Original article

Evaluation of the severity of periodontitis in obese individuals with and without type 2 diabetes mellitus – A cross-sectional study

Raveena Rose Baby, Richa Gautam, Pragathi R Bhat*, Anirudh B Acharya, Srinath L Thakur, Vijay A Trasad

Email: drdevanshim@gmail.co

Abstract

Background: Obesity is a metabolic disorder with high risk of various life-threatening diseases. There is a vast existing literature, which correlates the relationship between obesity and periodontitis, diabetes mellitus and periodontitis. Thus, this study assessed the severity of periodontitis in obese individuals with diabetes mellitus and the same in subjects without diabetes mellitus. **Materials and methods:** Hundred individuals between the age group of 30-65 years with at least 20 teeth were screened for presence of periodontitis, type 2 diabetes and obesity of which group A comprised of 50 obese-diabetic individuals with chronic periodontitis and group B comprised of 50 obese non-diabetic individuals with chronic periodontitis. Anthropometric measurements and fasting and random blood sugar level was measured and all the subjects underwent periodontal examination. **Results:** The results showed that periodontitis was present in both the groups, but severity being more in the obese-diabetic group. **Conclusion**: Periodontists should make the obese-diabetic patients realize the possible oral complications of the underlying systemic disease, to diminish patient morbidity.

Key words: Periodontitis, obesity, diabetes mellitus, patient morbidity

Introduction

The literature on periodontal medicine recently has highlighted the association of periodontal disease and systemic health and vice-versa and the evidence suggests that having periodontitis, contributes to total infectious and inflammatory burden further contributing to either cardiovascular events or stroke, adverse pregnancy outcomes and diabetes mellitus due to poor metabolic control in susceptible individuals.[1] Obesity being a risk factor for diabetes mellitus, is also considered the same for periodontitis.[2,3,4] Obesity is a metabolic disorder that is seen to occur as a result of an interaction between the environment and genotype.[5] Obese individuals

Raveena Rose Bab
Head of the Department, Professor, Department of Paedodontics and Preventive Dentistry, K M Shah Dental College and Hospital Sumandeep Vidyapeeth, Vadodara

Richa Gautam
Postgraduate Student, Department of Paedodontics and Preventive Dentistry, K M Shah Dental College and Hospital Sumandeep Vidyapeeth, Vadodara

Pragathi R Bha
Professor, Department of Paedodontics and Preventive Dentistry K M Shah Dental College and Hospital, Sumandeep Vidyapeeth Vadodara

Anirudh B Acharya
Professor, Department of Paedodontics and Preventive Dentistry K M Shah Dental College and Hospital, Sumandeep Vidyapeeth Vadodara

Srinath L Thaku
Postgraduate Student, Department of Paedodontics and Preventive Dentistry, K M Shah Dental College and Hospital, Sumandeep Vidyapeeth, Vadodara

Vijay A Trasa
Postgraduate Student, Department of Paedodontics and Preventive Dentistry, K M Shah Dental College and Hospital Sumandeep Vidyapeeth, Vadodara

* Corresponding Author

How to cite this article: Raveena Rose Baby, Richa Gautam, Pragathi R Bhat*, Anirudh B Acharya, Srinath L Thakur, Vijay A Trasad. (2017). Evaluation of the severity of periodontitis in obese, 2(1), 1-5.

are at a high risk of various life threatening diseases and most commonly being diabetes mellitus. Thus, this inter-relationship has led to a model which links inflammation to obesity, diabetes, and periodontitis.[4] Although the available literature on relationship between obesity, diabetes, and periodontitis attributes to inflammatory cascade, there is no much literature that links obesity, diabetes, and periodontitis. However, a study conducted by Awad et al.[6] revealed that apart from the subjects with diabetes mellitus, there was periodontitis even in subjects with normal glucose levels. Thus, the objective of this study was to assess the severity of periodontal disease in subjects with periodontitis and obesity alone and in subjects with periodontitis type 2 diabetic mellitus and obesity.

