic issues or indicate poor oral hygiene.

Limitations of this study include that smokers and patients with oral lesions were not significantly of a good number and further longitudinal study should be conducted to find out the relation between smokers, non-smokers and oral lesion correlation with BMI.

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