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Original Article

Association Between Periodontal Disease and Obesity in Young and Middle-Aged Adults

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ABSTRACT

Objective: To evaluate any possible correlation of obesity with periodontitis in young and middle-aged adults.
Study Design: Cross-sectional study
Place and Duration of Study: Periodontology Department, Institute of Dentistry, Combined Military Hospital, Medical and Dental College, Lahore from Dec 2022 to Mar 2023.
Methodology: Subjects reporting to dental outpatient department aged 22 – 45 years old, with at least twelve permanent teeth and a negative history for smoking and diabetes were selected. Height and weight of selected subjects was measured to calculate BMI and subjects categorized as normal, overweight or obese. Periodontal pocket depth was ascertained using Michigan O Probe with William's markings of ≥01 teeth from each sextant. Presence or absence of periodontitis was noted and classified according to severity of clinical attachment loss. Data analysis was done using descriptive statistics via SPSS. Chi-squared test was used to explore association of obesity and periodontitis. $p \leq 0.05$ was taken as significant.
Results: Obesity was prevalent in 54(38.3%) of the subjects while periodontitis was seen in 93(66%) subjects. A statistically significant association between periodontitis and obesity was observed ($p<0.001$), with periodontitis being more prevalent in overweight and obese individuals. Periodontitis was also significantly associated with age of the subjects with increased frequency in subjects aged 35-45 years ($p=0.002$).
Conclusion: A positive and significant association between periodontitis and obesity was observed ($p<0.001$), where overweight and obese individuals were more prone to suffer from periodontitis.

Keywords: Body Mass Index; Obesity; Periodontal disease; Periodontitis; Tooth Mobility.

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INTRODUCTION

Periodontal disease refers to a set of noncommunicable disorders characterized by inflammation of the periodontium i.e., the tissues supporting the teeth.[1] The most commonly encountered periodontal diseases are gingivitis and periodontitis. Gingivitis causes reversible inflammation of the periodontal tissues in response to the accumulation of dental biofilm and its associated pathogens.[2] Periodontitis, on the contrary, causes irreversible damage to periodontium with loss of both soft and hard tissues and eventual tooth loss.[3]

Bacterial infection by periodontal pathogens is the main causative factor leading to periodontal disease and the predilection to the disease depends on host's response to these pathogens.[4] However, numerous risk factors enhance the likelihood of incidence of these diseases including obesity, malnutrition and a sedentary lifestyle.[5] Of these risk factors, obesity affects periodontal tissues by influencing periodontal inflammation. It exacerbates "local oxidative stress" in the periodontium, promoting the release of oxygen radicals and hypochlorous acid in crevicular fluid with consequent periodontal tissue damage.[2]

Obesity is a chronic disease characterized as both nutritional and metabolic in nature. It has been recognized as a global health concern having tripled in statistics since 1975, and with World Health Organization (WHO) categorizing over 13% of the world's population as "obese" in 2016.[6] Traditionally, adiposity is gauged via "Body Mass Index (BMI)" which is one's body weight in relation to one's height. As per World Health Organization (WHO) guidelines, a person with BMI ≥ 30kg/m^2 is labelled as "obese" and BMI of 25-29 kg/m^2 as "overweight.[7] Obesity can also be characterized as per the pattern of deposition and distribution of fat across the body. Body fat distribution can be calculated by gauging body's circumference at waist or the ratio of waist circumference to hip circumference.[8]

A recent research reported a high prevalence of 71% of periodontitis in the local population with an

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increased incidence in overweight and obese individuals.[9] While some research works have highlighted an association between obesity and periodontitis,[8,9] others have found mild to no relationship between these conditions.[10] This study aimed to explore any possible connection of adiposity with periodontal disease in young adults and middle-aged adults of Pakistan. Knowledge thus gained will help increase awareness about the diseases and improve provision of oral healthcare services to the population at risk.

METHODOLOGY

A research study bearing "cross-sectional descriptive design" was conducted at Periodontology Department, Institute of Dentistry, CMH Medical and Dental College, Lahore from December 2022 to March 2023. Approval from Institute's ethical committee was sought (Case no. 641/ERC/CMH/LMC). A total sample size of 141 was calculated by WHO calculator with 95% confidence interval, 0.075 margin of error and 0.71 anticipated population proportion of periodontitis.[9]

Inclusion Criteria: Subjects of either gender, with age ranging from 22 to 45 years, with at least twelve permanent teeth and a negative history for smoking reporting to dental out patient department for reasons other than periodontal issues were selected.

Exclusion Criteria: Under- or over-aged subjects, those with deciduous dentition or multiple missing permanent teeth, those with a positive smoking status and diabetics were excluded from the study.

