



Research Article

Association between Body Mass Index, Serum Lipids and Periodontal Disease: A Case – Control Study

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Abstract

Introduction: Periodontal disease (PD) is a common chronic tissue –destructive inflammatory and infectious disease. Obesity and overweight are major public health problem. .The aim of this study was evaluation of relationship between BMI, TC, LDL, HDL, TG and PD in Hamadan, Iran.

Material and Methods: In this study 110 students were participated. All clinical examination was carried out by single examiner. Blood samples were obtained from the antecubital vein. Lipid profile was measured by enzymatic method using auto analyzer. Data were analyzed using Stata.11 software. Statistical comparisons were performed using student's t-test and chi-square test.

Results: The results showed that BMI was significantly lower in healthy group than PD group ($p=0.008$). Male and PD group had higher BMI than female and healthy group. In male and PD group: TG was grater and LDL, HDL, TC was lower but this difference was not statistically significant.

Conclusion: PD group had significantly greater BMI than healthy control group. One consequence of obesity might be an increased risk for PD, although PD inflammation can exacerbate the weight gain. The nature of bidirectional relationship between the BMI and oral health is complex. More additional investigations should be done about the mechanism of relationship among PD, BMI and serum lipids.

Key words:

Body mass index; Serum lipids; Periodontal disease

Introduction

Periodontal disease [PD] is a common chronic tissue –destructive inflammatory and infectious disease which initiate by dental plaque biofilm associated with gram negative anaerobic bacteria [1,2]. Its cause attachment degradation around the teeth, tooth loosening and in severe form, tooth loss [3]. PD is considered to be one of the two most important oral health problems. [4] .

Obesity is a chronic multifactorial global health problem. Its prevalence is 9-35.6% [5].WHO estimate overweight and obesity will be reach up to 1.5 billion people in 2015 [6] .

Obesity was increased significantly within a past 20 years in all age group and countries due to decreased physical activity, secondary life style, computer / TV, change in dietary consumption habits [7], fast foods , low social status and income, overweight parent and genetic[8].

Obesity has various serious and life threatening consequences such as metabolic syndrome , including insulin resistance, hypertension, and dyslipidemia , increased risk of chronic inflammatory disease such as type 2 diabetes, atherosclerosis, cancer and impaired lung function [8,9] cardiovascular disease[CVD] as well as endocrine and muculoskeletal disease[10].

Obesity cause chronic inflammation, increased proinflammatory cytokines, serum adipokine, crevicular fluid tumor necrosis factor – a, interleukin -1 and interleukine -8 and subsequentlyenhanced inflammatory response in many body organs [9,11,12]

Literature reported that oral and periodontal health can increase risk of chronic disease such as obesity and CVD. There was also link between body mass index [BMI] and periodontal pocket [13]. Poor oral health increase myocardial infarction and coronary atherosclerosis risk. [14,15,16].In several studies overweight and obesity also were associated with an increased risk for PD. [6,9,10,17,18,19]

In some investigations total cholesterol [TC] and low density lipoprotein cholesterol [LDL] levels were higher and high density lipoprotein cholesterol [HDL]levels was lower significantly in patients with severe PD [20-23]. But another study did not confirm this relationship [24]. Severe PD also was associated with impaired glycemic control and increased plasma triglycerides [TG] levels [25,26,27] .High cholesterol diet provide proliferation of junctional epithelium and increased bone resorption in rat[28]. Obese individuals usually have caloric food with saturated fat consumption with low nutritional values, which correlate with a poor oral health. Decreased blood flow in obese people affect host vascular and immune response [6].

Obesity may adversely affect PD via impaired glucose tolerance, dyslipidemia and high levels of adipose tissue secreted substance [13].

In according to the importance of this subject and contradictory results also very limited studies in Iran, this study evaluated the relationship between BMI, TC, LDL, HDL, TG and PD in Hamadan, Iran.

