



Assessment of Health Related Behavior Changes in Obese Patients with Chronic Periodontitis Before and After Non Surgical Periodontal Therapy

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KEYWORDS

Chronic periodontitis, Nonsurgical periodontal therapy, Obesity, Oral hygiene .

ABSTRACT:

Aim: To measure and correlate oral and overall health-related behavior changes in obese patients with chronic periodontitis after nonsurgical periodontal therapy.

Methods: A total of 200 obese patients diagnosed with chronic periodontitis were enrolled. Clinical parameters, including Oral Hygiene Index-Simplified (OHI-S), Patient Hygiene Performance (PHP) index, and Community Periodontal Index (CPI), were assessed at baseline and six months after nonsurgical periodontal therapy (NSPT). Lifestyle-related behavior was evaluated using a health practice index at the same time points.

Results: Six months following non surgical periodontal therapy the mean OHI-S, PHP, and CPI scores showed marked reductions, indicating improved oral hygiene and periodontal health ($p < 0.001$). Lifestyle behaviors also improved, with the proportion of participants categorized as poor decreasing from 36.5% to 22.5%, those with average practices increasing from 41% to 45%, and those with healthy practices increases from 22.5% to 32.5%.

Conclusion: Nonsurgical periodontal therapy in obese patients with chronic periodontitis not only improved clinical periodontal parameters but also promoted favorable lifestyle and health-related behavior changes.

1. Introduction

Obesity is recognized by World Health Organization as a predisposing factor to a variety of systemic disorders including cardiac diseases, diabetes mellitus, malignancies, and atherosclerosis. Obesity is considered as a risk factor for periodontitis. Most recent fields of research in periodontal medicine have shown association between obesity and periodontitis.¹

Chronic Periodontitis is a multifactorial disease affecting the supporting tissues of the teeth. Interaction between periodontal pathogenic bacteria and the host immune

response eventually leads to destruction of tissues through the synthesis and release of proinflammatory cytokines and mediators.¹ The adipocytokines released from visceral fat initiate same inflammatory processes and oxidative stress condition with a similar pathophysiology between both obesity and periodontitis.²

Lifestyle and social factors influence health and are linked to numerous chronic conditions, including periodontitis and obesity. A contemporary etiologic model for generalized periodontitis highlights the role of personal risk factors such as adverse lifestyle behaviors



and psychosocial stressors in disease development.³ Research by Sakki et al. and Locker et al. has shown associations between unhealthy lifestyles and increased periodontitis incidence.^{4,5} Conversely, Kusaka Y et al, Shirakawa T et al have proposed healthier lifestyles associated with enhanced immune function, including higher levels of natural killer cells, whereas unhealthy behaviors may alter immunoglobulin levels.^{6,7}

Although no single international standard exists for lifestyle assessment, several instruments are widely used. The Breslow seven-pattern model, for instance, assesses behaviours such as adequate sleep, non-smoking, moderate alcohol use, healthy weight, daily exercise, regular breakfast, and avoidance of between-meal snacking.⁸ Morimoto's criteria for the Health Practice Index (HPI) are widely used to evaluate general health behavior and consist of eight healthy habits: (1) adequate sleep of at least 8 hours per day, (2) non-smoking, (3) abstinence from alcohol, (4) working less than 7 hours per day, (5) engaging in at least 30 minutes of regular daily exercise, (6) consuming breakfast every day, (7) maintaining a balanced diet, and (8) experiencing only mild stress. In the present study, HPI was employed to assess changes in health-related behavior.⁹

Poor oral hygiene that permits accumulation of a pathogenic microbial biofilm (dental plaque) which is the principal etiologic factor in periodontal disease. Oral hygiene maintenance can be measured with oral hygiene index-Simplified (OHI-S),¹⁰ Performance hygiene index (PHI),¹¹ Loss of attachment is considered the standard measurement for assessing periodontitis. Hence Periodontitis is evaluated using the Community Periodontal Index (CPI).¹² Therefore clinical indices such as OHI-S, PHP, and CPI were employed in the present study to ensure standardized assessment and treatment of periodontitis in obesity patients.

