

## OBESITY AND PERIODONTAL DISEASE

Gurpreet Kaur <sup>1</sup>, N.D.Gupta <sup>2</sup> Lata Goyal <sup>3</sup>**Abstract**

Obesity is the most common nutritional disorder and is a significant risk factor for numerous adult diseases, and may be a factor in the incidence of periodontitis. Obesity has a significant association with periodontitis in terms of BMI, waist-to-hip circumference ratio, body fat, and maximum oxygen consumption. Chronic Inflammation has multidirectional link with periodontal disease, obesity and other chronic conditions.

**Key words**

Obesity, BMI, Periodontitis

**INTRODUCTION**

Periodontal disease is no longer identified as only an oral health problem but also a public health issue as it is associated with systemic health. Many mediators have been recognized for this relationship like chronic inflammation, infection and genetic predisposition.<sup>1</sup> Apart from these mediators, nutrition has been postulated as an alternative mediator.<sup>2</sup> Obesity, the most common nutritional disorder in America<sup>3</sup>(Kopelman 2000) is a significant risk factor for numerous adult diseases, and may be a factor in the incidence of periodontitis. Obesity has a significant association with periodontitis in terms of BMI, waist-to-hip circumference ratio, body fat, and maximum oxygen consumption. The body mass index has always been considered a simple method for analysis of the nutritional status. These findings suggest that periodontitis may be aggravated by certain conditions associated with obesity for example, "the metabolic syndrome", a clustering of dyslipidemia and insulin resistances. Obesity is well-known to be a significant risk factor for various adult diseases, such as type 2 diabetes, hyperlipidemia, hypertension, cholelithiasis, arteriosclerosis, and cardiovascular and cerebrovascular disease (Kopelman et al 2000). Obesity is also known to increase mortality from these and other health disorders. Among these obesity-related diseases, the risk of cardiovascular disease has been shown to be increased by periodontitis in some epidemiological studies.<sup>6</sup>

**CLASSIFICATION**

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health leading to reduced life expectancy and health related problem.<sup>7</sup>It is defined by body mass index (BMI) and further evaluated in

terms of fat distribution via the waist-hip ratio and total cardiovascular risk factor. Obesity in children and adolescents is defined not as an absolute number, but in relation to a historical normal group, such that obesity is a BMI greater than the 95th percentile.<sup>8</sup>

BMI	Classification
< 18.5	Underweight
18.5–24.9	Normal weight
25.0–29.9	Overweight
30.0–34.9	Class I obesity
35.0–39.9	Class II obesity
>40.0	Class III obesity

Metric: BMI = kilograms / meters<sup>2</sup>

As Asian populations develop negative health consequences at a lower BMI than Caucasians, some nations have redefined obesity; the Japanese have defined obesity as any BMI greater than 25 while China uses a BMI of greater than 28.<sup>9</sup>

WHR (waist to hip ratio) is used as a measurement of obesity, which in turn is a possible indicator of other more serious health conditions. A WHR of 0.7 for women and 0.9 for men have been shown to correlate strongly with general health.

Elevated waist circumference Men ‡ 40 inches (102 cm) Women ‡ 35 inches (88 cm)

**PREVALENCE**

The prevalence of periodontal disease is 76% higher among young obese (body mass index ‡ 30 kg/m<sup>2</sup>) individuals aged 18–34 years than in normal-weight individuals<sup>10</sup> and that weight is associated with increased risk of periodontitis among those aged 17–21 years<sup>11</sup>.

**ADIPOSE TISSUE**

Adipose tissue is loose connective tissue composed of adipocytes. It is not only a passive triglyceride

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reservoir, but also produces high levels of cytokines and hormones, collectively called adipokines or adipocytokines<sup>12</sup>, which may in turn affect the periodontal tissues. Some act locally and others via systemic circulation affect various body parts. Several studies have demonstrated a close involvement of adipokines (such as leptin, adiponectin and resistin) in inflammatory processes<sup>13,1</sup>

### **Role of adipokines in inflammation**

#### **1. Hormone like proteins: Leptin and adiponectin**

Leptin that plays a key role in regulating energy intake and energy expenditure, including appetite and metabolism. It is similar in some action with insulin. Most of patients suffering from obesity have leptin resistance. Leptin can elevate blood pressure and contribute to atherosclerosis and CVD<sup>15</sup>. But leptin in relation to periodontitis related with obesity still need to be examined. Adiponectin is a protein hormone that modulates a number of metabolic processes, including glucose regulation and fatty acid catabolism.<sup>16</sup> there is inverse association between adiponectin and markers of inflammation. Low levels of adiponectin are associated with an increased risk of coronary artery disease and some other features related to metabolic syndrome.

