

Association of Body Mass Index and Chronic Periodontitis

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Abstract

Increase in the Body Mass Index has been associated with various systemic conditions. There is a gradual increasing trend of high BMI individuals in the population. High BMI has also shows a bi-directional relationship between inflammatory diseases like periodontitis. Periodontitis is a chronic immune-inflammatory disease which is caused by oral bacteria which causes heightened immune mediated reactions which ultimately leads to the destruction of the host periodontal tissues itself. The present study aims to find a correlation between the BMI and periodontitis. A retrospective study design of 410 case records of patients with chronic periodontitis was included in the study. We report that the number of percentage of overweight individuals in chronic periodontitis group is more (39.7%) than the prevalence of overweight individuals in the general population confirming the association of overweight individuals to chronic periodontitis.

Key Words: Chronic periodontitis, Adult periodontitis, Body Mass Index, Overweight

INTRODUCTION

Obesity has been defined by World Health Organisation (WHO) a medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health, leading to reduced life expectancy and/or increased health problems. [1] Obesity is most commonly caused by a combination of excessive food energy intake and lack of physical activity, although a few cases are caused primarily by genes, endocrine disorders, medications, or psychiatric illness. Obesity increases the likelihood of various diseases, particularly heart disease, type 2 diabetes, obstructive sleep apnoea, certain types of cancer and osteoarthritis. On an average, obese people have greater energy expenditure than their thin counterparts due to the energy required to maintain an increased body mass. Further, recent studies have suggested that obesity is also associated with oral diseases, particularly periodontitis. [2,3]

Periodontitis involves progressive loss of the alveolar bone around the teeth, and if left untreated, can lead to the loosening and subsequent loss of teeth. Periodontitis is caused by periodontopathic microorganisms (*Porphyromonas gingivalis*, *Aggregatobacter actinomycetemcomitans*, *Fusobacterium nucleatum*) that adhere to and grow on the tooth's surfaces, along with an over-aggressive immune response against these microorganisms which in turn causes destruction of the host tissues also.

Various bio active molecules are secreted by adipose tissues such as adipokine, leptin, adiponectin, resistin, visfatin, serum retinol binding protein, interleukin 6 and TNF α are regarded initially as markers mainly related to weight gain and insulin resistance. It has become clear that adipokines are involved in various functions including inflammatory diseases such as periodontitis. Adipokines

can transfer the inflammatory process as well as oxidative stress thereby increasing the risk of periodontitis. Studies also reveal that adipokines are produced by periodontal cells and regulated by periodontal pathogens. This provides a bi directional link between periodontitis and obesity. It has been ascribed to unhealthy dietary patterns with insufficient micronutrients and excess sugar and fat content, which could pose a risk both for periodontal disease and obesity.

Obesity is quantified by the Body Mass Index (BMI). BMI is defined as the body mass divided by the square of the body height. In fact, the adipose tissue secretes several cytokines and hormones that are involved in inflammatory processes, suggesting that similar pathways are involved in the pathophysiology of obesity and periodontitis. The aim of the research is to evaluate the possible relationship between BMI and chronic periodontitis.

MATERIALS AND METHODS

A retrospective analysis of case records of patients who reported to Saveetha Dental College 'outpatient department' from (14/03/2015 - 25/06/2015) was collected for the study. A total of 410 patients diagnosed as chronic periodontitis were included. Patients of age group 18-75 with a minimum of 20 teeth present were included. General information of age, sex, height, weight, (localized or generalized) chronic periodontitis were included. All the patients were of South Indian ethnicity. Patients with aggressive periodontitis were excluded from the study.

The indicators of obesity were assessed using Body mass index (BMI). Based on the WHO criteria, the patients were categorized as underweight ($<18.5 \text{ kg m}^2$), normal weight (18.5 to 24.9 kg m^2), overweight (25 to 29.9 kg m^2) and obese ($> 30 \text{ kg m}^2$).

RESULTS

The study consists of a group of 410 patients. Out of 256 male patients, 210 were found to have localized periodontitis and the remaining 46 had generalised periodontitis. In the female category 124 patients had localized chronic periodontitis and 30 had generalised chronic periodontitis. [Table 1]

On compiling the BMI in patients with chronic periodontics, 6 patients were underweight, 238 were of normal weight, 163 were over-weight and 3 were found to

be obese. [Table 2, Figure 1] The frequency distribution pattern of the study population is given in table 3.

The chronic periodontitis patients have been categorised into localised and generalised chronic periodontitis. On evaluating the frequency distribution of BMI, 39.9% of the patients were in the localised periodontitis group and 39.4% of the patients were found to be overweight in generalised chronic periodontitis group. [Table 3, Figure 2,3]

Periodontitis	Male	Female	Total
Localized	210	124	334
Generalized	46	30	76

Table 1: The male to female distribution of the patients.

