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Research Article

Obesity and Periodontitis

The Link Between Obesity and Periodontitis Severity: A Population-Based Study

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Abstract: Obesity contributes to an overall inflammatory condition through its metabolic and immune parameters, thereby increasing susceptibility to periodontal disease and periodontitis being one of the most common chronic inflammatory diseases. Therefore, by evaluating the risk variables for Obesity and periodontitis, we could know the association, influence, and severity of Periodontal disease. 150 individuals reported to the Department of Periodontics, SBDCH, who were more than 35-70 years of age with mild, moderate, and severe Periodontitis were included in the study. A clinical examination was performed, which included height, weight, waist circumference, abdominal/hip circumference, and blood pressure. On Intra oral examination, bleeding on probing, Periodontal probing pocket depth, and clinical attachment level was measured to assess the severity of the periodontal condition. In addition, a blood investigation of lipid profile and HbA1C was taken. We found a statistically significant association between metabolic syndrome and Periodontal status. Obesity influences the severity of Periodontitis, and it's a population-based cross-sectional study; all the independent risk variables have a major role in developing the risk of periodontitis. Periodontitis has been proposed to contribute to systemic conditions such as cardiovascular disease primarily through the inflammatory and microbial burden posed by the inflamed surface area of the periodontal pocket.

Keywords: obesity; metabolic syndrome; periodontal diseases; dyslipidemia, diabetes mellitus; hypertension; inflammation.

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1. INTRODUCTION

Overweight and obesity are rapidly increasing in countries like India. The prevalence of overweight increased from 9.7 % before 2001 to 13.9 % in studies reported after 2010. [1]Periodontitis is related to disorders of the polymicrobial synergism that results in dysbiosis.[1,2] Obesity is defined as an abnormal or excessive fat accumulation, an imbalance between energy intake and expenditure, referred to as over nutrition, and a health risk. This may initiate interactions of environmental, genetic, and neuroendocrine factors involved in the complex feedback systems in response to food intake or activity of the fat cells[3]. More than ever before, it is understood that systemic inflammation occurs as a consequence of obesity[4]. With fatty tissue at the forefront of understanding obesity and its associated health consequences, measurements of overweight or obesity aim to quantify the amount or proportion of fat tissue in an individual's body.[5] It is recognized that body mass index is valuable in assessing possible risk but may be less meaningful at an individual level because of differences in fat distribution. The role of visceral fat in increased health risk has resulted in measurements of waist circumference or waist-hip ratio. The threshold of waist circumference defined as related to increased health risk s 94 cm for men and 80 cm for women[5]. Over the past few years, the association between Obesity and Periodontitis has been widely studied. Recently Metabolic syndrome (MetS), a condition characterized by insulin resistance, central obesity, dyslipidemia, and hypertension, associated with chronic low-grade inflammation, constitutes a major risk factor for atherosclerotic cardiovascular disease and diabetes mellitus type II[8]. More attention has been reserved for the correlation between Periodontitis and systemic health. So it is assumed that improving periodontal health by diminishing the local inflammation/immune activation should reduce and impact systemic inflammation. The study aims to assess Periodontitis and obesity, which appear to be linked through common pathologic and metabolic ways, by evaluating the risk variables BMI, WHR, and WC in chronic periodontitis patients. The present study aims to discover obesity and its influence on various stages of Periodontitis. Thereby, the severity of Periodontitis in obese patients is assessed. The study aims to determine the correlation between metabolic syndrome risk parameters (age, lipid profile, diabetes) and chronic periodontitis patients.

2. MATERIALS AND METHODS

2.1. Study Population

50 individuals reporting to the Department of Periodontics, SBDCH, who are more than 35-70 years of age with mild, moderate, and severe Periodontitis were included in the study

2.2. Inclusion Criteria

Participants were obese Obese/ Overweight individuals (BMI - > 25), male/ female of 25-60 years in the presence of ≥20 scorable teeth.

2.3. Exclusion Criteria

Participants who were pregnant and lactating mothers, had any antibiotic or steroid therapy for the past 6 weeks, periodontal treatment for the past six months, individuals on anti-depressants, and hormonal imbalance individuals were excluded from the study.