Nonsurgical periodontal therapy (NSPT) in obese patients with periodontitis improves periodontal status, reduces systemic inflammation, and promotes healthier lifestyle behaviors. It serves as both a local treatment and a systemic health modifier, bridging oral and general health.¹³ Thus the aim of the study is to measure and correlate oral and overall health related behavior changes in obese patients with chronic periodontitis after nonsurgical periodontal therapy.

2. Materials and Methods

A present study was conducted to evaluate influence of lifestyle factors and overall lifestyle variables on oral hygiene assessment and periodontal assessment among obese patients with chronic periodontitis aged 35–44 years over a period of six months. Ethical clearance (Pr.197/IEC/SIBAR/2023) was obtained from the Institutional Ethical Committee before commencement of study, and informed consent was obtained from all participants.

Sample Size

The sample size was estimated at 90% confidence level and a 5% margin of error. The estimated sample size was 200. A pilot study on 20 individuals (10% of the calculated sample) was carried out to validate the health practice index questionnaire and check feasibility. Reliability analysis produced a Cronbach's alpha of 0.86, confirms adequate internal consistency and no adjustments were done.

Inclusion and Exclusion Criteria

The study included patients who were apparently healthy, diagnosed with chronic periodontitis, and had a minimum of 20 teeth. Eligible participants were required to have a body mass index (BMI) of ≥ 30 kg/m², calculated using the formula BMI = weight (kg)/height² (m²) in accordance with the WHO 2020 guidelines, and a waist circumference exceeding 80 cm for women or 90 cm for men.¹⁴ Exclusion criteria comprised patients with a history of any periodontal therapy within the past six months, pregnant or lactating women, patients taking medications that could influence periodontal health or cholesterol levels, and those with systemic diseases other than obesity.

Examiner Training and Calibration

A single investigator, trained and calibrated in the OHI-S, PHP, CPI recorded all periodontal measurements. Calibration was performed on 20 subjects prior to the study. Duplicate examinations conducted on successive days were analyzed using kappa statistics, which yielded a value of 0.88, indicating substantial intra-examiner reliability.



Clinical Examination

Demographic details were taken and Lifestyle behavior changes were measured using Morimoto's eight-item Health Practice Index (HPI), which evaluates smoking, alcohol consumption, sleep duration, working hours, physical activity, breakfast habits, nutritional balance, and mental stress were taken. Later OHI-S, PHP, CPI (LOA ≥ 4 mm at ≥ 1 site.) were recorded. Scaling is performed with through oral hygiene instructions given. Education, motivation, awareness about oral and overall health was given. Oral hygiene reinforcement was regularly followed for every 2 weeks up to 6 months.

3. Results

Data was analyzed by IBM SPSS Statistics for Windows, Version 21.0 (IBM Corp., Armonk, NY). Descriptive statistics were used for baseline characteristics. Cumulative Frequency percentage is used for Health Practice Index (HPI). Paired t-test used for comparison of Clinical indices. A p-value < 0.05 was considered statistically significant.

Table 1: Demographic Distribution and Lifestyle Habits of Study Participants

| Parameter | Category | Number of Participants (n) | Percentage (%) |
|-------------------------|----------------------|----------------------------|----------------|
| Age (years) | Mean = 39.5+2 | 200 | – |
| Gender | Male | 95 | 47.5 |
| | Female | 105 | 52.5 |
| Smoking (n=43) | Smoking | 36 | 83.7 |
| | Not smoking | 7 | 16.3 |
| Alcohol Drinking (n=33) | Almost every day | 7 | 21.2 |
| | Sometimes | 26 | 78.8 |
| Sleeping Hours (n=34) | ≤ 6 or ≥ 9 | 12 | 35.3 |
| | 7–8 | 22 | 64.7 |
| Working Hours (n=26) | ≥ 10 | 14 | 53.8 |