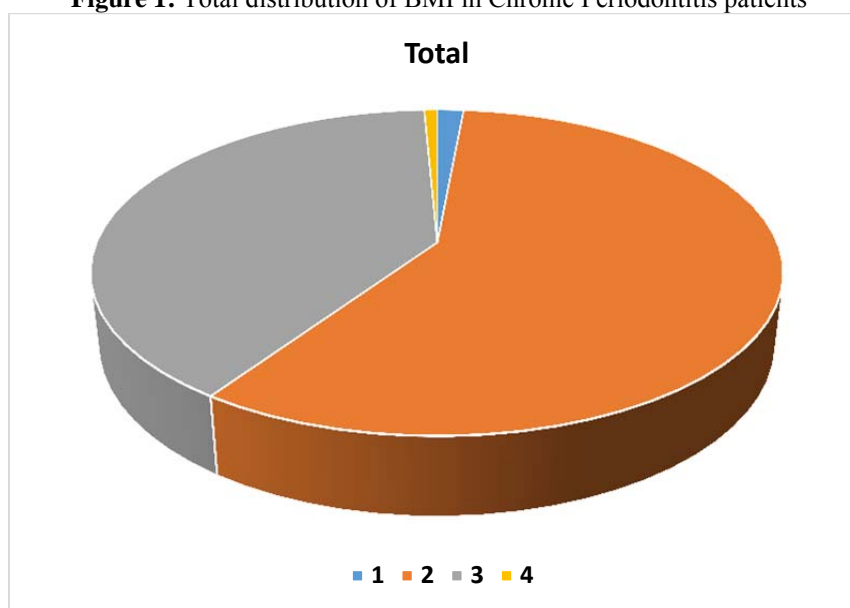
Periodontitis	Underweight (n)	Normal (n)	Overweight (n)	Obese (n)
Localized	5	148	103	2
Generalized	1	90	60	1
Total	6	238	163	3

Table 2: Distribution of BMI status of chronic periodontitis patients.

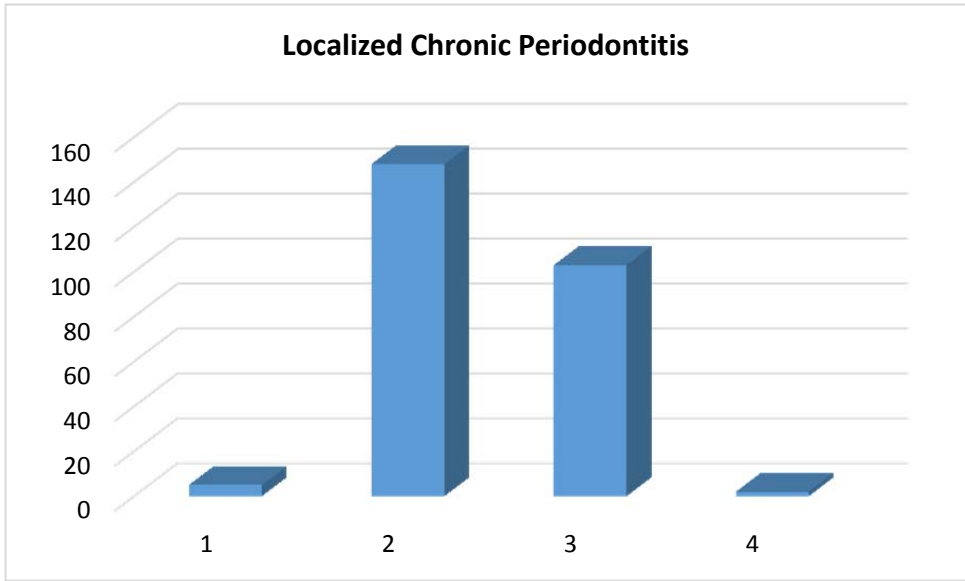
Periodontitis	Underweight (%)	Normal (%)	Overweight (%)	Obese (%)
Localized	1.9	57.3	39.9	0.7
Generalized	0.6	59.2	39.4	0.6
Total	1.4	58.0	39.7	0.7

Table 3: Frequency distribution of BMI status in chronic periodontitis patients.