2.4. Study Design

Population-based

2.5. Cross-Sectional Study

The American Heart Association and the National Heart, Lung, and Blood Institute propose that MetS be identified as the presence of three or more of the following components[8]:

- Elevated waist circumference:
- Men – equal to or greater than 40 inches (102 cm);
- Women – equal to or greater than 35 inches (88 cm);
- Elevated triglycerides: equal to or greater than 150 mg/dL;
- Reduced HDL (“good”) cholesterol:
- Men – less than 40 mg/dL;
- Women – less than 50 mg/dL;
- Elevated blood pressure: equal to or greater than 130/85 mm Hg;
- Elevated fasting glucose: equal to or greater than 100 mg/dL.
- Individuals reporting to the Department of Periodontics, SBDCH, who were obese/overweight, were recruited for the study. A questionnaire-based survey was conducted to evaluate diet, lifestyle, and stress. The height and weight of the person were measured, and blood pressure, diabetic status, and lipid profile were also evaluated. Body mass index of > 30.0 kg/m^2 and waist-hip ratio using measuring tape was recorded. The Williams probe measured periodontal parameters: bleeding on probing, clinical attachment level, recession, and pocket probing depth.

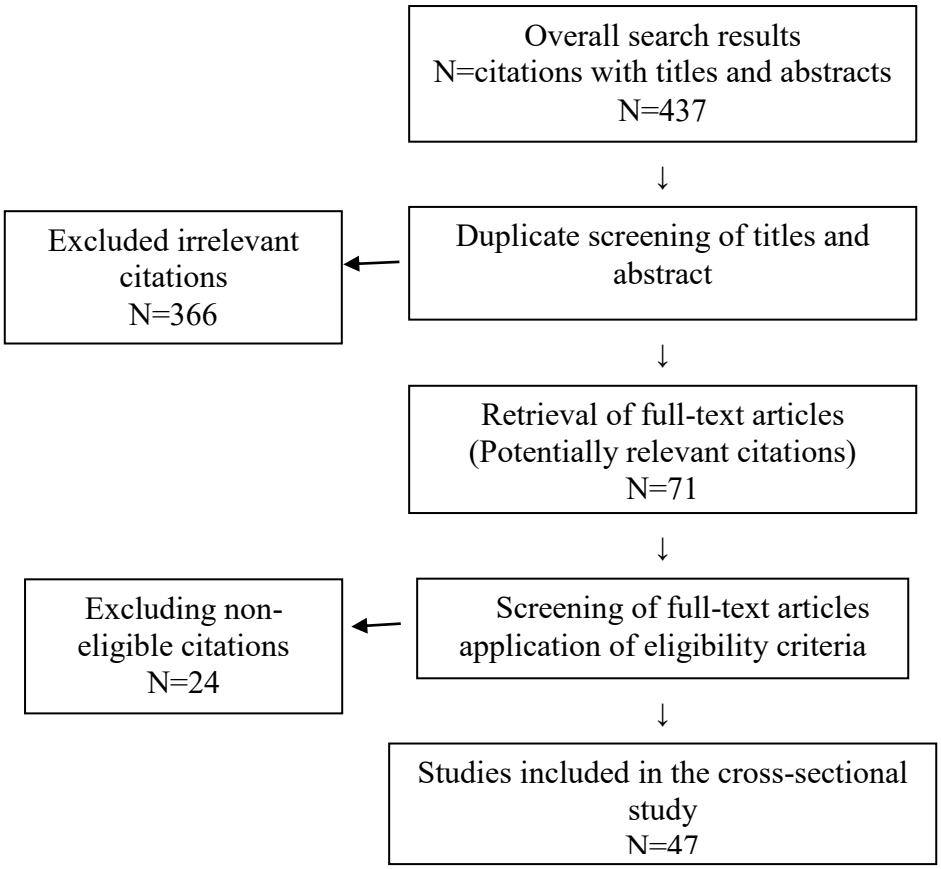
2.6. Statistical Analysis

Statistical analysis was performed using STATA version 15.0. One Way Anova and Pearson Chi-Square test was done, and P value = 0.000 was statistically significant. The data were presented as mean ± standard deviation (SD).

