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Association Between Obesity & Periodontitis - A Clinical & Biochemical Study

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Abstract

Aim : To evaluate the relationship between obesity & periodontitis and role of serum lipids as potential mediators in periodontitis.

Material & Methods : 45 subjects aged >30 years were recruited from Department of Periodontology & Oral Implantology, Dasmesh Institute of Research & Dental Sciences, Faridkot. Three study groups of 15 patients each were made; Group 1: Non obese without systemic disease, Group 2: Obese without systemic disease, Group 3: Obese with systemic disease. Body mass index& waist circumference were used to assess obesity. Gingival index& Community Periodontal Index of Treatment Needs (CPITN) were recorded to assess periodontal status. Serum levels of triglycerides, high density lipoprotein (HDL), low density lipoprotein (LDL) were analysed enzymatically.

Results : The prevalence of periodontitis was significantly more in obese (p=0.000 for gingival index, p=0.007 for CPITN index) than in non obese. The mean value of all parameters was higher in obese with systemic disease than in obese but it was not statistically significant (p=0.683). There was an association of high serum triglycerides (p=0.02) &LDL (p=0.05) with periodontitis among obese subjects but no association between HDL& periodontitis was found.

Conclusion : Strong correlation exists between obesity& periodontitis. Obese with high serum triglycerides & LDL could be at higher risk of periodontitis.

Key Words
Obesity, Periodontitis, LDL, HDL

Quick Response Code

Introduction

Obesity is one of the most significant health risks of modern society, and is now recognized as a major health concern in both developed and developing countries. It is now the sixth most important risk factor contributing to diseases worldwide & increased levels of obesity may result in decline in life expectancy in future. Obesity is a multisystem condition associated with an elevated risk of cardiovascular disease, type 2 diabetes and some cancers.[1]

Recent studies documented the important role of nutritional status in periodontal disease and showed that obesity could be a potential risk factor for periodontal disease (Chapper et al. 2005, Saito et al. 2005). Through its impact on metabolic and immune parameters, obesity may increase the host's susceptibility to periodontal disease (Nishimura & Murayama 2001, Genco et al. 2005).[2]

Hyperlipidaemia is a state of abnormal lipid profile, which is characterized by elevated blood concentrations of triglycerides, elevated levels of total cholesterol and low-density lipoprotein-cholesterol (LDL), and decreased levels of high-density lipoprotein cholesterol (HDL). It has been suggested that hyperlipidaemia could be associated with periodontitis, although the role of hyperlipidaemia as a risk factor has not been established Hyperlipidaemia often coexists with obesity and hyperlipidemia has been suggested to be one possible mechanism explaining the association between obesity and periodontitis.[3]

The aim of the present study was to evaluate the relationship between obesity & periodontitis and role of serum lipids as potential mediators between body weight & periodontitis.

Materials & Methods

Subject selection

A systemic random sample of 45 patients aging 30 years & above were recruited from Department of Periodontology & Oral Implantology, Dasmesh Institute of Research & Dental Sciences, Faridkot. Three study groups of 15 patients each were made.

- Group 1: Non obese subjects without systemic disease.
- Group 2: Obese subjects without systemic disease.
- Group 3: Obese subjects with systemic disease (hypertension).

Inclusion Criteria

- Dentate persons, 30 years of age & above.
- Obese & non obese patients with/without systemic disease (hypertension).

Exclusion Criteria

- Patients who had received periodontal treatment or antibiotics for at least 3 months prior to the study.
- Chronic usage of anti-inflammatory drugs within 3 months prior to study.
- Physically & mentally challenged patients.
- Pregnant women & lactating mothers.

All the subjects were explained the need & design of study & only those who gave written informed consent were included in the study.

Collection of data

- All the subjects screened for periodontal status by a single

examiner on a dental chair & observations were recorded on a printed proforma. The first part of proforma was related to general information: age, sex, marital status, education, medical & dental history . The second part of proforma was related to all the parameters recorded (Anthropometric, clinical, & biochemical).

Anthropometric parameters

Body Mass Index (BMI) & Waist circumference (WC) was used to assess obesity. BMI was calculated by the following formula:

BMI = Weight (kg)
(Height)2 (m)2

World Health Organisation & National Heart, Lung and Blood Institute (NHUBI) defined overweight as a body mass index of 25-29.9 & obesity as a body mass index of > 30.

