ORIGINAL RESEARCH

Relationship between Obesity and Periodontal Diseases in Saudi Women (Asir Region): A Prospective Study

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ABSTRACT

Aim: The present study is undertaken to assess any possible association between obesity and periodontal diseases among Saudi women in Asir region.

Materials and methods: A total number of 100 obese subjects in the age group between 16 and 35 years participated in the study. A questionnaire which consisted of anthropometric measurements [neck circumference (NC) ≥ 34 cm for women] and demographic features was used. Periodontal status was assessed for the subjects.

Results: The periodontal disease shows significant association with anthropometric measurements (NC ≥ 34 cm for women) and demographic features.

Conclusion: The findings of this prospective study showed possible relationship between obesity and periodontal disease.

Clinical significance: In view of changing lifestyle with dietary habits, there is a possibility of developing obesity. The results in this research show a direct relationship between obesity and periodontal diseases by measuring body mass index (BMI) and NC in the age group of 16 to 35 years females in Saudi Arabia. Thus, it helps in preventing and managing obesity, especially among youth.

Keywords: Body mass index, Neck circumference, Obesity, Periodontal disease.

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INTRODUCTION

Obesity and overweight are defined as excessive deposition of fat that may alter health. An adult is considered overweight if his or her BMI is ≥25 and obese if BMI is ≥30 kg/m^2.[1]

The prevalence of obesity and overweight has raised concern worldwide during the last decades, with impact on health and socioeconomic status.[2] A low-grade inflammation in obese individuals has been found to be a risk factor to major chronic diseases, such as type II diabetes, hyperlipidemia, cholelithiasis, arteriosclerosis, cardiovascular and cerebrovascular diseases, certain type of cancer, and osteoarthritis, and obesity has been found to be a risk factor for periodontal diseases.[3,4]

Periodontitis being a chronic inflammatory disease affects the supporting structures of the teeth resulting from the interaction between pathogenic bacteria and the host's immune response,[5,6] which may result in partial or complete loss of teeth.[6,7]

The possible interaction between obesity and periodontal diseases is based on the elevated serum levels of C-reactive protein, interleukin (IL)-6, tumor necrosis factor (TNF)-α, and leptin, suggesting that similar mechanisms are involved in obesity and periodontitis pathophysiologies. The secretions of these substances could induce an inflammatory response on periodontal disease.[8]

The prevalence of periodontal diseases has been assessed by various risk factors, wherein obesity and its correlation with periodontal diseases are low among Saudi women. Since Saudi Arabia has been increasingly adopting Western lifestyle, it has now become top in the obesity and overweight prevalence rates.

In the light of the above relationship between obesity and periodontitis, the present study is undertaken to assess any possible association between obesity and periodontal diseases among Saudi females visiting the outpatient Department of Preventive and Community Sciences, College of Dentistry, Abha, Kingdom of Saudi Arabia.

MATERIALS AND METHODS

A total number of 100 healthy Saudi women who had exposure to obesity participated in the study. The study subjects were picked from the outpatient Department of Preventive and Community Sciences, College of Dentistry, Asir region, Abha, Kingdom of Saudi Arabia, between October 1, 2016 and October 31, 2017.

Inclusion Criteria and Exclusion Criteria

All the subjects should be systemically healthy and fall in the age group ranging from 16 to 35 years without any familial history of diabetes in their family until 35 years of age. These subjects are included in the study. Though the family history is associated with the increased prevalence of obesity, this research helps in knowing the relation between obesity and advanced lifestyle in food habits and its effects in the age group of 16 to 35 years female patients.

As the patients included are from 16 to 35 years of age, we have included only chronic periodontitis patients excluding the rapid destructive periodontal disease. Patients who had received periodontal treatment or antibiotics for at least 3 months prior to study are not included. Subjects with chronic usage of antiinflammatory drugs and premedication within 3 months prior to study are not included in the study. Subjects physically, mentally, or legally incapacitated are not included. Pregnant women and lactating mothers are also not included in the study.

Collection of Data

Patient's records with documented weight, height, age, sex, NC, and a completed periodontal evaluation were included. Periodontal disease was classified in the presence of periodontal pocket of 4 mm or greater; BMI was calculated; and patients were classified as obese (BMI ≥ 30) or nonobese (BMI < 30).

Periodontal Examination

A complete periodontal examination was assessed and recorded by taking plaque index (PI), gingival index (GI), probing pocket depth (PPD), clinical attachment loss (CAL), and recession.

Measuring Obesity

Obesity is typically evaluated by measuring BMI, and NC was used to evaluate the distribution of fat mass.

Body Mass Index

Body mass index is a number calculated from a person's height and weight. The formula for calculating the BMI is as follows: weight (kg)/[height (m)]^2 = BMI, with the metric system the formula for BMI is weight in kilograms divided by height in meters squared.[9]

The standard weight status categories associated with BMI ranges for adults are shown in Table 1.

Body Fat Measurement

Another way to determine obesity is to assess percent body fat. Doctors and scientists generally agree that men with more than 25% body fat and women with more than 30% body fat are obese.