| Parameter | Category | Number of Participants (n) | Percentage (%) |
|----------------------------|--------------------------|----------------------------|----------------|
| | ≤ 9 | 12 | 46.2 |
| Physical Exercise (n=26) | Less than once a week | 14 | 53.8 |
| | More than once a week | 12 | 46.2 |
| Eating Breakfast (n=29) | Sometimes or not | 14 | 48.3 |
| | Everyday | 15 | 51.7 |
| Nutritional Balance (n=26) | Not eating balanced diet | 14 | 53.8 |
| | Eating balanced diet | 12 | 46.2 |
| Mental Stress (n=23) | Excessive | 12 | 52.2 |
| | Mild | 11 | 47.8 |

Table 1 show Demographic Distribution and Lifestyle Habits of Study Participants. The study population includes 200 participants with a average age of 39.5. 95 males (47.5%) and 105 females (52.5%). Among lifestyle habits, smoking was reported by 83.7% of participants, while only 16.3% were non-smokers. With respect to alcohol consumption, 21.2% consumed alcohol almost every day and 78.8% reported occasional intake. Regarding sleep duration, 64.7% maintained the recommended 7–8 hours of sleep per day, while 35.3% had insufficient (< 6 hours). Longer working hours (≥ 10 hours/day) were observed in 53.8% of participants, whereas 46.2% worked ≤ 9 hours per day. Physical activity levels were relatively low, with 53.8% engaging in exercise less than once a week and only 46.2% exercise more than once weekly. Dietary behaviors showed that 51.7% consumed breakfast daily, while 48.3% skipped or only occasionally ate breakfast. Nutritional patterns indicated that 53.8% did not follow a balanced diet, whereas 46.2% reported balanced dietary habits. Mental stress levels were also notable, with



52.2% experiencing excessive stress compared to 47.8% with mild stress.

Table 2: Paired t-test Comparison of Clinical Parameters Before and 6 months After Scaling

| Parameter | Before (Mean ± SD) | After (Mean ± SD) | t-statistic | p-value |
|-----------|--------------------|-------------------|-------------|---------|
| OHI-S | 4.25 ± 0.24 | 2.45 ± 0.28 | 13.500 | 0.0000 |
| PHP | 4.51 ± 0.22 | 1.91 ± 0.59 | 15.922 | 0.0000 |
| CPI | 3.60 ± 0.52 | 1.40 ± 0.52 | 8.820 | 0.0000 |

Table 2 shows Comparison of Clinical indices before and 6 months after Scaling. Six months after nonsurgical periodontal therapy, all clinical indices demonstrated highly significant improvement. The mean OHI-S score reduced from 4.25 ± 0.24 at baseline to 2.45 ± 0.28 6 months post-scaling ($t = 13.50$, $p < 0.001$), indicating a marked reduction in plaque and calculus accumulation. Similarly, the mean PHP score decreased from 4.51 ± 0.22 to 1.91 ± 0.59 ($t = 15.92$, $p < 0.001$), reflecting a substantial improvement in plaque control with a nearly 58% reduction. The CPI score with respect to LOA also declined from 3.60 ± 0.52 to 1.40 ± 0.52 ($t = 8.82$, $p < 0.001$), suggesting a clear gain in clinical attachment and gingival inflammation.

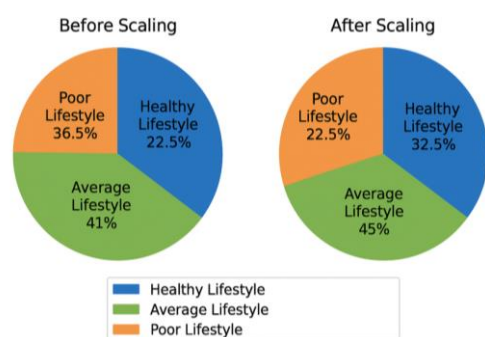


Figure 1: Cumulative Frequency Distribution of Health Practice Index (HPI) Scores 6 months after Periodontal Intervention