3. RESULTS

Frequency Distribution of Variables

Pearson Chi-Square Test Analysis



Flowchart 1: Study Identification Flowchart

Table 1:Correlation of Age and Periodontal Disease

Age	Periodontal Status			Total
	Mild	Moderate	Severe	
≤ 30	3	1	0	4
31-40	26	28	14	68
41-50	22	21	16	59
51-60	1	11	4	16
>60	1	1	1	3
Total	53	62	35	150

Pearson Chi- Square test was done with X^2 (8) = 11.1887: and the P value = 0.191

Table 2:Gender Distribution of The Patients

Sex	Periodontal Status			Total
	Mild	Moderate	Severe	
Female	32	27	11	70
Male	21	35	24	80
Total	53	62	35	150
Pearson Chi-Square test:	X^2 (2) = 7.5106 P value = 0.023			

The age and gender distribution correlated with various stages of Periodontitis.

- **BARTLETT'S TEST FOR EQUAL VARIANCE**

Table 3: Correlation Of Various Parameters Of Obesity And Periodontal Disease

Periodontal Status	Bmi			Wc			Whr		
	Mean	SD	Frequency	Mean	SD	Frequency	Mean	SD	Frequency
mild	24.3	3.18	53	46.118868	10.960454	53	.84320755	.05370051	53
moderate	26.381613	4.1617624	62	42.140323	9.9791497	62	.86919355	.07708412	62
severe	29.126571	3.5828915	35	41.331429	8.9400543	35	.87253333	.10457448	150

BMI -Bartlett's test for equal variances: $F_{(2,147)}$ = 18.44 P value = 0.000; WC -Bartlett's test for equal variances: $F_{(2,147)}$ = 9.97 P value = 0.0001; WHR - Bartlett's test for equal variances: $F_{(2,147)}$ = 6.63 P value = 0.0017.

Table 4: Periodontal Diseases Severity And Other Parameters					
Periodontal Status	Diabetic Status			Blood Pressure	
	HBA1C<6.5	HBA1C>=6.5	Total	SYSTOLIC BP <135mmhg	DIASTOLIC BP<85mmhg
mild	50	3	53	32	32
moderate	31	31	62	17	22
severe	8	27	35	5	10

Table 4: Pearson Chi-Square test was done, and P value = 0.000 was statistically significant.

One-way ANOVA (Analysis of variance) is deployed to test if there is a statistically significant difference in BMI concerning periodontal status. BMI will be the dependent variable and periodontal status as the independent variable. From the analyses, we can conclude that the mean BMI is significantly different for at least one of the groups in periodontal status ($F_{2, 147}$ = 18.44, p < 0.000), which is mild, moderate, and severe. (Table 3).

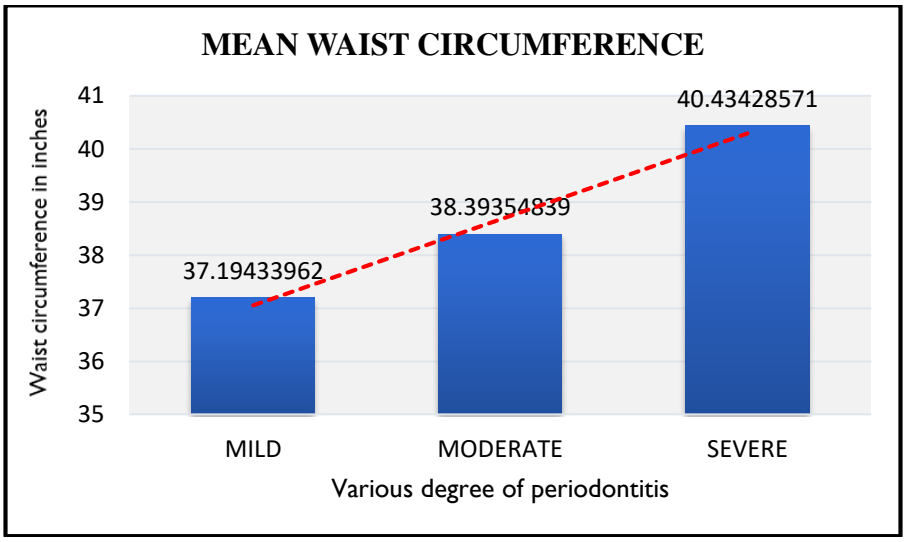


Fig 1: The mean for waist circumference correlated with different stages of periodontitis. The mean waist circumference is higher in patients with severe periodontitis.