Informed consent was obtained from selected individuals. Height and weight of selected subjects was measured and noted in a proforma. BMI was calculated and subjects categorized as normal, overweight or obese as per WHO criteria. A thorough dental examination was carried out. Periodontal examination was done using Michigan O Probe with William's markings of ≥01 teeth per sextant under the guidance of consultant periodontist. Presence or absence of periodontitis was documented. Periodontitis was classified according to severity of "clinical attachment loss" (CAL) as follows – mild: 1-2 mm CAL, moderate: 3-4 mm CAL and severe: ≥ 5mm CAL.

Data was analyzed using "Statistical Package for Social Sciences (SPSS) version 24". Descriptive statistics were evaluated. Mean±SD values of quantitative variables were calculated while frequency and percentage for categorical variables were assessed. Stratification was used to control effect-modifying variables such as gender with post-stratification application of chi-squared test. Association of obesity and periodontitis was also measured using chi-squared test. $p \leq 0.05$ was taken as significant.

RESULTS

Of the 141 selected study subjects, 86(61%) were women and 55(39%) were men. Subjects had a mean age of 33.28±6.56 years and a mean BMI of 27.51±3.89 kg/m^2. Using BMI as the diagnostic criteria, 54(38.3%) subjects were categorized as "Obese". Details of patient anthropometric characteristics and distribution of subjects according to their BMI is given in Table-I.

Table-I: Mean Anthropometric Characteristics and Distribution of Study Subjects According To BMI (n=141)

Patient Characteristics	Mean±SD	n (%)
Age (years)	33.28±6.56	-
Weight (kg)	77.02±13.14	-
Height (m)	1.67±0.11	-
BMI (kg/m2)	27.51±3.89	-
BMI 18 – 24.99 (healthy)	-	41(29.1%)
BMI 25 – 29.99 (overweight)	-	46(32.6%)
BMI ≥ 30 (Obese)	-	54(38.3%)

Periodontitis was diagnosed in 93(66%) subjects with majority of 60(42.6%) exhibiting mild CAL of 1-2 mm. Severe CAL was seen in only 04(2.8%) subjects. A significant difference could not be found between males and females for frequency of periodontitis (p=0.792), CAL (p=0.617) and prevalence of obesity (p=0.16).

A significant difference could be observed amid age groups i.e., young adults aged 22-33 years and middle-aged adults 34-45 years old, for both frequency of periodontitis (p=0.002) and CAL (p<0.001) with an increased prevalence of periodontitis and CAL observed in middle-aged adults (Table-II). Furthermore, subjects from different age groups also showed a significant difference in obesity whereby obesity was found to be more prevalent in middle-aged adults (p<0.001) (Table-II).

Frequency of periodontitis and CAL was also found to be statistically significantly different between subjects from different weight groups as per their BMI as shown in Table-III (p<0.001). For both periodontitis and CAL, a significantly higher prevalence was observed in overweight and obese subjects than in subjects with a healthy weight (Figure-1).

Table-II: Comparison of Periodontitis, Clinical Attachment Loss and Obesity Status Between Different Age Groups Of Study Subjects (n=141)

Parameter		Age Groups		*p*-value
		Group A (22-33 years) n=74	Group B (34-45 years) n=67	
Periodontitis	Positive	40 (28.37%)	53 (37.58%)	0.002
	Negative	34(24.11%)	14(9.93%)	
Clinical Attachment Loss	Positive	40(28.37%)	53(37.58%)	0.002
	Negative	34(24.11%)	14(9.93%)	
Obesity	Positive	40(28.37%)	60(42.55%)	<0.001
	Negative	34(24.11%)	07(4.96%)	

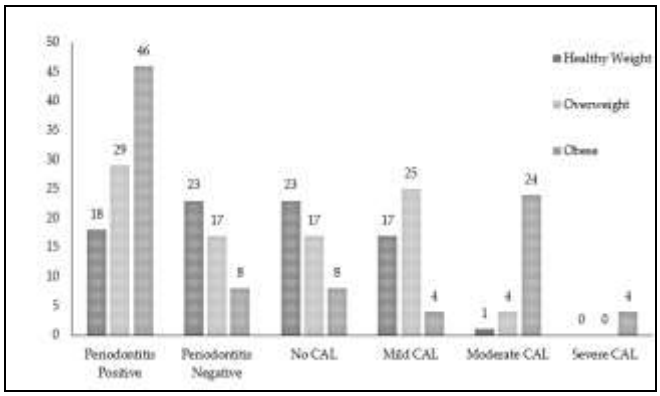

Figure-1: Prevalence of Periodontitis and Clinical Attachment Loss According to Weight of Subjects

