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PREVALENCE OF DIFFERENT STAGES OF PERIODONTAL DISEASES AMONG A SAMPLE OF YOUNG ADULT OBESE PATIENTS: A HOSPITAL BASED CROSS-SECTIONAL STUDY OVER 1 YEAR

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Abstract

Background: This cross-sectional study aims to investigate the prevalence of different stages of periodontal diseases based on recent classifications among young adult obese dental outpatients.

Methods: A total of 314 patients receiving dental treatment participated in this study. Patients completed validated oral health questionnaires, providing demographic information such as age, gender, education level, and oral health habits. The oral health impact profile questionnaire for chronic periodontitis (OHIP-CP) was also administered. Obesity parameters were assessed using weight, height, and waist circumference to determine the stage of obesity. Diagnosis of periodontal diseases was based on clinical parameters including plaque index (PI), bleeding on probing (BoP), pocket depth (PD), clinical attachment level (CAL), and gingival recession depth (RD), supplemented by periapical radiographs. Statistical analysis included ordinal logistic regression to identify predictors of periodontal diseases and discriminant analysis to predict disease classification.

Results: The study's participants, aged 19–39 years, exhibited a 100% prevalence of various periodontal disease stages. Gingivitis was the most prevalent (63.7%), followed by Periodontitis Stage III (22.6%) and Stage II (11.1%), with Stage I being the least prevalent (2.5%). A significant association was observed between increasing BMI and elevated PD, CAL, RD, and PI (P-value < 0.05). The mean OHIP-CP score for all participants was 15.99 ± 3.06.

Conclusions: This study highlights a significant correlation between periodontal diseases and obesity among young adults. BMI showed a direct association with periodontal parameters, emphasizing the importance of self-assessment of oral health and obesity as predictors of periodontal disease.

Background:

Obesity is a significant global health concern associated with an increased risk of various diseases, including periodontitis. Inflammation induced by obesity may heighten the host's susceptibility to periodontal deterioration. The interplay between the immune and inflammatory systems likely contributes to both obesity and periodontitis. Ongoing research focuses on elucidating the biological mechanisms linking these conditions. Adipose tissue's secretion of hormones and cytokines involved in inflammation may influence the pathophysiology of both obesity and periodontitis. (Di Spirito et al., 2019)

Periodontitis shares a bidirectional relationship with metabolic disorders such as type 2 diabetes and obesity. Biological factors associated with obesity, including alterations in pro- and anti-inflammatory cytokines, contribute to a hyper-inflammatory response that promotes periodontitis. Systemic low-grade inflammation triggers host responses and the release of inflammatory cytokines like tumor necrosis factor-alpha (TNF-α) and interleukins (IL) such as IL-1 beta and IL-6, which are common factors in these chronic conditions. (Holmstrup et al., 2017)

A systematic review highlighted a significantly elevated risk of periodontal diseases among obese individuals compared to non-obese individuals. Another review and meta-analysis focused on the link between gingival inflammation and obesity, showing higher levels of gingival inflammation in obese patients with periodontitis. (da Silva et al., 2021)

Despite these findings, there is limited data in the periodontal literature regarding periodontal disease prevalence among obese individuals in the Arab African population. Epidemiological studies representing this region's adult population are crucial for developing guidelines and public health programs. (Gamil et al., 2021)

Standardized definitions for periodontal disease are essential for epidemiological studies, as variations in case definitions can significantly impact reported prevalence rates across populations. Therefore, this cross-sectional study adopts the new EFP/AAP classification of periodontal disease, including staging and grading systems, to diagnose patients accurately. While a recent study investigated periodontitis frequency and risk indicators in an adult population, obesity was not specifically addressed. Hence, this study aims to determine the prevalence of periodontal diseases according to the new classification system among young adult obese patients . This study is the first of its kind in examining periodontal disease prevalence based on the new EFP/AAP classification system in this population. (Thomas et al., 2020)

Methods

Study Settings: The observational cross-sectional study involved 314 young adult obese patients seeking dental care . Patients were consecutively recruited

Ethical Procedure: The study protocol received approval from the Research Ethics Committee, . Informed consent was obtained from all participants after explaining the study's purpose and procedures.