Patients with NC ≥ 34 cm for women require evaluation of overweight status.[5] Circumferences were measured with a Gulick tape. Waist circumference was measured at the umbilicus and recorded to the nearest 0.1 cm. Neck circumference was measured below the laryngeal prominence and perpendicular to the long axis of the neck, and the minimal circumference was recorded to the nearest 0.1 cm.[10]

RESULTS

Subjects used in this study were 100 dentate female patients (n = 100) with mean age of 25.5 years. Of those, 86% of participants are Saudi nationalists and 14% are non-Saudi nationalists. Table 2 describes the mean, standard deviation, minimum–maximum weight, height, BMI, and NC.

Table 1: Standard weight status categories associated with BMI ranges for adults

Categorization	BMI values
Underweight	<18.5
Normal	18.5–24.9
Overweight	25.0–29.9
Obesity class I	30.0–34.9
Obesity class II	35.0–39.9
Obesity class III	>40.0

Table 2: Mean, standard deviation, minimum–maximum weight, height, BMI, and NC

Characteristic	Min–Max	Mean ± Std. deviation
Weight	62–130	81.59 ± 13.104
Height	143–173	157.33 ± 5.819
BMI	24–51	32.82 ± 5.194
NC	30–42	35.65 ± 2.459

Table 3: Correlation between participants' BMI, NC, and some dental diseases

Variable	Parameter	BMI	NC
Periodontal disease pockets	r	0.082	−0.012
	p-value	0.415	0.904
GI	r	0.215*	−0.078
	p-value	0.032	0.439
PI	r	0.052	−0.001
	p-value	0.607	0.993
GR	r	−0.024	0.028
	p-value	0.814	0.781
CAL	r	−0.022	0.041
	p-value	0.828	0.687

*Correlation is significant at the 0.05 level (two-tailed)

Out of 100 participants, only one individual got normal BMI, whereas 9 subjects (9%) were severely or morbidly obese, 63 (63%) were obese, and 27 (27%) were overweight. According to body fat measurement done by measuring NC, 93% of individuals were obese and 7% were overweight.

Minimum to maximum weight, height, BMI, and NC of the study subjects are 62 to 130, 143 to 173, 24 to 51, and 30 to 42 respectively (Table 3). Mean and standard deviation of the study subject's weight, height, BMI, and NC are 81.59 ± 13.104, 157.33 ± 5.819, 32.82 ± 5.194, and 35.65 ± 2.459 respectively.

On examining oral hygiene characteristics, 20% used horizontal brushing, 30% followed vertical tooth brushing techniques; 40% of the participants brushed twice daily, whereas 24% brushed once daily, 21% more than twice, and interestingly, 12% of the individuals reported that they brush their teeth less than once in a day. 66% of the individuals used brush and paste for cleaning the teeth and 45% of the individuals reported that they use mouthwash as an adjunct to brushing.

On gingival and periodontal examination, almost all the subjects showed signs of gingival inflammation and plaque accumulation. Class I gingival recession (GR) is seen in 25% of the individuals, whereas 3% is class II GR. Only 2% of the individuals showed pocket depth of 4 mm, rest of the individuals showed 3 or <3 mm probing depth, whereas measuring clinical attachment level 6% showed mild, 20% showed moderate, and 2% showed severe CAL (Tables 4 and 5).

Table 4: Dental-related diseases characteristics

Variable	Parameter	Frequency	%
Periodontal disease pockets	1	1	1.0
	2	59	59.0
	3	38	38.0
	4	2	2.0
GI	Absence of signs of inflammation	0	0.0
	Slight change in color and texture	6	6.0
	Visual inflammation and bleeding on probing	89	89.0
	Overt inflammation and spontaneous bleeding	5	5.0
PI	Absence of plaque	0	0.0
	Plaque seen after probing the gingival margin	13	13.0
	Visible plaque	80	80.0
	Abundance of plaque	7	7.0
GR	0	72	72.0
	1	11	11.0
	2	14	14.0
	3	3	3.0
CAL	0	72	72.0
	2	6	6.0
	3	9	9.0
	4	11	11.0
	5	1	1.0
	6	1	1.0

Table 5: Correlation between some dental diseases affecting the participants

		GI	PI	GR	CAL
Periodontal disease pockets	r	0.297**	0.101	0.072	0.165
	p-value	0.003	0.317	0.478	0.100
GI	r	1	0.200*	0.017	0.075
	p-value		0.046	0.865	0.461
PI	r		1	0.211*	0.264**
	p-value			0.035	0.008
GR	r			1	0.953**
	p-value				0.000

*Correlation is significant at the 0.05 level (two-tailed); **Correlation is significant at the 0.01 level (two-tailed)

DISCUSSION

Nowadays, obesity has become one of the commonest health problems. As the prevalence of obesity is increasing worldwide in recent years, it is important to know the causative factors for this multifactorial disease or syndrome.[11,12] The adipokines like leptin, resistin, and adiponectin have shown a close relationship with many of the inflammatory processes. Its role in causing periodontal disease is yet to be known.[13-15]