Materials and methods

A total of 100 subjects visiting the outpatient department of Periodontics, SDM College of Dental Sciences and Hospital (SDMCDSH), Dharwad and outpatient department of SDM Medical College and hospital, Dharwad from January 2016 to July 2016. Subjects between 30-65 years of age were randomly selected and screened for the presence of periodontal disease, diabetes, and obesity. Group A comprised of 50 obese-diabetic individuals with chronic periodontitis and group B comprised of 50 obese non-diabetic individuals with chronic periodontitis. Subjects with minimum 20 teeth, those diagnosed as having chronic periodontitis, those diagnosed with type 2 diabetes mellitus and obese individuals were included in the study. Geriatric patients were not included in the study so as to avoid less accurate measurement of Body Mass Index.[7] Apart from this, patients with malignancy and osteoporosis, pregnant and lactating women, patients who had already received periodontal therapy in the past, patients on antibiotics, steroids or hormonal therapy and smokers were not included in the study. Chronic periodontitis was said to be present when probing pocket depth of more than 3 mm and clinical attachment loss more than 1 mm was noted and bleeding on probing was seen in at least 30 percent of teeth. A person was said to be obese when the Body Mass Index was more than 30 kg/m^2 and waist circumference was more than 102 cm in men, 88 cm in women and subjects with no history of any surgery in the past 12 months. A detailed medical and dental history was recorded and a full-mouth periodontal examination was done at six sites per tooth (third molars excluded) using a manual periodontal probe with Williams markings or a UNC-15 (University of North Carolina) probe. Patient's oral hygiene status, clinical attachment loss, probing pocket depth (PPD), and gingival bleeding were recorded. The measurements of probing pocket depth and clinical attachment loss were made in millimeters and were rounded off to the nearest millimeter[8, 9] and the severity of periodontitis was evaluated based upon the clinical attachment loss viz. mild (1- 2 mm of CAL, 3 - 4 mm of PPD), moderate (3 - 4 mm of CAL, 5 - 7 mm of PPD) and severe (5 or > 5 mm of CAL, >7 mm of PPD).[10] Height of the patient was measured using a measuring rod and body weight was measured on a weighing machine. Waist Circumference (WC) was measured at the narrowest point between the umbilicus and the rib cage and Hip Circumference (HC) was measured around the buttocks below the anterior superior iliac spine. Thus the Waist hip ratio (WHR) was calculated as the ratio of WC to HC. As a measure of obesity, Body Mass Index (Quetelet Index) was calculated and the subjects with BMI more than 30 kg/m^2 were considered as obese[1, 6] for the Indian population and were included in the study. The existing literature considers the measurement of the waist circumference or waist-hip ratio as a better disease risk predictor than BMI.[11,12] Thus, to be more specific the anthropometric measurements including BMI, WC, HC, and WHR were measured to evaluate obesity. About 5 ml of venous blood was collected from the subjects to assess the fasting and random blood sugar levels on two occasions i.e., the random blood sugar level was measured on the first day and fasting blood sugar level was measured on the third day. Thus, anthropometric measurements and periodontal status were recorded to evaluate the severity of periodontitis in subjects with obesity, along with anthropometric measurements, periodontal status, and diabetes mellitus.

Statistical analysis

The data was subjected to statistical analysis by performing a Mann-Whitney test so as to compare various parameters between the groups.

Results

The results showed that there was a statistically significant difference between obese-diabetic-group and obese-non-diabetic group with respect to waist circumference, plaque index, gingival index, probing pocket depth, and clinical attachment loss. It was observed that there was an increased plaque index, gingival index, probing pocket depth, and clinical attachment loss in the obese-diabetic-individuals when compared to obese-non-diabetic individuals. There was also a statistically significant difference between both the groups with respect to RBS and FBS values (Table 1). However, there was no statistically significant difference with respect to age, BMI, and other clinical parameters.

With respect to bleeding on probing, it was observed that amongst the 50 obese-diabetic individuals, 45 subjects (76.3%) did show positive bleeding on probing and five subjects (12.2%) had no bleeding on probing. While amongst the 50 obese-non-diabetic individuals, only 14 subjects (23.7%) had bleeding on probing and 36 subjects (87.8%) had no bleeding on probing, thus indicating that there was an association between positive bleeding on probing, obesity, and diabetes (Table 2).

Discussion

Prevalence of periodontitis is more in young obese individuals than those individuals with normal weight, thus suggesting increased periodontitis in obese individuals.[13] Obesity is a common health

Table 1: Results showing a statistically significant difference between obese-diabetic-group and obese-non-diabetic group with respect to waist circumference, plaque index, gingival index, probing pocket depth, clinical attachment loss, RBS, and FBS groups

Patients		Age	Waist circumference	BMI	PI	GI	PPD	CAL	RBS mgs&	FBS mgs%
Group 1	Mean	50.6600	114.5000	33.0468	2.0122	2.1324	6.2000	7.7600	159.56	131.70
	N	50	50	50	50	50	50	50	50	50
	Standard deviation	7.56094	8.32564	1.55895	.53569	.57502	.85714	1.39328	15.674	7.760
Group 2	Mean	48.0800	107.6000	33.5414	.8516	.5202	5.0000	6.0400	125.30	85.00
	N	50	50	50	50	50	50	50	50	50
	Standard deviation	7.49922	10.07523	1.92370	.34093	.34965	.75593	1.06828	6.774	8.997
Total	Mean	49.3700	111.0500	33.2941	1.4319	1.3263	5.6000	6.9000	142.43	108.35
	N	100	100	100	100	100	100	100	100	100
	Standard deviation	7.60337	9.82717	1.75963	.73465	.93836	1.00504	1.50756	20.993	24.912

Table 2: Significant association between positive bleeding on probing, obesity, and diabetes