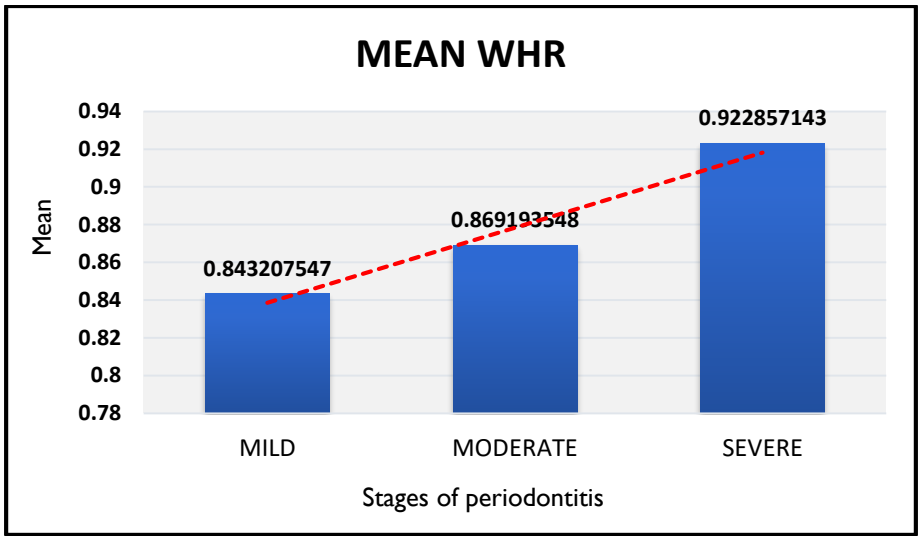


Fig 2: The waist-hip ratio is correlated with different periodontitis stages. The Mean of WHR is higher in patients with severe periodontitis.

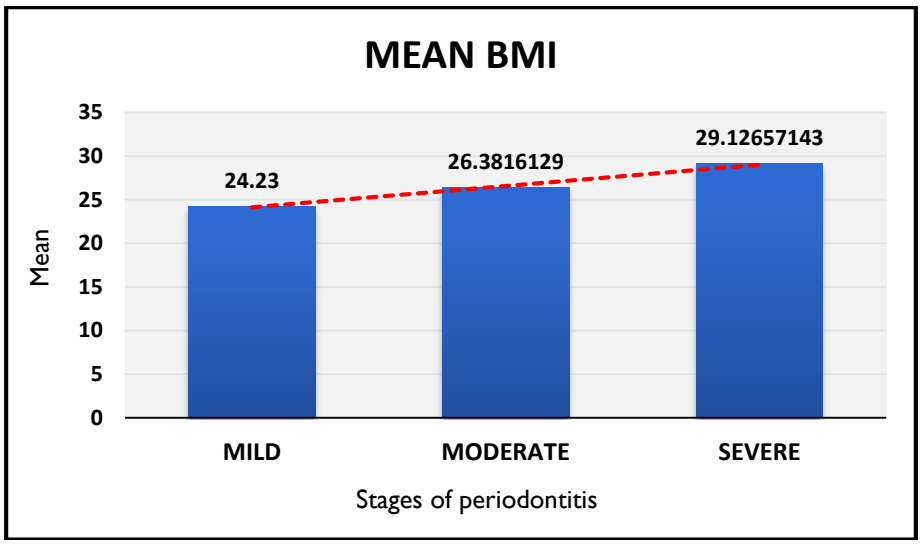


Fig 3: The mean for BODY MASS INDEX correlated with different stages of periodontitis. Mean BMI is higher in patients with severe periodontitis.