Table-III: Comparison of Periodontitis Status Between Different Weight Groups of Study Subjects (n=141)

Periodontitis (including clinical attachment loss)	Weight Groups		*p*-value
	Healthy weight (BMI 18-24.99) n=74	Overweight/Obese (BMI>25) n=67	
Positive	18 (12.76%)	75 (53.19%)	<0.001
Negative	23 (16.31%)	25 (17.73%)	

DISCUSSION

Periodontitis and obesity are two commonly encountered heath condition with high prevalence in the Pakistani population.[11,12] Unhealthy dietary habits as well as poor nutrition especially high sugar intake as seen in obese individuals negatively affect one's oro-dental health. Hence, a possible link between obesity and periodontitis has been speculated.

In this study, periodontitis was diagnosed in 66% of the subjects. This finding is comparable to those of Attaullah *et al*.[9] who found 71% subjects affected by the disease in their study. The prevalence observed in the current study is slightly higher than that reported by Fahim et al. who reported a prevalence of 56.6% at the national level.[11] These differing results may be explained by the drastically differing study cohorts. In contrast to the findings of this study, an Australian research reported a prevalence of periodontitis as 21.3%.[13] This difference in results can be explained by increased awareness, better access to healthcare facilities and improved community oral health programs in the developed countries.

In the present study, obesity was found in 38.3% of the subjects which is quite a high figure. Ataullah et al.9 also reported a similar frequency of 36% in their study subjects while a prevalence of 35% was reported by Rafique *et al*.[14] in the local population. In contrast, Asif et al.12 reported 5% prevalence of obesity as observed in a survey of over ten thousand subjects across all provinces of Pakistan. This difference in findings may be attributed to the difference in sample sizes as well as to the fact that Asif *et al*.[12] used data collected for Pakistan panel household survey in 2010. Considerable changes in sociodemographic data of the Pakistani population have since occurred and may account for the varying prevalence.

The present study revealed periodontitis and obesity to be positively associated. Periodontitis was more frequently encountered in individuals categorized as "obese" and "overweight" with over 85% and 63% subjects presenting with the disease in each category. On the contrary, only 43% individuals in the healthy weight category presented with periodontitis, with the difference between groups being statistically significant (p<0.001). These results are endorsed by Sahar *et al*.[15] who documented a significantly higher frequency of periodontitis in overweight and obese persons. Analogous findings can also be seen in studies by Gulati *et al*.[8] Hegde *et al*.[16] and Al-Qahtani *et al*.[17] Likewise, Thomas *et al*.[18] reported periodontitis in 71.3% of the obese subjects in their study. Rafique *et al*., also reported a higher mean BMI value indicating obesity associated with cases of periodontitis.[14] A possible explanation for this association may be attributed to the unhealthy eating habits and increased frequency of food intake leading to compromised oral hygiene seen in overweight and obese individuals. Culebras-Atienza *et al*.[10] on the contrary, reported a lack of any interlink between the two diseases in women only. They, however, used "waist-to-hip ratio" as the measure of obesity instead of BMI and their cohort only comprised of individuals suffering from Down's syndrome.

The current research also revealed a relationship between periodontitis and age of subjects with an increased prevalence of periodontitis in subjects aged 34-45 years. Similar results were documented by Sahar *et al*.[15] and Attaullah *et al*.[9] both of whom found increased frequency of periodontitis in older subjects aged 35-45 years. Bokhari *et al*., and Billings *et al*.[19] have also documented a significantly higher prevalence of periodontitis associated with increasing age.[20]

This study has its own share of limitations. The main shortcoming of this study is its relatively small sample size. Moreover, selection of subjects was not limited to first dental visit, so it is a possibility that some subjects had previously undergone periodontal treatment or therapy. An attempt was made to control confounding factors that may affect periodontal health such as smoking and diabetes. However, a detailed systemic health analysis can help rule out other confounders. Future studies with larger diverse samples may be conducted to further explore the association between periodontitis and obesity.

CONCLUSION

Obesity was prevalent in 38.3% of the subjects while periodontitis was seen in 66% of the study subjects. A positive and significant association between periodontitis and obesity was observed (p<0.001), with greater prevalence of periodontitis in obese individuals. Periodontitis also had a positive association with subjects' age showing increased frequency in subjects aged 35-45 years (p=0.002).

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MT & AWA: Data acquisition, data analysis, critical review, approval of the final version to be published.