Eligibility and Exclusion Criteria:

- **Inclusion Criteria:** Patients aged 18–39 years with a body mass index (BMI) over 30 kg/m2 and able to provide informed consent were included.
- **Exclusion Criteria:** Excluded were patients with systemic diseases or on systemic medications, completely edentulous patients, those with removable prosthetic appliances, recent periodontal treatment or antibiotic use, pregnant or lactating women, and those with oral mobility restrictions.

Power and Sample Size Calculation: A sample size of 314 was determined based on an expected frequency of 71.3% with a margin of error of 5% and a confidence level of 95%.

Addressing Potential Bias:

- **Non-Respondent Bias:** Patients who declined participation were queried about their reasons, emphasizing their importance to the study.
- **Selection Bias:** Patients were included consecutively as they entered the diagnostic center.

Interview & Data Collection:

- **Oral Health Questionnaire:** A structured questionnaire based on WHO guidelines collected sociodemographic data, oral hygiene habits, dental visits, and smoking status. The Oral Health Impact Profile questionnaire for Chronic Periodontitis (OHIP-CP) was also used.
- **Clinical Periodontal & Radiographic Examination:** A trained examiner conducted clinical and radiographic assessments according to the latest EFP/AAP classification. Periodontal parameters including plaque index (PI), bleeding on probing (BoP), pocket depth (PD), clinical attachment level (CAL), and gingival recession depth (RD) were recorded.
- **Obesity Parameters:** Weight, height, waist circumference, and BMI were measured to categorize obesity according to WHO guidelines.

Statistical Analysis: Data were analyzed using descriptive statistics, chi-square tests, t-tests, Mann–Whitney U tests, Spearman's correlation coefficient, ordinal logistic regression analysis, and discriminant analysis. IBM SPSS Statistics software was used for analysis.

Results

The results of your study provide a comprehensive overview of the demographic characteristics, oral health behaviors, prevalence of periodontal diseases, and associations with obesity among the study participants. These are some key findings:

Demographic Characteristics: The study included 314 participants, with a nearly equal distribution of male (44.9%) and female (55.1%) participants. The mean age was 32.2 years, with the majority residing in urban areas (73.2%) and having completed college or university education (75.2%).

Oral Health Behaviors: Most participants reported good oral health self-assessment (38.2% rated as good, 29.6% as very good). The majority (60.2%) did not drink alcohol in the last 30 days, and 39.8% were smokers. Tooth brushing with toothpaste was the predominant cleaning method (99.7%).

Prevalence of Periodontal Diseases: All participants had some form of periodontal disease, with 63.8% having gingivitis, and varying percentages across different stages of periodontitis (2.5% Stage I, 11.1% Stage II, 22.6% Stage III).

Periodontal parameters such as pocket depth (PD), clinical attachment level (CAL), bleeding on probing (BoP), and plaque index (PI) varied across gingivitis and different stages of periodontitis.

Obesity and Oral Health: There was a significant association between obesity and different stages of periodontal diseases (P-value = 0.006), with class I obesity showing a higher prevalence of gingivitis and lower prevalence of periodontitis compared to class II obesity. BMI correlated positively with periodontal parameters (PD, CAL, RD, PI), indicating that higher BMI was associated with worse periodontal health.

Multivariate Analysis: Ordinal regression analysis identified self-assessment of oral health and obesity (Class I) as significant predictors of periodontal disease. Poor oral health self-assessment was associated with higher grades of periodontal diseases, while class I obesity was associated with lower grades.

Discriminant Analysis: The discriminant analysis provided equations for classifying periodontal disease stages based on various predictors, achieving an overall correct classification of 96.5%.

These findings suggest a complex interplay between demographic factors, oral health behaviors, obesity, and periodontal health. Improving oral health awareness and interventions tailored to individuals with obesity may be beneficial in managing periodontal diseases.

