

Is There a Relationship Between Obesity and Periodontal Diseases?

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Obesity, a common metabolic disorder, is a condition for the development of chronic diseases, such as hypertension, diabetes mellitus, cardiovascular and cerebrovascular diseases. The present study evaluates the prevalence of periodontal diseases in Romania and their association with obesity, as a risk factor. This cross-sectional study included 170 subjects aged between 18-65, with healthy periodontal status, gingivitis, aggressive periodontitis and chronic periodontitis. All subjects completed the questionnaire with independent variables: age, education, socio-economic status, oral hygiene habits, smoking habit, the presence of any systemic diseases. Periodontal examination included: plaque index, gingival index, probing depth, clinical attachment level. Body mass index (BMI) and waist circumference (WC) were measured. Statistically significant correlations were found between periodontal diseases and BMI and WC: according to BMI 30.5% were obese, and 42.5% had high WC. 51.9% of obese participants had chronic periodontitis. Gingivitis and initial periodontitis do not influence BMI and WC, only the chronic periodontitis remained significantly associated with obesity. Our study suggests that there is an association between chronic periodontitis and BMI-defined obesity or WC, but further prospective studies should be carried on to establish the extent of it. The prevention and management of obesity may represent an approach to control periodontal health. Our study evaluates the prevalence of periodontal diseases in Romania and their association with obesity, as a risk factor.

Keywords: obesity, periodontal disease, body mass index, waist circumference

The prevalence of obesity worldwide has become an essential source of concern because of its impact on medical care cost, morbidity and mortality. World Health Organisation (WHO) has recognized obesity as a predisposing factor in major chronic diseases [1]. Recently, a public health issue regarding the epidemic spread of obesity caught scientists' attention as obesity has tripled since 1980, especially in some countries [2]. Obesity and SP are medically defined as abnormal or excessive accumulation of adipose tissue representing a significant risk factor for the general health. Unhealthy lifestyle habits, including improper diet, can play a major role in the development of several chronic diseases, including obesity [3], being an important cause of several comorbidities [4]. The growing incidence of obesity is closely related to the modern diet, rich in lipids and carbohydrates [5].

Lately, several studies brought data concerning the active role of adipose cells in influencing inflammation and immunity [6, 7]. As a result, obesity has been defined as a chronic disease affecting general health and influencing altered blood pressure, resistance to insulin, dyslipidemias, etc [1, 8]. Moreover, numerous other comorbidities have been investigated in connection with obesity and SP: diabetes, coronarian diseases, stroke, respiratory diseases, osteoarthritis, liver and gall diseases and cancer. Obesity induces the secretion of pro-inflammatory cytokines, and reduces the anti-inflammatory ones, maintaining a low grade chronic inflammation [5].

The periodontal disease is a chronic inflammatory condition characterized by changes in the microbial

microflora biofilms, subgingival plaque and progressive destruction mediated by a host in the tooth structure. Numerous studies evidenced a close connection between periodontal inflammation and other chronic conditions especially heart diseases, diabetes or reduced birth weight in premature infants [9].

The hypothesis that systemic disease associated with obesity and SP can negatively affect chronic infectious diseases served as a starting point for associating obesity and SP to periodontitis.

Most of the study investigating the connection between obesity and periodontitis used BMC to define [10]. However, the precision of BMC in establishing obesity degrees has been highly controversial as it thus not take into account the constitutional type or the fact that weight can be represented either by the adipose tissue or muscular mass [11, 12]. The issue can be solved by determining WC. Extensive recent studies showed that WC or WHR (waist/hip ratio) measurements could represent a better risk index as compared to BMI.

Experimental part

This cross-sectional study included 170 subjects aged between 18-65, with healthy periodontal status, gingivitis, aggressive periodontitis and chronic periodontitis. Informed consent was obtained from all subjects. All subjects completed the questionnaire with independent variables: age, education, socio-economic status, oral hygiene habits, smoking habit, presence of any systemic diseases.

The questionnaire is a descriptive instrument specifically designed to evaluate socio-demographic characteristics including age, gender, marital status, income and years of

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education. Participant's history of chronic disease including diabetes, hypertension, and dyslipidemia were collected. Smoking was defined as current smoker, past smoker, or non-smoker.