WC was measured (in centimeter) at the midpoint between lower border of ribs & upper border of pelvis & was divided into 2 categories using the cutoff points 102 cm for men & 88 cm for women. A measuring tape was used to record the measurements.[4]

Clinical Parameters

The periodontal examinations were performed by a single examiner in the Department of the Periodontology & Oral Implantology under normal clinical conditions with a mouth mirror and periodontal probe. Following periodontal parameters were recorded:

- **Gingival index** (GI) (Loe and Sillness ,1963): The gingiva was assessed for gingivitis and the individual score was expressed as the mean score of the examined teeth .
- **Community Periodontal Index of Treatment Needs** (CPITN) (W.H.O/ F.D.I,1982): Index teeth in each sextant were evaluated and the individual CPITN score was defined as the highest score among the examined sextants.[5]

Biochemical Parameters

Serum triglycerides were analysed enzymatically and HDL-cholesterol and LDL-cholesterol were measured by using direct methods based on immunocomplex separation followed by enzymatic cholesterol determination.[3]

Criteria For Hypertension

- Systolic Blood pressure >140 mm of Hg
- Diastolic Blood pressure >90 mm of Hg

Results:

Based on Gingival index:

The mean of gingival index in Group 1, Group 2, and Group 3 was 1.44, 1.78, and 1.86 respectively **(Figure 1)**. When intergroup comparisons were done using post hoc tests there was statistically significant difference between Group 1 & Group 2 (p =0.001), Group 2 & Group 3 (p=0.000) but there was no significant difference between Group 2 & Group 3 (p=0.683).

Based on Community Periodontal Index of Treatment Needs (CPITN)

When evaluation was done according to this index ,the means of Group 1, Group 2, Group 3 came out to be 2.33, 2.73, 3.53 respectively **(Figure 2)**.There was no statistically significant difference between Group 1 & Group 2 (p =0.227), Group 2 & Group 3 (p=0.227) but significant difference between Group 1 & Group 3 (p=0.005).

Based on Low Density Lipoprotein (LDL)

The mean values of LDL in Group 1, Group 2, and Group 3 were 96.93, 102.53, and 120.54 respectively **(Figure 3)**. There was no statistically significant difference between Group 1 & Group 2 (p=0.838), Group 2 & Group 3 (p=0.173). There was statistically significant difference between Group 1 & Group 3 (p=0.054).

Based on High Density Lipoprotein (HDL)

The mean values of HDL in Group 1, Group 2, and Group 3 were 43.75, 42.63, and 42.37 respectively **(Figure 4)**. There was no significant difference between any of the groups; p = 0.645 between Group 1 & Group 2, p=0.518 between Group 1 & Group 3 & p= 0.977 between Group 2 & Group 3.

Based on Serum Triglycerides (STG)

The mean values of STG in Group 1, Group 2, and Group 3 were 139.11, 193.05, and 212.91 respectively **(Figure 5)**. There was no significant difference between Group 1 & Group 2 (p=0.109), Group 2 & Group 3 (p=0.729). There was

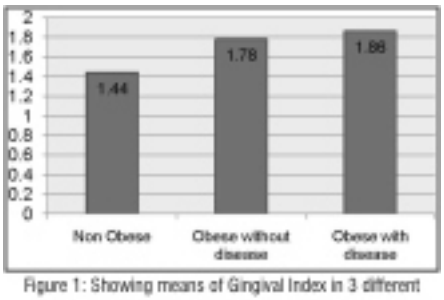

Figure 1: Showing means of Gingival Index in 3 different groups

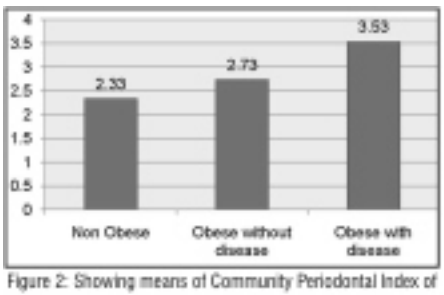

Figure 2: Showing means of Community Periodontal Index of Treatment Needs in 3 different groups