4. DISCUSSION

The study was conducted in the South Indian Population, Where the BMI (P value < 0.046) and Waist circumference (P value < 0.0001) was found to be significantly associated with at least one of the groups of Periodontitis. The results of these variables were in concordance with the study by Al-Zahrani et al.[9], in which they used the NHANES III database for a sample of 665 participants aged 18 years or older. They examined the association between the level of BMI, or waist circumference, and the increasing odds of having periodontal disease and found a significant association among younger adults (18 to 34 years old); on waist circumference, there was about a two-fold increase in the odds of having periodontal disease among young adults with high waist circumference (>102 cm for men; >88 cm for women) compared to the same age categories with low waist circumference (OR: 2.3 (95% CI: 1.5–3.5) Similarly, findings from the study by Saito et al.[10] suggest that independent of BMI, a high waist–hip ratio is associated with a risk of periodontitis, especially in higher BMI categories. A study by Kumar et al.[11], which compared mean values of components of MetS and lipid parameters between cases and controls, reveals that the mean waist circumference (mean difference: −4.8 [95% CI: −7.75–−1.84], P < 0.002), mean total cholesterol level(mean difference: −9.43 [95% CI: −18.72–−0.14], P < 0.047), mean triglycerides level (mean difference: −25.75 [95% CI: −49.22–−2.28], P < 0.032), and mean LDL level (mean difference: −7.6 [−14.2–−0.99], P < 0.024) were significantly higher in cases than in control groups. In the study, in lipid profile, HDL cholesterol (P value < 0.0468) and Triglyceride (P value < 0.000) which was found to be significantly associated with Periodontitis. It is well known that uncontrolled diabetes leads to greater periodontal destruction, and also it has proposed a bidirectional association between diabetes and periodontitis.[12,13] Pro-inflammatory cytokines may play a pivotal role in the close relationship among periodontitis, obesity, and chronic diseases (Beck and Offenbacher, 2005; Genco *et al.*,2005).[14,15] This association may be multidirectional and has been supported by systematic reviews.[16,17] Here the glucose intolerance is analysed using HbA1C, and we found a significant association between HbA1C (P value = 0.000) and severity of Periodontitis.The prevalence of HbA1C in patients with moderate (50.8%) and severe (44.2%) periodontitis was significantly higher than that of the mild (4.9%) periodontitis group, the prevalence of hypertension in patients with moderate (Sys: 46.8%; Dias: 46.4%) and severe (Sys: 31%; Dias: 29%) Periodontitis was significantly higher than that of the mild (Sys: 21.8%; Dias: 24.4%) Periodontitis group. The BMI, Waist circumference, and waist-hip ratio have been highly correlated in severe periodontitis; it is understood that obesity contributes to an overall inflammatory condition through its metabolic and immune parameters, thereby increasing susceptibility to periodontal disease. [18]

5. CONCLUSION

The study gives us a clear picture of how obesity influences the severity of periodontitis; it being a population-based study, all the independent variables have a major role in the development of risk of Periodontitis. The study suggests an association between periodontal diseases and the risk factors for cardiovascular disease, including obesity, dyslipidemia, diabetes mellitus, and hypertension. Also, periodontal diseases have been associated with systemic alteration, such as low-grade inflammation, dyslipidemia, a procoagulant state, glucose intolerance, and endothelial dysfunction. While treating and diagnosing periodontal diseases could help us improve systemic health and vice versa; therefore, Obesity and Periodontal disease may be linked through a common pathophysiological pathway.

6. THE HIGHLIGHTS OF THIS STUDY

It is a South Indian Population-based study, which studies the Various stages of Periodontitis that gives us specific data; all the risk variables are compared to various stages of periodontitis.

7. LIMITATIONS OF THE STUDY

Further studies with larger sample sizes are needed to validate the relationship between chronic periodontitis and obesity. Also, treatment studies are needed to be conducted to assess the effect of periodontal treatment on obesity. Finally, the underlying microbiological mechanisms showing a relation between obesity and periodontal disease should be

established; more studies are needed to prove this association.

8. ETHICAL APPROVAL STATEMENT

The study was reviewed and approved by the institutional ethical committee for our study with reference number (SBDCH /IEC/12/2020/07). All participants were aware of the survey, and the study consented to provide the required data and informed consent before participation.

9. AUTHORS CONTRIBUTION STATEMENT

Dr V. Ramya conducted the whole study and was approved by the institutional ethical committee (Sree Balaji Dental College). All the authors read and approved the final version of the manuscript.

10. CONFLICT OF INTEREST

Conflict of interest declared by none.