Figure 1: Total distribution of BMI in Chronic Periodontitis patients



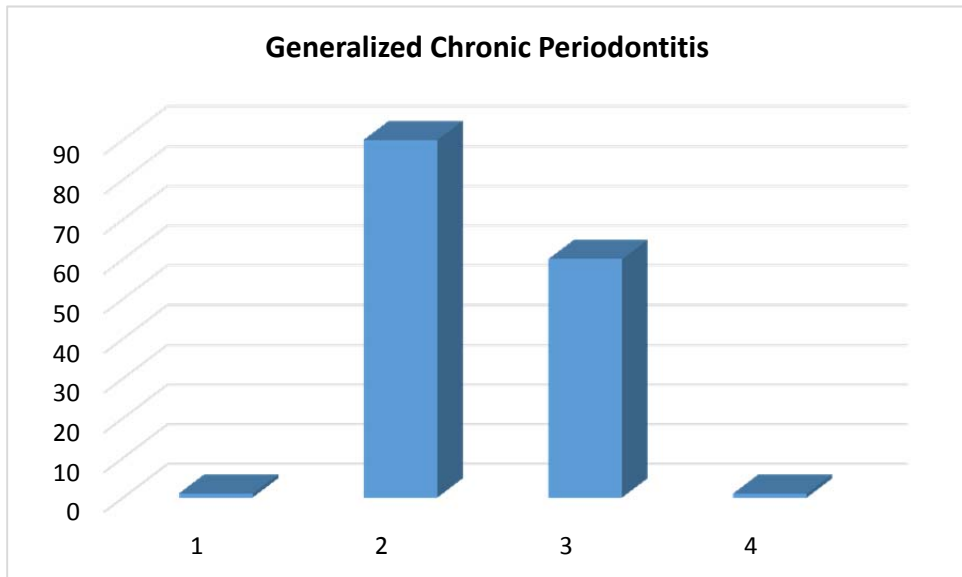
(1- Underweight, 2- Normal weight, 3- Overweight, 4- Obese)



No of Localised Chronic periodontitis patients

Under weight-5
Normal weight-148
Overweight -103
Obese -3

Figure 2: Frequency distribution of BMI status in localized chronic periodontitis patients



No of Genralized Chronic Periodontitis patients

Under weight-1
Normal weight-90
Overweight -60
Obese -1

Figure 3: Frequency distribution of BMI status in generalised chronic periodontitis patients

DISCUSSION

The bi-directional relationship between periodontitis and various systemic diseases has been long studied in the literature. Adiposity is considered is a systemic disease since it subjects the patients to various life threatening diseases like atherosclerotic cardiovascular diseases and diabetes. Hence it is of prime importance to a clinical practioner to make his patients aware of the possible threats caused by obesity. Periodontitis or chronic infectious disease of the supporting structures of the teeth is one such alarming condition that has shown a bi-directional relationship with obesity. Obesity is the second-most strong risk factor for periodontitis after smoking. [4] It has been proven that adipose tissue secretes various cytokines and hormones that are involved in the inflammatory process,

suggesting similar pathophysiological pathways of obesity and periodontitis. Adipose tissue is known to secrete pro-inflammatory cytokines such has Tumour Necrosis Factor alpha (TNF α) and interleukin 6 (IL-6) which are also the key cytokines involved in the periodontal tissue destruction.[5] Recent biomarkers like leptin have been intricated in proving the link between periodontitis and obesity. Leptin, also called as the satiety hormone is a circulating polypeptide hormone produced by adipose tissue, which regulates the energy balance by inhibiting the hunger and providing satiety. Obesity has shown to decrease the sensitivity to leptin, thereby inhibiting satiety inspite of high energy source. Surprisingly elevated levels of leptin have been seen in chronic inflammatory diseases like periodontitis and periodontal therapy has shown to

decrease the levels of leptin. [6] Also, studies with ligature induced periodontitis on rat have shown increased bone loss in obese rats as compared to normal weighed rats. [7]

The prevalence of overweight and obese persons in a population has shown a gradual increase over the years attributed to the lifestyle changes, dietary habits, stress, lack of sleep and lack of exercise. In 1998, Subramanya reported the prevalence of overweight individuals to be 9.8% in [8] which have increased to 12.7% in 2008 [9] and 24.3% in 2013 [10]. In the present study, we aimed to evaluate the distribution of chronic periodontitis patients based on their BMI according to the WHO scoring criteria by retrospectively studying the patient records. All patients were of south Indian ethnicity. Out of 410 patients with chronic periodontitis, 1.4% of the patients were underweight, 58% were of normal weight, 39.7% were over-weight and 0.7% was obese. On comparing with the prevalence of overweight individuals in a normal population, we observed that the prevalence of overweight individuals in chronic periodontitis patients was significantly high (39.7%) justifying the association between the increase in BMI and periodontitis.

The limitations of the study were that there was no control group of healthy population given and the data was compared with the previous prevalence studies given in the literature. Also, other confounding risk factors like smoking, diabetes and systemic factors that are known to have a proven impact on periodontitis were not excluded from the study. There could also be a risk of bias since the case records were filled by different clinicians.

CONCLUSION

Within the limitations of the study, our results deduce a positive association between overweight individuals and chronic periodontitis.

Further studies may be carried out to assess the BMI of the individuals with the severity of periodontitis.

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