Anthropometric measurements including body mass index (BMI) and waist circumference (WC) were measured. According to WHO guidelines, obesity was defined as BMI $\geq 30\text{kg/m}^2$, and overweight was defined as BMI between 25 and 29.9 kg/m^2 (WHO 1998) (table 1).

Table 1
WHO CLASSIFICATION

BMI(kg m^{-2})	WHO classification	Popular description
<18.5	Underweight	Thin
18.5-24.9	Normal	Healthy, normal
25.0-29.9	Grade 1 overweight	Overweight
30.0-39.9	Grade 2 overweight	Obesity
≥ 40.0	Grade 3 overweight	Morbid obesity

The periodontal status was recorded on Ramfjord teeth, which include the maxillary right first molar, the maxillary left central incisor, the maxillary left first premolar, the mandibular left first molar, the mandibular right central incisor, and the mandibular right first premolar. Periodontal examination included: plaque index (PI), gingival index (GI), probing depth (PD), clinical attachment level (CAL). Periodontitis is defined as presence of four or more teeth with one site or more with PPD ≥ 4 mm and CAL ≥ 3 mm.

The Statistical Package for Social Sciences (SPSS) was used for data processing. The statistical analysis was carried out using t-test and chi-square. The level of significance was set at $p < 0.05$.

Results and discussions

The present study included 170 subjects, 86 females and 84 males. Table 2 shows socio-demographic, anthropometric and clinical characteristic. Periodontal

Variable	n(%)
Gender	
Female	86 (50.6)
Male	84 (49.4)
Age	
18-25	63 (37.1)
26-45	57 (33.5)
46-70	50 (29.4)
Education	
College	66 (38.8)
University	104 (61.2)
Smoking	
Current	33 (19.4)
Past	14 (8.2)
No	123 (72.4)
Brushing	
Regular	111 (65.3)
Irregular	45 (26.5)
No	14 (8.2)
Body Mass Index	
Normal	60 (35.5)
Overweight	58 (34.1)
Obesity	52 (30.6)
Waist circumference	
Normal	57 (33.5)
High	113 (66.5)
Diabetes mellitus	31 (18.2)
Hypertension	24 (14.1)

Table 2
SOCIO-DEMOGRAPHIC,
ANTHROPOMETRIC AND
CLINICAL
CHARACTERISTIC OF
SUBJECTS

diseases were more frequent in males than in females, and the prevalence increased with age. Subjects with poor oral hygiene habits, smokers or unsatisfactory socio-economic status showed significantly higher incidence of periodontal diseases.

The average PI, GI, PPD, CAL, average of percent of sites with CAL $\geq 3\text{mm}$, and percent of sites with CAL $\geq 4\text{mm}$ were significantly higher among subjects with high WC. Periodontitis was more prevalent among patients with high WC (42.5%) compared with those with standard WC (18.9%).

Statistically significant correlations were found between periodontal diseases and BMI and WC: according to BMI 30.5% were obese, and 42.5% had high WC. 51.9% of obese participants had chronic periodontitis. Gingivitis and initial