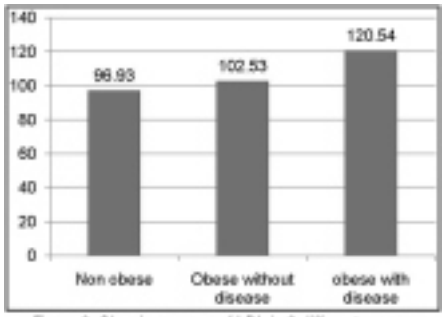

Figure 3: Showing means of LDL in 3 different groups

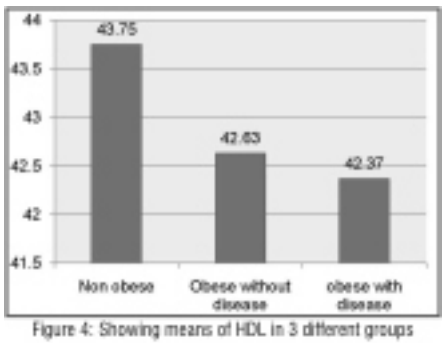

Figure 4: Showing means of HDL in 3 different groups

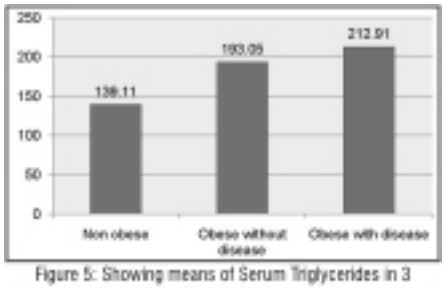

Figure 5: Showing means of Serum Triglycerides in 3 different groups

statistically significant difference between Group 1 & Group 3 (p=0.019).

Discussion:

Evidence is rapidly mounting indicating obesity as an independent or aggravating risk factor for several diseases, including coronary heart disease, osteoarthritis and type 2 diabetes mellitus. Studying the relationship between obesity and periodontal disease is, therefore, important since this association could further contribute to increased morbidity of these diseases in overweight or obese individuals.[6]

Adipose cells in obese subjects secrete more than 50 bioactive molecules known as adipokines. These adipokines include hormone like proteins (leptin, adiponectin), classical cytokines (Tumour necrosis factor α {TNF α}, Interleukin-6 {IL-6}), Plasminogen Activator Inhibitor-1, acute phase respondents(C- reactive protein), Angiotensinogen. Obesity increases the host's susceptibility by modulating the host's immune and inflammatory system, leaving the patient with greater risk of periodontitis.[2]

TNFα increases insulin resistance. Insulin resistance, in turn, contributes to a generalized hyperinflammatory state, including periodontal tissue, especially when triggered by oral pathogens. The number of monocytes is increased in blood of obese subjects, thereby acting as a source of cytokines. Plasminogen-activating system has been shown to play an important role in gingival inflammation. Plasminogen-activator inhibitor-1 (PAI-1) has an increased expression in visceral fat and induces agglutination of blood increasing the risk of ischaemic vascular disease. Thus, PAI-1 may also decrease the blood flow to the gingiva in obese people that encourage periodontitis progression (Wood et al. 2003).[2]

In this study, the prevalence of periodontal disease was higher in obese subjects when compared to non obese subjects. This result was in agreement with the studies published by Al-Zahrani et al (2003) which showed that participants with a BMI >30 kg/m2 had significantly increased risk of periodontitis.[7] Findings in a recent 3rd National Health and Nutrition Examination Survey in USA (US NHANES III) suggested that obesity is significantly associated with periodontitis.[4]

Cytokines such as interleukin-1 β (IL-1-β) and interferon β and Gram negative lipopolysaccharides that are produced in high quantities in response to periodontal infection may interfere with lipid metabolism. This may further enhance obesity and obesity-related health problems.[6]

Biological explanations for the association between hyperlipidaemia and periodontal infection have been presented. Noack et al. (2000) assessed neutrophil respiratory burst by the whole blood chemiluminescence and found significant increases in both chemiluminescence and pocket depth on a group of patients with hyperlipidaemia. They suggested that the association of hyperlipidaemia with periodontitis could be due to the dysfunction of polymorfonuclear leucocytes (PMN-cells).[3]

Katz et al[5] (2002) showed that periodontal pockets as measured by CPITN was positively associated with total cholesterol and LDL-cholesterol. The findings of the study support the reports linking increased prevalence of cardiovascular mortality among patients with periodontal disease.

There were several limitations of the study. Firstly Body Mass Index has been used to assess obesity. BMI is a determinant of overweight but does not truly reflect the body fat as it takes height into consideration which confounds the assessment of total body fat.[8] Secondly the sample size was short & other systemic diseases should also have been considered. Lastly, our results do not exclude the possibility that different combinations of lipid fractions could have some synergistic effect on periodontium.[3]

Conclusion:

Within the scope & limitations of the study a significant correlation was found between obesity and periodontitis. Obese subjects with high serum triglycerides & LDL could be at higher risk of periodontitis .Weight screening should be an integral part of periodontal risk assessment on regular basis. Periodontist should counsel obese persons regarding the possible complications of obesity. This will help to diminish morbidity of obese individuals. Further prospective studies with larger sample size are needed to determine this correlation.

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