Table 1: Descriptive Statistics for Demographic Data and Basic Characteristics

Demographic Data	
Gender	n (%)
- Male	141 (44.9%)
- Female	173 (55.1%)
Age (Mean ± SD)	32.2 ± 4.8
Residence	n (%)
- Urban	230 (73.2%)
- Rural	84 (26.8%)
Education	n (%)
- Less than primary school	3 (1.0%)
- Primary school completed	4 (1.3%)
- Secondary school completed	18 (5.7%)
- High school completed	43 (13.7%)
- College/University completed	236 (75.2%)
- Postgraduate degree	10 (3.2%)
Smoking habits	
- Yes	125 (39.8%)
- No	189 (60.2%)
Prevalence of alcohol drinking in last 30 days	
- Yes	4 (1.3%)
- No	189 (60.2%)
Self-assessment of oral health	
- Excellent	3 (1.0%)
- Very good	93 (29.6%)
- Good	120 (38.2%)
- Average	76 (24.2%)
- Poor	17 (5.4%)
- Very poor	5 (1.6%)
Frequency of cleaning teeth	
- Never	6 (1.9%)
- Once a month	11 (3.5%)
- 2–3 times a month	42 (13.4%)
- Once a week	95 (30.3%)

- 2–6 times a week	100 (31.8%)
- Once a day	48 (15.3%)
- Twice or more a day	12 (3.8%)
Method of cleaning	
- Toothbrush	307/308 (99.7%)
- Wooden toothpicks	17/308 (5.5%)
- Plastic toothpicks	7/308 (2.3%)
- Dental floss	13/308 (4.2%)
- Mouthwash	31/308 (10.1%)
- Miswak/chew stick	10/308 (3.2%)
Use of toothpaste	
- Yes	308/308 (100%)
- No	0/308 (0%)

Table 2: Frequencies and Percentages for OHIP-CP Questionnaire

OHIP-CP Dimensions	**Never**	**Hardly ever**	**Occasionally**	**Fairly often**	**Very often**
Pain and Functional Limitation					
- Have you had toothache because of problems with your teeth or mouth?	0 (0)	0 (0)	314 (100)	0 (0)	0 (0)
- Have you had painful gums because of problems with your teeth or mouth?	0 (0)	0 (0)	313 (99.7)	1 (0.3)	0 (0)
- Have you had sensitive teeth, due to hot or cold foods or drinks, because of problems with teeth or mouth?	89 (28.3)	61 (19.4)	56 (17.8)	66 (21)	42 (13.4)
- Have you ever had any teeth become loose on their own, without an injury?	314 (100)	0 (0)	0 (0)	0 (0)	0 (0)
- Have you had difficulty chewing any foods because of problems with your teeth or mouth?	98 (31.2)	103 (32.8)	101 (32.2)	12 (3.8)	0 (0)
- Have you ever had bleeding gums (spontaneous bleeding or while brushing your teeth or biting hard objects)?	0 (0)	0 (0)	205 (65.3)	109 (34.7)	0 (0)
- Have you felt your breath has been stale because of problems with your teeth or mouth?	0 (0)	0 (0)	313 (99.7)	1 (0.3)	0 (0)
- Have you had food catching in your teeth?	0 (0)	0 (0)	312 (99.4)	2 (0.6)	0 (0)

Psychological Discomfort					
- Have you felt your sense of taste has worsened because of problems with your teeth or mouth?	311 (99)	2 (0.6)	1 (0.3)	0 (0)	0 (0)
- Have you been self-conscious because of your teeth or mouth?	34 (10.8)	259 (82.5)	15 (4.8)	6 (1.9)	0 (0)
- Have you felt tense because of problems with your teeth or mouth?	33 (10.5)	261 (83.1)	16 (5.1)	4 (1.3)	0 (0)
- Have you avoided smiling (i.e., noticed that gaps had developed between your front teeth or that you had swollen or abscess gums) because of problems with your teeth or mouth?	279 (88.9)	1 (0.3)	29 (9.2)	5 (1.6)	0 (0)
- Have you been embarrassed because of your teeth or mouth?	290 (92.4)	0 (0)	20 (6.4)	4 (1.3)	0 (0)
- Have you avoided going out because of your teeth or mouth?	293 (93.3)	2 (0.6)	17 (5.4)	2 (0.6)	0 (0)
Psychological Disability and Social Handicap					
- Have you been unable to brush teeth because of your teeth or mouth?	277 (88.2)	2 (0.6)	25 (8)	9 (2.9)	1 (0.3)
- Has your diet been unsatisfactory because of problems with your teeth or mouth?	305 (97.1)	1 (0.3)	6 (1.9)	2 (0.6)	0 (0)
- Have you felt your general health has worsened because of problems with your teeth or mouth?	314 (100)	0 (0)	0 (0)	0 (0)	0 (0)
- Have you felt that life in general was less satisfying because of problems with your teeth or mouth?	313 (99.7)	1 (0.3)	0 (0)	0 (0)	0 (0)