The main focus on obesity and periodontal disease relation has shifted to whether the overweight and obesity increase the disease progression, affect the prognosis of the disease, or there is any effect on total morbidity and

mortality.[16-18] Studies done on this relation have found contradictory results and are few in number. Thus, further research is needed to clearly demonstrate the relation between obesity, disease progression, and on morbidity and mortality.[19,20]

Obesity is one of the strongest risk factors for periodontal disease next to smoking. Note that in presence of bacterial plaque accumulation in obese individuals, the severity of periodontal disease is more when compared with the obese individuals without plaque accumulation.[21]

Due to the changes in dietary patterns and eating habits in the present-day life, it is very important to know the strong relation or association with these factors to obesity and periodontal disease. Hence, BMI and NC are considered in this study, which helped in assessing the obesity.[3,8]

Adipose tissue-derived cytokines and hormones play an important role in the pathogenesis of periodontal disease in case of obese individuals in which they are in high levels along with triglycerides in fat tissue.[12]

Chronic inflammatory disease is especially due to the deposition of adipose tissue in case of obese patients, though the exact mechanism of causing periodontal disease is not known in obese patients.[22]

Adipocytes and macrophages of the white adipose tissue produce higher levels of proinflammatory cytokines, such as IL-1β, TNF-α, and IL-6. These cytokines are responsible for the development and progression of periodontal disease.[23]

For example, the adipocytes secrete these inflammatory cytokines (TNF-α) into the plasma which inhibit insulin signaling, leading to insulin resistance. The free fatty acids released by the adipocytes also cause apoptosis of B cells leading to insulin resistance, resulting in diabetes with hyperinflammatory state of periodontal tissues showing response to infecting microorganisms leading to periodontal breakdown. Obesity management alone does not subside the periodontal disease. Treatment of periodontal disease is compulsory along with the management of overweight and obesity.[11]

According to Memish et al,[24] both males and females are affected by obesity: 28.7% (men = 24.1% and women = 33.5%). It is associated with diet, marital status, hypertension, hypercholesterolemia, diagnoses of diabetes, and physical activity in men, whereas education, marital status, hypertension, and history of chronic diseases are related with females. In a research done by Ahmed et al,[25] 71% females and 56.2% males are obese in the Hail region, Kingdom of Saudi Arabia. The study done by us is in accordance with Memish et al[24] and Al-Hazzaa et al,[26] with females showing higher prevalence of obesity than males.

According to Al-Hazzaa et al,[26] the abdominal obesity in males and females was 35.9 and 30.3% respectively, showing higher prevalence in males. Across all ages, overweight and obesity are more prevalent in males compared with females, ranging from 39.9 to 45.6% in males and from 30.4 to 38.7% in females.

It is important to assess BMI in regular intervals in dental practice, which helps in evaluating the risk of overall general health and oral health. Though many studies shown the association between periodontal disease and obesity, still the research is ongoing when it comes to conclude whether BMI, waist circumference, NC can be considered as risk predictors for periodontal disease and obesity. The present study utilized NC, which may be higher among populations where waist circumference is hard to measure or not interpretable as a measure of central adiposity because of culture, time of the day, clothing, last meal, empty bladder, pregnancy, and various health conditions, all of which are unlikely to impact NC.

In the present study, there is a significant association between the obese individuals and periodontitis patients. Hence, it is advisable to the periodontist to assess the BMI in a regular basis and also to explain the correlation between BMI, NC, and periodontal disease.

The present findings showed a statistically significant positive correlation between obesity in terms of BMI and NC and gingival findings of GI and PI (p < 0.415, 0.713) in female participants. These results were in accordance with previous study findings and have shown a positive correlation between obesity and periodontal disease among females. It also suggests that inflammatory periodontal disease is caused by the hormonal fluctuation in female patients due to their lifecycle events. In our study, PPD, CAL, and GR results were in accordance with previous findings on correlation between obesity and periodontal disease among females.[7,20] A recent review by AlJehani[27] concluded that there was a clear association between low socioeconomic status and gingivitis, but the association was less direct for periodontitis. In the study by Gorman et al,[28] the time to periodontal progression was defined as the number of years from the baseline examination to the first examination where the periodontal progression was noted. Therefore, the time to periodontal progression was interval censored; i.e., it occurred sometime between examinations.[7] It is difficult to assess the nature, direction, and size of such bias that arises from the imputation, but potentially it leads to attenuation rather than inflation of the association, giving credit to the observed direct associations in that study.[20-25]

CONCLUSION

As obesity is a multifactorial and complex disease, it is important to know its relation with gingival and

periodontal diseases. Many researchers concluded that there is an increase in adipokines in adipose tissue which are related to the inflammatory diseases, such as periodontal disease. Hence, it is important to all the dental clinicians to assess the oral status in obese persons and to educate the patients about the role of BMI, NC, and waist circumference as risk factors in developing periodontal diseases.

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