BOP * PTS Cross tabulation						
			PTS		Total	Chi-square
			D	ND		P value
BOP	Ab	Count	5	36	41	
		% within BOP	12.2%	87.8%	100.0%	39.727
	Pr	Count	45	14	59	P=0.000*
		% within BOP	76.3%	23.7%	100.0%	
Total		Count	50	50	100	
		% within BOP	50.0%	50.0%	100.0%	

problem in the world and is considered to be an independent risk factor for various life-threatening diseases.[14] Obesity is seen to increase susceptibility of the host to develop periodontitis owing to its impact on metabolic and immune system, which also makes them susceptible to developing type 2 diabetes. The adipocytokines released in obesity and hormones in diabetes are involved in inflammatory processes, mimicking a hyper-inflammatory pathway involved in the patho-physiology of periodontitis.[4] The present study assessed the relationship between obesity, diabetes mellitus, and periodontitis. Hundred subjects between 30-65 years of age were screened for the presence of periodontitis, obesity, and diabetes mellitus in which group A comprised of 50 obese-diabetic individuals with chronic periodontitis and group B comprised of 50 obese non-diabetic individuals with chronic periodontitis. The results suggested that severe periodontitis was noted in the obese diabetic individuals than in obese non diabetic individuals. The results also revealed a statistically significant difference between both the groups with respect to random blood sugar and fasting blood sugar levels which could be attributed to a model which linked inflammation to obesity, diabetes, and periodontal infection. The free fatty acids in the diet add to obesity and also enhance apoptosis of β-cells of the pancreas thereby leading to insulin resistance. Insulin resistance is also brought about by the pro-inflammatory cytokines produced and released by the adipose cells. This insulin resistance is a critical feature of type 2 diabetes mellitus. In a diabetic individual, the interaction of advanced glycation end products (AGE) and receptors for AGE trigger the trigger monocyte/macrophage and cytokine production leading to a hyper inflammatory state which in turn trigger the periodontal pathogens.[1, 4] Thus, this experimental inflammatory model attempts to clarify the mechanism of precise nature of the molecular interactions of inflammatory cytokines with obesity, diabetes, and periodontal disease. The results from this study suggest that periodontitis in obese individuals is an important factor that precipitates the clinical outcome of diabetes mellitus.

Conclusion

Although the severity of periodontitis is more in obese-diabetic individuals, this relationship needs to be investigated further. Moreover, periodontists should make the obese-diabetic patients aware about the oral problems of the underlying systemic disease, to diminish patient morbidity.

References

1. Thomas B, Shetty SY and Kumari S. Correlation between Obesity, Diabetes Mellitus and Periodontal Disease in Adults – A clinical and biochemical study. *Journal of the Society of Periodontists and Implantologists of Kerala* 2010; 04: 35 - 38.
2. Saito T. et al. Relationship between obesity, glucose tolerance, and periodontal disease in Japanese women: the Hisayama study. *J Periodont Res* 2005; 40:346 - 53.
3. Chapper A, Munch A, Schermann C, Piacentini C and Fasolo T. Obesity and periodontal disease in diabetic pregnant women. *Pesquisa Odontologica Brasileira* 2005; 19:83 - 87.
4. Genco RJ, Grossi SG, Ho A, Nishimura F and Murayama Y. A proposed model linking inflammation to obesity, diabetes and periodontal infections. *J Periodontol* 2005; 76: 2075 - 84.
5. Dennison E, Syddall H, Sayer A, Martin H and Cooper C. Hertfordshire Cohart Study Group. Lipid profile, obesity and bone mineral density: The Hertfordshire Cohart Study. *Quarterly Journal of Medicine* 2007; 100:297 - 303.
6. Awad M, Rahman B, Hasan H and Ali H. The relationship between body mass index and periodontitis in Arab patients with type 2 diabetes mellitus. *Oman Med J.* 2015; 30: 36 - 41.
7. Dahiya P, Kamal R and Gupta R. Obesity, periodontal and general health: Relationship and management. *Indian J Endocr Metab* 2012; 16:88 - 93.
8. Grossi SG, Genco RJ. Periodontal disease and diabetes mellitus: A two-way relationship. Ann Periodontol 1998; 3:51- 61.
9. Saito T, Shimazaki Y, Sakamoto M. Obesity and periodontitis. *N Engl J Med* 1998; 339:482 - 483.
10. Flemmig TF: Periodontitis. *Ann Periodontol* 1999; 04:32 - 35.

11. Reeves AF, Rees JM, Schiff M, and Rujoel P. Total body weight and waist circumference associated with chronic periodontitis among adolescents in the United States. *Arch Pediatr Adolesc Med* 2006; 160:894 - 99.
12. Wang Y, Rimm EB, Stampfer MJ, Willet WC and [illegible] FB. Comparison of abdominal adiposity and overall obesity in predicting risk of type 2 diabetes among men. *Am J Clin Nutr* 2005; 81:555 - 63.
13. Al-Zahrani MS, Bissada NF, Borawskit EA. Obesity and periodontal disease in young, middle-aged and older adults. *J Periodontol* 2003; 74:610 - 15.
14. Haenle M, Brockmann S, Kron M, Bertling U, Mason R and Steinbach G. Overweight, physical activity, tobacco and alcohol consumption in a cross-sectional random sample of German adults. *BMC Public Health* 2006; 6:233.