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The Interrelation Between Obesity and Gingivitis in Adults

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Abstract

*Currently **Background:** Fat deposition in excess is known as obesity. It is a risk factor for many systemic diseases including cardiovascular and atherosclerotic diseases. It is also a risk factor for periodontal disease. This study was undertaken to evaluate association between obesity and gingivitis. **Methods:** 50 adult subjects participated in this study. Waist circumference (WC) and Body mass index (BMI) was measured. Visceral fat (VF) was measured with Bioelectrical impedance analyzer (BIA). For gingivitis, gingival index (GI) and Plaque index (PI) was measured. Statistical analysis was done using Multinomial logistic regression and Chi-square test. **Results:** There was significant correlation between BMI and gingivitis (P<0.05), whereas no relationship was found between gingivitis, visceral fat and waist circumference (P>0.05). **Conclusion:** Only relationship was found between BMI and gingivitis. Obese subjects may have a risk of gingivitis.*

Keywords: *Bioelectrical impedance analysis, Obesity, Periodontal disease.*

1. Introduction

Chronic The prevalence of obesity is increasing rapidly in recent years. Many countries are affected with obesity. It is now considered a global burden. It is viewed as chronic disease. It involves many etiological factors like, genetic, behavioural, lack of physical activity, sedentary lifestyle, etc. It is associated with many systemic diseases, like cancer, diabetes and hypertension. It also increases potential for oral diseases, particularly periodontal disease. Periodontitis is more prevalent in patients with obesity. [(1)]

The fat accumulated in body promotes pro-inflammatory state in an individual. In oral cavity, inflammation of gingival tissue is known as gingivitis. The inflammation is common pathway for both obesity and gingivitis. Ample amount of research has been done for interrelationship between periodontal disease and obesity.

BMI is the most common criteria used for obesity study. BMI has limitations like, the weight of an individual may due to fat accumulation or muscle mass. It does not differentiate between these two. Therefore, along with BMI, waist circumference and other fat tissue estimation procedures can be added for estimation of obesity [(2)]. Subjects with high fat deposition in abdomen area may have high waist circumference. Studies evaluating this correlation are very less. So, indicator like visceral fat must be used for assessment of additional risk to health.

Relationship between obesity and periodontal disease reported in literature showed contentious results. No relationship was reported by some studies, whereas others reported association between periodontal disease and obesity [(3,4)]. Very less is known about this association in ahmedabad, india. This study was undertaken to evaluate correlation between gingivitis and obesity in adults aged 18-55 years.

2. Materials And Methods

Subjects visiting dental hospital above 18 years of age were recruited for the study (n=24 males and n=26 females). Aim was briefly explained to the subjects and those who were willing to sign the informed consent forms were included in the study. Research data has been collected by oral examination and anthropometric measurements.

The calibrated clinician collected data on a dental chair under standard condition of light using mouth mirror, explorer, university of north carolina 15 (UNC-15) probes. Gingival condition was briefly examined.

Patients who underwent periodontal treatment within 6 months, pregnant and lactating females, systemic disease like diabetes, hypertension were excluded from the study. Patients with minimum 6 teeth should be present in oral cavity to be included in the study.

Variables were collected like, age, sex, brushing habit, brushing technique, type of tooth brush and smoking habit. Gingival index and plaque index were taken for gingivitis. Visceral fat, BMI and waist circumference were taken for obesity.

Silness and Loe plaque index [(5)] was used which evaluates plaque at mesial, distal, facial and lingual surface of tooth. Loe and silness gingival index [(6)] which estimates condition of gingiva was used for every teeth present.

Omron® body fat analyzer was used to estimate visceral fat. According to WHO classification of BMI [Table 1], BMI was calculated for obesity and overweight subjects [(7)].

Table 1. BMI classification

BMI (Kg/m^2)	Class
Less than 18.5	Underweight
18.5-less than 25	Normal
25-less than 30	Overweight
Greater than or equal to 30	Obesity

Waist circumference criteria for females were >88cm and for males >102 cm [(8,9)]. Measure tape was used in midpoint between lower rib and iliac crest for measurement. Visceral fat was categorized as normal from 1-9, high from 10-14 and from 15-30 very high as per manufacturer's instruction on BIA device.

Multinomial regression analysis was used for relationship between GI and BMI. SPSS statistics software was used for data interpretation. The null hypothesis for the study was no relationship between Body mass index and gingival index. The alternate hypothesis was association between BMI and GI categories.

3. Results and Discussion

Obesity was more prevalent in patients with severe form of gingivitis [Table 2]. Amount of plaque present was consistent with clinical feature of gingivitis as more amount of plaque was associated with more severe form of gingivitis (Mean score of 1.98 and 4.22 for moderate and severe form of gingivitis respectively).

Subjects who used soft and medium bristled toothbrush had more severity in gingivitis as compared to hard bristled toothbrush users. Vertical tooth brushing habit was associated with less severe form of gingivitis. For normal and obese categories in waist circumference, almost similar results were found for moderate and severe form of gingivitis. Nearly 30% of subjects were having moderate to severe gingivitis when evaluated for high and very high visceral fat.