Material and Methods

Study population

In this case – control study, 110 people 55 healthy (27 female and 28 male) with 30-50 years age range and 55 patients with chronic periodontitis (27 female and 28 male) with same age range, were participated. Age and sex of participants' were matched as much as possible. Written informed consent was obtained from all persons. The protocol of this investigation was approved by ethic committee of Hamadan University of Medical Sciences (Hamadan- Iran).

Exclusion criteria

Systemic disease, medication, pregnant women's, smoking, alcohol and addiction

Periodontal clinical examination

All clinical examinations were carried out by single trained post graduate oral medicine student. Clinical attachment loss (CAL) of each participant evaluated by a full – mouth periodontal examination .All selected group had same age range. CAL was determined by measuring the distance from the cement – enamel junction to the bottom of the gingival crevice. In this study we selected moderate PD with 3-4 mm attachment loss and severe PD with greater than 5 mm attachment loss. PD was defined as presence of proximal or mesial to distal CAL > 4mm in two or more teeth [29].

Blood sample

Blood samples were obtained from the antecubital vein between 8:00 and 9:30 am. The blood samples were centrifuged for 10 min at 3000 rpm within 30 min of veinpuncture.

Lipid profile

TC, HDL, LDL, and TG were measured by enzymatic method using auto analyzer (Hitachi Model 902, Hitachi Ltd., Japan) [30].

The following cutoff points were used according to the laboratory's recommendation: TG >200mg/dl, TC >200mg/dl, LDL> 130mg/dl, HDL <35 mg/dl.

BMI

Anthropometric measurements including weight and height were measured with the subjects wearing light clothing and no shoes by professional nutritionist. Height was measured using measuring rod and body weight was measured using mechanical flat scale. BMI was calculated by dividing the weight in kilograms of the subjects with height of the subjects in meter square. In according to WHO guidelines, < 18.5 kg/m² was underweight, 18.5-24.9 kg/m² was normal, 25-29.9 kg/m² was overweight and > 30 kg/m² was obese (WHO 1998).

Statistical analysis

Data were analyzed with Stata.11 software. Statistical comparisons were performed using student's t-test and chi-square test. The values are expressed as mean ± SD. A p value of <0.05 was considered statistically significant.

Results:

There was statistically significant difference between BMI and PD (P=0.006) and patients with PD had high BMI than healthy control group. Table 1 shows BMI distribution in female and male and healthy and PD state in detail. As well as Table 2 shows statistically significant difference between mean BMI in female and male and specially health and PD group.

BMI group	underweight	normal	overweight	Total (number)	P-value
Male	0	21	34	55	
Female	2	33	20	55	
Total	2	54	54	110	P=0.016
Health	2	34	19	55	
Periodontitis	0	20	35	55	
Total	2	54	54	110	P=0.006

Table1: The relationship between BMI and PD with Chi-square

	Number	Mean BMI	SD	Std. Err.	
Male	55	25.49	3.19	0.43	P=0.007
Female	55	23.79	3.34	0.45	
Health	55	23.43	3.44	0.46	P=0.0001

Periodontitis	55	25.84	2.83	0.38	
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Table 2: Mean a standard deviation of BMI in according to gender and PD status.

Male and PD group had higher BMI than female and healthy group.

In male and PD group: TG was grater and LDL, HDL, TC was lower but this difference was not statistically significant. (Table 3)

variable	TG Mean ± SD	p value	Chol Mean ± SD	p value	LDL Mean ± SD	p value	HDL Mean ± SD	p value
Male	173.36 ± 40.27	p=0.34	197.68 ± 37.76	p=0.42	112.14 ± 23.82	p=0.39	50.87 ± 9.66	p=0.26
Female	166.03 ± 36.25		202.30 ± 25.35		115.77 ± 18.01		53.33 ± 12.27	
Health	164.86 ± 46.78	p=0.21	200.99 ± 23.85	p=0.69	114.02 ± 24.51	p=0.92	54.00 ± 11.97	p=0.08
periodontitis	174.52 ± 29.11		198.73 ± 24.19		113.60 ± 18.38		50.23 ± 9.73	