Table 3: Descriptive Statistics for Periodontal Parameters

Periodontal Disease	**Periodontal Parameters**	**Mean**	**SD**	**95% CI**	**Median**	**Minimum**	**Maximum**
Gingivitis	PD (mm)	2.3	0.2	2.27–2.33	2.3	1.7	2.9
	CAL (mm)	0	0	0–0	0	0	0
	RD (mm)	0	0	0–0	0	0	0

	BoP (%)	97.33	5.39	96.57–98.08	100	66	100
	PI (Score)	1.82	0.52	1.75–1.89	2	0.2	3
Periodontitis Stage I	PD (mm)	2.43	0.23	2.24–2.61	2.35	2.2	2.9
	CAL (mm)	1.75	0.46	1.36–2.14	2	1	2
	RD (mm)	0.75	1.04	-0.12–1.62	0	0	2
	BoP (%)	96.88	5.84	91.99–101.76	100	86	100
	PI (Score)	2.36	0.34	2.08–2.65	2.35	2	3
Periodontitis Stage II	PD (mm)	2.38	0.28	2.29–2.47	2.3	1.8	3.1
	CAL (mm)	3.77	0.43	3.63–3.92	4	3	4
	RD (mm)	0.53	0.79	0.26–0.8	0	0	2
	BoP (%)	97.11	6.23	94.97–99.26	100	71	100
	PI (Score)	2.02	0.57	1.82–2.21	2	1	3
Periodontitis Stage III	PD (mm)	2.51	0.24	2.45–2.56	2.5	2.1	3.3
	CAL (mm)	5.2	0.47	5.09–5.31	5	5	7
	RD (mm)	0.83	1.11	0.57–1.09	0	0	3
	BoP (%)	95.51	7.84	93.65–97.36	100	61	100
	PI (Score)	2.4	0.45	2.29–2.51	2.4	1.4	3

Table 4: Descriptive Statistics and Fisher's Exact Test Results

Obese Patients	Obesity Class I (n=267)	Obesity Class II (n=47)	P-value	Effect size (v)
Frequency of cleaning teeth				
- Never	6 (2.2)	0 (0)	0.275	0.157
- Once a month	8 (3)	3 (6.4)		
- 2–3 times a month	31 (11.6)	11 (23.4)		
- Once a week	82 (30.7)	13 (27.7)		
- 2–6 times a week	87 (32.6)	13 (27.7)		
- Once a day	43 (16.1)	5 (10.6)		
- Twice or more a day	10 (3.7)	2 (4.3)		
Method of cleaning teeth				
- Toothbrush	260 (99.6)	47 (100)	1	0.847
- Wooden toothpicks	16 (6.1)	1 (2.1)	0.486	1.118
- Plastic toothpicks	6 (2.3)	1 (2.1)	1	1.012
- Dental floss	12 (4.6)	1 (2.1)	0.700	1.094
- Mouthwash	29 (11.1)	2 (4.3)	0.193	1.117
- Miswak/chew stick	8 (3.1)	1 (2.1)	1	1.051
Self-assessment of oral health				
- Excellent	3 (1.1)	0 (0)	0.406	0.133
- Very good	82 (30.7)	11 (23.4)		
- Good	104 (39)	16 (34)		
- Average	60 (22.5)	16 (34)		
- Poor	13 (4.9)	4 (8.5)		
- Very poor	5 (1.9)	0 (0)		
Smoking			0.422	0.084
- Never	165 (61.8)	24 (51.1)		
- Once a week	1 (0.4)	0 (0)		
- Several times a week	14 (5.2)	3 (6.4)		
- Everyday	87 (32.6)	20 (42.6)		
Drinking alcohol			1	0.048
- 1 drink	1 (0.4)	0 (0)		
- 2 drinks	2 (0.7)	0 (0)		
- 3 drinks	1 (0.4)	0 (0)		
- Non-drinker	263 (98.5)	47 (100)		
Periodontal diseases			0.006*	0.199

- Gingivitis	180 (67.4)	20 (42.6)		
- Periodontitis Stage I	6 (2.2)	2 (4.3)		
- Periodontitis Stage II	29 (10.9)	6 (12.8)		
- Periodontitis Stage III	52 (19.5)	19 (40.4)		

Table 5: Comparison of Periodontal Parameters in Patients with Class I and Class II Obesity