11. REFERENCES

1. Kinane DF, Bartold PM. Clinical relevance of the host responses of periodontitis. Periodontol 2000. 2007;43:278-93. doi: 10.1111/j.1600-0757.2006.00169.x, PMID 17214845.
2. Campos JR, Costa FO, Cota LOM. Association between periodontitis and metabolic syndrome: A case-control study. J Periodontol. 2020 Jun;91(6):784-91. doi: 10.1002/JPER.19-0298, PMID 31691971.
3. Andriankaja OM, Sreenivasa S, Dunford R, DeNardin E. Association between metabolic syndrome and periodontal disease. Aust Dent J. 2010 Sep;55(3):252-9. doi: 10.1111/j.1834-7819.2010.01231.x, PMID 20887511.
4. Marchetti E, Monaco A, Procaccini L, Mummolo S, Gatto R, Tetè S et al. Periodontal disease: the influence of metabolic syndrome. Nutr Metab (Lond). 2012 Dec;9(1):88. doi: 10.1186/1743-7075-9-88, PMID 23009606.
5. Linden GJ, Lyons A, Scannapieco FA. Periodontal systemic associations: review of the evidence. J Periodontol. 2013;84(4);Suppl:S8-S19. doi: 10.1902/jop.2013.1340010, PMID 23631586.
6. Grundy SM, Cleeman JI, Daniels SR, Donato KA, Eckel RH, Franklin BA, et al. Diagnosis and management of the metabolic syndrome: an American Heart Association/National Heart, Lung, and Blood Institute scientific statement. Circulation. 2005;112(17):2735-52. doi: 10.1161/CIRCULATIONAHA.105.169404, PMID 16157765.
7. Jaramillo A, Contreras A, Lafaurie GI, Duque A, Ardila CM, Duarte S et al. Association of metabolic syndrome and chronic periodontitis in Colombians. Clin Oral Investig. 2017 Jun;21(5):1537-44. doi: 10.1007/s00784-016-1942-9, PMID 27535794.
8. Bascones-Martinez A, Matesanz-Perez P, Escribano-Bermejo M, González-Moles MÁ, Bascones-Ilundain J, Meurman JH. Periodontal disease and diabetes—review of the literature. Med Oral Patol Oral Cir Bucal. 2011;16(6):e722-9. doi: 10.4317/medoral.17032, PMID 21196866.
9. MS T, TE VD, working group 1 of the joint EFP/AAP workshop. J Periodontol. 2013 Periodontitis and atherosclerotic cardiovascular disease: consensus report of the Joint EFP/AAP Workshop on Periodontitis and Systemic Diseases;84(4): S24-9.
10. Reaven GM. Banting lecture 1988. Role of insulin resistance in human disease. Diabetes. 1988;37(12):1595-607. doi: 10.2337/diab.37.12.1595, PMID 3056758.
11. Bray GA. Obesity is a chronic, relapsing neurochemical disease. Int J Obes Relat Metab Disord. 2004;28(1):34-8. doi: 10.1038/sj.ijo.0802479, PMID 14557829.
12. Falagas ME, Kompoti M. Obesity and infection. Lancet Infect Dis. 2006;6(7):438-46. doi: 10.1016/S1473-3099(06)70523-0, PMID 16790384.
13. Brochu M, Mathieu ME, Karelis AD, Doucet E, Lavoie ME, Garrel D, et al. Contribution of the lean body mass to insulin resistance in postmenopausal women with visceral obesity: a Monet study. Obesity (Silver Spring). 2008;16(5):1085-93. doi: 10.1038/oby.2008.23, PMID 18356851.
14. Saltiel AR, Olefsky JM. Inflammatory mechanisms linking obesity and metabolic disease. J Clin Invest. 2017;127(1):1-4. doi: 10.1172/JCI92035, PMID 28045402.
15. Matsuzawa Y. The role of fat topology in the risk of disease. Int J Obes (Lond). 2008;32;Suppl 7:S83-92. doi: 10.1038/ijo.2008.243, PMID 19136997.
16. Chaffee BW, Weston SJ. Association between chronic periodontal disease and obesity: a systematic review and meta-analysis. J Periodontol. 2010;81(12):1708-24. doi: 10.1902/jop.2010.100321, PMID 20722533.
17. Perlstein MI, Bissada NF. Influence of obesity and hypertension on the severity of periodontitis in rats. Oral Surg Oral Med Oral Pathol. 1977 May 1;43(5):707-19. doi: 10.1016/0030-4220(77)90055-x, PMID 266151.
18. Genco RJ, Grossi SG, Ho A, Nishimura F, Murayama Y. A proposed model linking inflammation to obesity, diabetes, and periodontal infections. J Periodontol. 2005 Nov;76(11);Suppl:2075-84. doi: 10.1902/jop.2005.76.11-S.2075, PMID 16277579.