MH & WL: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Arboleda S, Vargas M, Losada S, Pinto A. Review of obesity & periodontitis: An epidemiological view. Br Dent J. 2019; 227(3): 235-239.
2. Khan MS, Alasqah M, Alammar LM, Alkhaibari Y. Obesity and periodontal disease: A review. J Family Med Prim Care 2020; 30(9): 6.
3. Federica DS, Ludovico S, Vincenzo P, Francesco DA. Obesity and periodontal disease: A narrative review on current evidence and putative molecular links. Open Dent J 2019; 13: 526-536.
4. Saliem SS, Bede, S. Y., Cooper, P. R., Abdulkareem, A. A., Milward, et al. Pathogenesis of periodontitis - A potential role for epithelial-mesenchymal transition. Jpn Dent Sci Rev 2022; 58(2022): 268-278.
5. Jepsen. S., Suvan J, J. D. The Association of Periodontal Diseases With Metabolic Syndrome And Obesity. Periodontol 2000 2020; 83(1): 125-153.
6. World Health Organisation. World Health Statistics 2017: Monitoring health for the SDGs. 2017 [cited 2023 4/12]. Available from: https://apps.who.int/iris/handle/10665/255336
7. World Health Organisation. Obesity and overweight. 2021 [cited 2023 06/01]. Available from: https://www.who.int/news-room/fact-sheets/detail/obesity-an
8. Gulati NN, Masamatti SS, Chopra P. Association between obesity and its determinants with chronic periodontitis: A cross-sectional study. J Indian Soc Periodontol 2020; 24(2): 167-72.
9. Attaullah K, Khan ZA, Sibghatullah M, Chachar ZH, Shaikh MI, Ahmed S et al. Association between obesity and periodontal disease among young and middle aged adult groups. Professional Med J 2019; 26(10): 1688-1692.
10. Culebras-Atienza E, Silvestre FJ, Silvestre-Rangil J. Possible association between obesity and periodontitis in patients with Down syndrome. Med Oral Patol Oral Cir Bucal 2018; 23(3): e335-e43.
11. Fahim A, Shakeel S, Shahid TN, Anwar HM, Raja AA, Khan A. Prevalence of Periodontitis in Pakistan: a Systematic Review. J Uni Coll Med Dent. 2022;1(1):30-4.
12. Asif M, Aslam M, Altaf S, Atif S, Majid A. Prevalence and Sociodemographic Factors of Overweight and Obesity among Pakistani Adults. J Obes Metab Syndr 2020 29(1): 58-66.
13. Khan S, Bettiol S, Kent K, Barnett T, Peres M, Crocombe LA et al. Obesity and periodontitis in Australian adults: a population-based cross-sectional study. Int Dent J 2020; 70(1): 53-61.
14. Rafique S, Khan S, Ahmed S, Qureshi MA, Amin R. Case-control study for assessment of factors associated with periodontitis among adults attending a university hospital in Karachi, Pakistan. J Pak Med Assoc 2021; 71(1B): 252-256.
15. Sahar N, Tangade P, Jain A, Priyadarshi S, Hasan M, Ahsan I, et al. Association between obesity and periodontal disease among 35–44 years old patients visiting Teerthanker Mahaveer Dental College and Research Centre, Moradabad: A cross sectional study. J Family Med Prim Care 2023; 12(1): 21-26.
16. Hegde S, Chatterjee E, Rajesh KS, Arun Kumar MS. Obesity and its association with chronic periodontitis: A cross-sectional study. J Educ Health Promot 2019; 8(11): 222-226.
17. Al-Qahtani SM, Elagib MF, Reddy NR, Alghamdi NS, Baldo SM, Kumar PM et al. Relationship between Obesity and Periodontal Diseases in Saudi Women (Asir Region): A Prospective Study. J Contemp Dent Pract 2018; 19(8): 969-973.
18. Thomas JT TT, Ahmed M, Kannan S K, Abdullah Z, Alghamdi SA, Joseph B. 2020 Apr 24; 56(4): 197. Prevalence of Periodontal Disease among Obese Young Adult Population in Saudi Arabia-A Cross-Sectional Study. Medicina (Kaunas) 2020; 56(4): 197-207.
19. Billings M, Holtfreter B, Papapanou PN, Mitnik GL, Kocher T, Dye BA et al. Age-dependent distribution of periodontitis in two countries: Findings from NHANES 2009 to 2014 and SHIP-TREND 2008 to 2012. J Periodontol 2018; 89(Suppl 1): S140-S58.
20. Bokhari SA, Suhail AM, Malik AR, Imran MF. Periodontal disease status and associated risk factors in patients attending a Dental Teaching Hospital in Rawalpindi, Pakistan. J Indian Soc Periodontol 2015; 19(6): 678-682.