Periodontal Parameters	**Obesity Class I**	**Obesity Class II**	**P-value**	**Effect size (d)**
Gingivitis				
- PD (mm)	2.3 ± 0.2	2.34 ± 0.24	0.389	0.204
- CAL (mm)	0.0 ± 0.0	0.0 ± 0.0	-	-
- RD (mm)	0.0 ± 0.0	0.0 ± 0.0	1	0
- BOP (%)	97.21 ± 5.59	98.4 ± 2.87	0.348	0.222
- PI (Score)	1.82 ± 0.51	1.86 ± 0.62	0.735	0.048
Periodontitis stage I				
- PD (mm)	2.32 ± 0.08	2.75 ± 0.21	0.003*	3.92
- CAL (mm)	1.83 ± 0.41	1.5 ± 0.71	0.420	0.707
- RD (mm)	0.67 ± 1.03	1 ± 1.41	0.693	0.237
- BOP (%)	95.83 ± 6.52	100 ± 0	0.424	0.7
- PI (Score)	2.43 ± 0.36	2.15 ± 0.21	0.241	0.906
Periodontitis stage II				
- PD (mm)	2.39 ± 0.29	2.32 ± 0.17	0.545	0.274
- CAL (mm)	3.72 ± 0.45	4 ± 0	0.152	0.658
- RD (mm)	0.53 ± 0.8	0.5 ± 0.84	0.938	0.022
- BOP (%)	96.76 ± 6.71	98.83 ± 2.86	0.466	0.331
- PI (Score)	2 ± 0.57	2.1 ± 0.61	0.759	0.104
Periodontitis stage III				
- PD (mm)	2.49 ± 0.23	2.54 ± 0.27	0.509	0.178
- CAL (mm)	5.19 ± 0.44	5.21 ± 0.54	0.885	0.039
- RD (mm)	0.71 ± 1.05	1.16 ± 1.21	0.139	0.31
- BOP (%)	94.98 ± 8.58	96.95 ± 5.21	0.353	0.251
- PI (Score)	2.32 ± 0.44	2.64 ± 0.4	0.014*	0.6

Table 6: Ordinal Regression Analysis Results

Variable	Regression Coefficient (b)	Standard Error (SE)	P-value	95% CI
Self-assessment of oral health				
- Very poor	18.265	0.85	<0.001*	16.6–19.93
- Poor	16.82	0.453	<0.001*	15.931–17.708
- Average	14.881	0.413	<0.001*	14.073–15.69
Obesity (Class I)	-0.934	0.369	0.011*	-1.656- -0.211

Discussion

This hospital-based cross-sectional study aimed to determine the prevalence of periodontal diseases using the new classification among young adult obese patients . The sample was considered representative of adult population due to the hospital's large patient volume. Obesity is known to affect various health conditions, including periodontal disease, through increased inflammation. Previous studies have shown a positive correlation between obesity and periodontal disease, emphasizing the importance of understanding this relationship. (Piché et al., 2020)

The study found that 100% of participants had periodontal diseases, with 35.3% experiencing different stages of periodontitis. This prevalence aligns with similar studies, highlighting the significant burden of periodontal issues in this population. The statistical analysis confirmed a direct correlation between BMI and periodontal parameters, indicating that obesity is a significant factor in periodontal health. (Kim et al., 2022)

Compared to patients with Class II obesity, those with Class I obesity showed a higher prevalence of gingivitis but a lower prevalence of periodontitis. This suggests a potential impact of varying obesity levels on different stages of periodontal disease. However, more research is needed to fully understand this relationship, especially considering factors like age, medical status, and degree of obesity. (Çetin et al., 2022)

The study's findings contribute valuable information to periodontal health landscape, highlighting the need for awareness and preventive measures, particularly among obese individuals. Policy makers can use this data to design comprehensive screening and treatment programs for oral health issues in young obese patients, potentially reducing the prevalence of periodontal diseases in this population. (Abu-Shawish et al., 2022)

Despite the study's strengths, such as its use of the latest periodontal disease classification and a sizable sample, there are limitations to consider. The hospital-based nature of the study limits generalizability, and being cross-sectional, it cannot establish causal relationships between obesity and periodontal disease. Future longitudinal studies with larger and more diverse samples can provide deeper insights into this complex relationship. (Chen et al., 2021)

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