Table 2. Characteristics of study population

Gingivitis	**Mild gingivitis**	**Moderate gingivitis**	**Severe gingivitis**
Measure	**Mean±SD/ N, Percentage**	**Mean±SD/ N, Percentage**	**Mean±SD/ N, Percentage**
Age	29.6,10.05	31.31,10.20	32.03,12.02
Number of teeth	27.28,1.49	28.77,1.49	32.12,3.12
Plaque index	0.29, 0.42	1.98, 0.80	4.22, 1.49
Gender			
Male	6,75%	8, 66.67%	12, 40%
Female	2, 25%	4, 33.33%	18, 60%
BMI			
Normal	4, 57.16%	1, 7.69%	13, 43%
Obese	1, 14.28%	5, 38.47%	5, 17.9%
Overweight	1, 14.28%	4, 30.76%	9, 31%
Underweight	1, 14.28%	3, 23.08%	3, 8.1%

Tooth Brushing			
Once	3, 75%	11, 68.75%	26, 86.66%
Twice	1, 25%	05, 31.25%	04, 13.34%
Technique of Tooth Brushing			
Circular	1, 12.50%	1, 8.34%	4, 13.33%
Horizontal	6, 75%	8, 66.66%	24, 80%
Vertical	1, 12.50%	3, 25%	2, 6.67%
Habit of smoking			
Former smoker	1, 12.5%	1, 8.33%	1, 3.33%
Less than 20 per day	0, 0%	1, 8.33%	1, 3.33%
Never Smoked	7, 87.5%	10, 83.34%	28, 93.34%
Toothbrush			
Hard	1,16.67%	1, 7.69%	5, 16.13%
Medium	1, 16.67%	2, 15.38%	6, 19.35%
Soft	4, 66.66%	10, 76.93%	20, 64.52%
WC			
Normal	6, 85.71%	7, 53.84%	16, 53.34%
Obese	1, 14.29%	6, 46.16%	14, 46.66%
VF			
Normal	1, 3.12%	2, 15.38%	1, 20%
High	28, 87.50%	8, 61.54%	3, 60%
Very High	3, 9.38%	3, 23.08%	1, 20%

For association between BMI and gingivitis, the P value ($P<0.05$) showed statistically significant results. The results were acquired after calibrating the categories related to tooth brush and plaque scores. The odds ratio was 4.12; indicated odds were higher for overweight subjects with moderate gingivitis. The same ratio for obese category was 17.87 for severe gingivitis when compared to subjects with normal body mass index. Severity of plaque collected was associated with severity of gingivitis. After adjusting for covariates, no statistically significant association was found between visceral fat and gingivitis ($P>0.05$). Non-significant association (Chi square value 1.56) was evident between waist circumference and gingivitis.

The principal finding of the study is strong association between obesity and gingivitis. Both conditions are having common pathological features like, pro-inflammatory condition. In presence of obesity, severity of gingivitis increases. First reported study in rats showed increase in periodontal destruction in presence of obesity. Highlighted the possibility of link between obesity and periodontal inflammation [(10)]. Negative association was described by another study [(11)], while the study done by Al-zahrani et al. reported positive association between obesity and periodontal disease [(12)].

In our study, between the normal BMI, obese and overweight individuals, the latter had poor gingival status. 25 subjects with gingivitis had BMI of obese and overweight category, various studies reported similar results for periodontal disease and obesity [(13,14)]. BMI measurement is commonly proposed by WHO for obesity related studies. 44% females were having moderate and severe gingivitis along with obesity. Similar results were reported by Ana et al. [(15)].

Periodontal risk factors include smoking and obesity. The association between infection of periodontal tissues and excessive weight is having perplexed effect with smoking [(16)]. Participants who were smokers were negligible in our study. The effect of smoking was meagre on the results.

In addition to BMI, present study included WC, both are good predictor of obesity [(17)]. 21 subjects (42%) in WC category were having obesity and gingivitis (P value 0.56) revealed statistically non-significant results, reports from another study revealed contrasting results showed statistically significant association between gingivitis and WC [(18)]. The dissimilar results may be due to discrepancy in number of participants and geographic location in both studies.

Dual X-ray absoptiometry (DXA) is used for visceral fat diagnosis, but it requires costly equipment, clinical set up and skills, BIA used in present study for visceral fat revealed similar correlation as DXA [(19)]. Non-significant association was found between gingivitis and visceral fat in this study.

Various pro-inflammatory cytokine secreted by adipose tissue like, interleukin1, interleukin-6 and TNF –α. These cytokines are involved in destruction of periodontal tissues through inflammatory pathway. This may lead to periodontal diseases, includes gingivitis and periodontitis [(20)].

The common link for obesity and gingivitis is inflammation. If we can control or prevent the inflammation of gingival tissues by proper treatment and timely intervention, we may anticipate positive

impact on overall health. Interrelation between gingivitis and obesity was evident in this study, but still some limitations were there. The study was a cross-sectional one, so causality could not be established. Cohort studies may provide better insight into this relationship. Large sample size with long term follow-ups will be desired if we ought to prove interrelation between these two conditions.

4. Conclusion

Among the obesity parameters used, BMI was having association with gingivitis, whereas central obesity parameters didn't have any relationship with gingivitis. Poor oral hygiene also revealed increase in obesity and overweight in an individual which may act as a potential confounder. Plaque retention was directly related to occurrence of gingivitis. As a preventive care regimen, daily twice tooth brushing with soft bristles is good practice as suggested by the data presented in this study. Obese subject should be encouraged to undergo oral examination and treatment for potential benefits.

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Conflicts of interest

None.

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