Table 3: Comparison of TG, TC, LDL and HDL in male and female group and healthy with PD group

Pearson correlation showed poor correlation between variables, although HDL had negative correlation with BMI and LDL. (Table 4)

	BMI	LDL	HDL	CHO	TG
BMI	1.00				
LDL	0.21	1.00			
HDL	-0.18	-0.06	1.00		
CHO	0.15	0.89	0.36	1.00	
TG	0.23	0.67	0.09	0.79	1.00

Table 4: Pearson correlation in patient with periodontal disease and variables

Discussion

WHO reported that obesity is “most bluntly, visible, yet most neglected, public health problem” in all countries [17]. Over weight also is important health problem [31] and sixth risk factor to disease which can lower life expectancy [19,32].As well as obesity is a risk factor for PD , moreover prevalence of PD is higher among obese patients [33] .

The results of this study showed that patient with PD had higher BMI and obesity could be a potential risk factor for PD. Other studies also confirm this finding [6,10,13, 31,32,34,35]Although kim et al did not confirm this relationship [36].

Various studies have found a strong association between obesity and PD[13,18,19, 33,37,38] .

Our result showed no statistically significant difference in LDL, TC, TG and HDL level between two groups.

In spite of our results previous studies demonstrated significantly higher TC and LDL levels and low HDL levels in individuals with severe PD [20-23] . PD also was associated with serum TC levels [20,21,39].One other study similar to our results did not confirm this relationship [24].

In Tomofuji et al study high-cholesterol diet cause junctional epithelium proliferation and bone resorption in rats[28] .Saturated fat with low nutritional values in obesity and bacteriemia and endotoxin in PD also related to poor oral and general health [6,40] .PD treatment decreased serum lipids levels [39].

Following reasons might induce alterations in lipid concentrations: the inflammatory local production of cytokines such as IL-1, TNF alpha, its effect on other systemic mediators [IL-6] and bacterial toxins. [41,42,22,40].

C - reactive protein level and lipoproteins were different in patients with PD compared with healthy control group [2].

Severe PD can cause impairment of glycemic control, increased plasma TG [25,26,27] higher diastolic blood pressure and increased cardiovascular risk profile in obesity [24].

Defense cells membranes composed of phospholipids which high serum lipid can influence their turnover and with decreased blood flow depress immune function[43] .

Weight loss reduce plasma levels of IL-6 and TNF a [44] Both obesity and PD cause oxidative stress [35,45] . Bullon et al showed a bidirectional relationship between metabolic syndrome,

hyperlipidemia and PD by circulating cytokines and oxidative stress [39,46].

One consequence of obesity might be an increased risk for PD, although PD inflammation can exacerbate the metabolic syndrome. [35] So the nature of relationship between the BMI and oral health is complex.

BMI shows overweight but does not truly measure adiposity. One study results showed that the correlation between BMI and body fat was high, and BMI is a fairly good and conservative method which reflect body fat [13].

Oral health care providers can diminish morbidity for these individuals by giving advice to obese and PD patients to maintain healthy weight have weight screening, aware about possible oral complications of obesity, have healthy nutrition and adequate physical activity and correlation of BMI with PD.

More additional investigations are needed to be done to understand the mechanism of relationship among PD, BMI and lipid profile in larger populations.

Conclusion

PD group had significantly greater BMI than healthy control group. One consequence of obesity might be an increased risk for PD, although PD inflammation can exacerbate the weight gain. The nature of bidirectional relationship between the BMI and oral health is complex. More additional investigations should be done about the mechanism of relationship among PD, BMI and serum lipids.

Conflict of interest statement

The authors declare that they have no conflicts of interest.

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