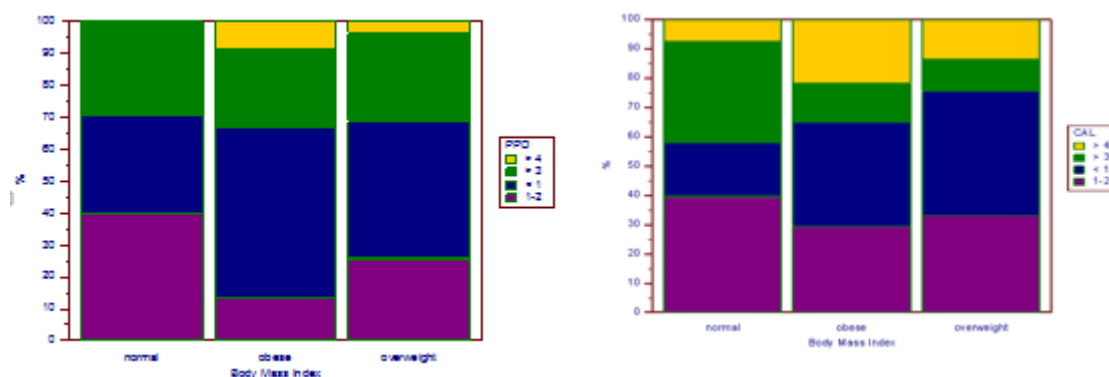


Fig. 1. Periodontal status (PPD, CAL) according with body mass index categories

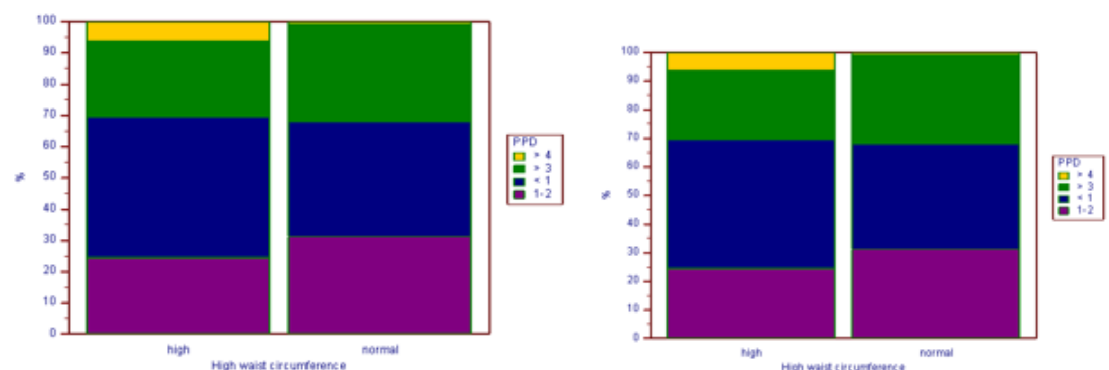


Fig. 2. Periodontal status (PPD, CAL) according with waist circumference

periodontitis do not influence BMI and WC, only the chronic periodontitis remained significantly associated with obesity.

Obesity can represent a systemic condition able to influence the onset and progression of periodontal disease. A recent study on induced periodontitis on rat model showed a close connection between obesity and periodontitis [13]. Some connection has been found recently in several studies.

Most of these studies [14, 15] evidence a relationship between the periodontal disease and metabolic disorders represented by obesity, resistance to insulin, dilipidemias and high blood pressure. In short, all these components of the metabolic disorder derive from a proinflammatory condition characterized by resistance to insulin and oxidative stress, the latter building a bidirectional relationship with periodontitis.

Other studies showed that the periodontal disease could be accelerated by destructive oxidative factors and final factors of advanced glycolysis [16]. The process is paralleled by periodontitis itself as a source of oxidative stress able to modify the level of circulant adipocytokines such as leptin, which is known to accelerate the onset of resistance to insulin and metabolic syndrome [17-20].

Even though most of the meta-analyses offer valuable information on the possible mechanisms of the relationship between obesity and periodontitis, none of them was systematic or quantitative nor did they evaluate the quality of the studies included [21]. There has been a clear tendency to evidence a series of relatively reduced number of studies targeting the specific connection between obesity and periodontitis but disregarding the rich anthropometric database obtained along numerous epidemiologic studies [17].

Another study aims at collecting data regarding the relationship between obesity and periodontal diseases and at using the individuals results in order to express a quantitative assessment of this relationship [12,16].

Our study is based on the hypothesis there is a difference in the prevalence of obesity in general adult population between groups of subjects with or without actual signs of periodontal disease.

Conclusions

Obesity is a complex and multifactorial disease.

Obesity is associated with Periodontitis

It is difficult to say whether obesity predisposes on an individual to periodontal disease or periodontal disease affects lipid metabolism or both.

Further prospective studies are needed to address the question of causality and to determine if obesity is a risk factor for periodontal disease

The prevention and management of obesity may be an adjunctive approach to improving periodontal health.

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