#### **2. Cytokines (TNF and IL-6)**

Pro-inflammatory cytokines, such as tumor necrosis factor- $\alpha$  and interleukin-6, may form a multidirectional link among periodontitis, obesity and other chronic diseases. It is mainly secreted from macrophages accumulated in adipose tissue. It is a member of a group of cytokines that stimulate the acute phase reaction. It has regulatory role in periodontal disease by stimulating Bone resorption, Collagen degradation, Activation of endothelial cell (ICAM/VCAM), Enhanced IL-8 production, Expression of MCP-1. It contributes to poor health by increasing insulin resistance and inducing C reactive protein and systemic inflammation. IL-6 is produced in greater quantity by deep abdominal fat. It is associated with up regulation of acute phase protein (CRP/serum amyloid), Increase procoagulant activity of monocytes, Stimulation of LDL receptor gene in hepatocytes. Elevated levels are associated with increased risk of cardiovascular events.

#### **3. Acute phase protein C reactive peptide**

Elevated levels are associated with obesity and cardiovascular disease. It also predicts the risk of progression to type 2 diabetes mellitus. CRP levels are associated with periodontal disease and levels respond to periodontal therapy

#### **4. Proteins associated with vascular hemostasis: plasminogen activator inhibitor 1**

It is regulatory protein of coagulation cascade. It acts by inhibiting fibrinolysis and extracellular matrix degradation. It contributes to obesity related complications like diabetes and coronary thrombi

#### **5. Others**

Increased levels of angiotensinogen which is secreted from adipose tissue are seen in obesity. It has vasoconstrictive effect and contributes to hypertension. Obesity is also associated with increased levels vascular endothelial growth factor which play role in hypertension and atherogenesis.

### **Obesity and periodontitis**

A variety of potential mechanisms could explain an association between obesity and periodontitis.

1. Overweight young subjects may have unhealthy dietary patterns with insufficient micronutrients and excess sugar and fat content, and such dietary patterns may increase the risk for periodontal disease.<sup>19</sup>

2. Changes in host immunity and/or increased stress levels, which are often associated with gain of excess fat early in life, may also play a role.<sup>11</sup>

3. The underlying biological mechanisms for the association of obesity with periodontitis are not well established. However, adipose-tissue derived cytokines and hormones may play a role.<sup>13</sup>

4. Obesity may also influence periodontal disease status by increasing lipid and glucose blood levels, which may in turn have deleterious consequences for the host response by altering T cells and monocyte/macrophage/macrophage function, as well as increasing cytokine production.<sup>1</sup>

Several recent studies have suggested a relationship between periodontal disease and obesity. In Saito's study of Japanese adults, increasing body mass index and waist: hip ratio was associated with increasing risk of periodontitis. Haffajee AD et al (2009)<sup>20</sup> concluded that an overgrowth of *T. forsythia* occurs in the subgingival biofilms of periodontally healthy, overweight and obese individuals that might put them at risk for initiation and progression of periodontitis and risk was significantly higher in obese periodontally healthy/gingivitis individuals. Kongstad J et al (2009)<sup>21</sup> reported that BMI may be inversely associated with clinical AL but positively related to BOP. Lundin et al. recently noted a correlation between tumor necrosis factor- $\alpha$  in the gingival crevice fluid and body mass index.<sup>22</sup> Mohammad Taghi Chitsazi et al demonstrated correlations between obesity, waist circumference, elevated CRP levels and severity of periodontitis.<sup>23</sup> Wood N et al (2003) found the significant correlations between body composition and periodontal disease (with WHR being the most significant, followed by BMI).<sup>2</sup>

Longitudinal studies with more precise measures of adiposity will provide better insights into the relationship between periodontal disease and obesity

### **Treatment**

Weight loss therapy is recommended for patients with a body mass index of  $\geq 30$  and for patients with a body mass index of 25–29.9, or a high-risk waist circumference, and two or more risk factors.. Faster rates of weight loss are no more effective over the long term.

Behavioural therapy, serving as a useful adjunct to dietary therapy, includes self-monitoring stress management; problem-solving, contingency management, and social support. If lifestyle changes do not lead to weight loss in 6 months, pharmacotherapy should be considered. The two medications currently available for the treatment of obesity are sibutramine, and orlistat. A new drug on the horizon is rimonabant.

Weight loss surgery is recommended for well informed and motivated patients who have clinically severe obesity (body mass index  $\geq 40$ ) or a body mass index of 35 and serious comorbid conditions. Two types of operations are routinely performed: those that restrict gastric volume (banded gastroplasty) and those that, in addition to limiting food intake, also alter digestion (Roux-en-Y gastric bypass).

### **CONCLUSION**

Obesity is a complex and multifactorial disease. Its relationship with periodontal disease and other chronic disease is well documented but underlying mechanism is under investigation. Chronic Inflammation has multidirectional link with periodontal disease, obesity and other chronic conditions. A periodontist can educate his patients about related information and can help in improving oral and overall health of patient.

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