Figure 1 shows Cumulative Frequency Distribution of Health Practice Index (HPI) Scores before and 6 months after Periodontal Intervention. Among the 200 participants, 36.5% were categorized as having poor lifestyle practices, 41% as average, and 22.5% as

healthy. Following scaling, there was a notable improvement and the proportion of participants with poor lifestyle practices decreased to 22.5%, those with average lifestyle increased to 45%, and healthy lifestyle practices increase to 32.5%. The cumulative frequency reflects this positive shift, suggesting that nonsurgical periodontal therapy combined with oral health education effectively promoted better lifestyle habits. Overall, these findings demonstrate a clear improvement in participants' health practices, evidenced by the reduction in poor lifestyle behaviors and the corresponding increase in average and healthy lifestyle categories.

4. Discussion

Obesity is increasingly recognized as a risk factor for periodontitis through shared inflammatory pathways. Adipose tissue secretes pro-inflammatory adipokines such as leptin, resistin, and TNF- α , which exacerbate systemic inflammation and impair host immune response, thereby aggravating periodontal tissue breakdown. Our findings of lifestyle improvements post-treatment may indirectly benefit obese individuals by reducing both oral and systemic inflammatory burden and are in accordance with the results of Pischon et al., Suvan et al study.^{15, 16}

Recent evidence highlights that periodontal therapy can positively influence systemic health, particularly in individuals with obesity and metabolic syndrome. A 2023 meta-analysis reported that non-surgical periodontal therapy significantly reduced pro-inflammatory markers such as IL-6 and RBP4 in obese patients and improved adiponectin levels in non-obese individuals.¹⁷ Similarly, a long-term study spanning over two years demonstrated sustained reductions in high-sensitivity C-reactive protein and orosomucoid following periodontal treatment, reflecting lowered systemic inflammation.¹⁸ Recent systematic review further showed that periodontal therapy in patients with metabolic syndrome led to improvements in systolic blood pressure and fasting glucose, while a recent meta-analysis confirmed short-term enhancement of endothelial function after treatment.^{19, 20} Additionally, interventional studies in obese chronic periodontitis patients revealed reductions in salivary visfatin and improved lipid profiles after non-surgical therapy.^{20, 21}

Verma I et al. assessed the influence of lifestyle variables with HPI on periodontal status among adults aged 35–44



years. Their study emphasizes that chronic periodontitis management should not be limited to clinical interventions alone but must also incorporate lifestyle modifications. The findings highlight the need for vital public health initiatives targeting unhealthy lifestyle habits across the community. This goal can be effectively achieved by promoting healthier lifestyles and encouraging active patient engagement in self-care practices. The results of Verma I et al study are in align to the present study results.²²

Xu. J et al investigated the association between periodontitis and various healthy lifestyle combinations. Findings from this cross-sectional analysis indicate that smoking, alcohol consumption, body mass index (BMI), and sleep patterns are significantly associated with periodontitis, with smoking emerging as the principal risk factor among them. Further the study highlights individualized lifestyle modifications, suggesting that tailored combinations of healthy behaviors for the prevention of periodontitis. Results of Xu. J et al study is in alignment to the present study results.²³

Ruth et al observed when personalized oral health education was delivered along with behavior modification approaches like Health Action Process Approach (HAPA) and Motivational Interviewing (MI) which combining education and behavior change techniques which found measurable improvements in oral hygiene indices. The results of Ruth et al study are in accordance to the present study results.²⁴

5. Limitations

External factors, including socioeconomic status and cultural influences, could affect participants' ability or willingness to modify behaviors. Furthermore, the complex interplay between lifestyle, systemic inflammation, and periodontal disease may be influenced by unmeasured confounding factors, limiting the generalizability of the findings.

6. Conclusions

Non-surgical periodontal therapy in obese patients with chronic periodontitis not only improved clinical periodontal parameters but also promoted positive changes in health-related behaviors. The study highlights that periodontal treatment, when combined with patient education and lifestyle guidance, can contribute to improved oral hygiene practices and may help reduce

systemic inflammatory burden. in populations at higher risk due to obesity.

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