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Evaluation of Plaque Index, Gingival Index and Oral Health-Related Quality of Life in Obese Patients

Evaluación del índice de placa, índice gingival y calidad de vida relacionada con la salud bucal en pacientes obesos

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ABSTRACT: Obesity is a chronic disease that may be related to caries, periodontitis, xerostomia, and dental erosion, as well as increasing morbidity and mortality. The aim of this study was to evaluate the plaque index (Silness & Löe, 1964), the gingival index (Löe & Silness, 1963), and the oral health-related quality of life (OHRQoL) in obese patients. The study included 45 extremely obese, 45 obese, and 45 normal-weight individuals between the ages of 18 and 58. The plaque index and gingival index of the individuals were determined by clinical examination by probing. In addition, the Oral Health Impact Profile-14 (OHIP-14) questionnaire was used for the OHRQoL. The IBM SPSS Statistic 22.0 software program was used for the statistical evaluation of the study data. The plaque index and gingival index values were statistically higher in obese compared to normal weight individuals ($p<0.05$). Both plaque index and gingival index values were not statistically significant between the extremely obese and control groups ($p>0.05$). There was no statistically significant difference between the OHIP-14 total scores of the groups ($p>0.05$). Increased apparent plaque index and gingival index values in obese patients may adversely affect periodontal health.

KEYWORDS: Body mass index; Extremely obese; Gingival index; Obesity; OHRQoL; Plaque index.

RESUMEN: La obesidad es una enfermedad crónica que puede estar relacionada con caries, periodontitis, xerostomía y erosión dental, además de aumentar la morbimortalidad. El objetivo de este estudio fue evaluar el índice de placa, el índice

gingival y la calidad de vida relacionada con la salud bucal (CVSB) en pacientes obesos. El estudio incluyó a 45 individuos extremadamente obesos, 45 obesos y 45 de peso normal entre las edades de 18 y 58 años. El índice de placa y el índice gingival de los individuos se determinaron mediante examen clínico y sondaje periodontal. Además, se utilizó el cuestionario Oral Health Impact Profile-14 (OHIP-14) para la evaluación CVSB. Se utilizó el programa informático IBM SPSS Statistic 22.0 para la evaluación estadística. Los valores del índice de placa y del índice gingival fueron estadísticamente más altos en obesos en comparación con los individuos de peso normal ($p<0,05$). Tanto el índice de placa como el índice gingival no fueron estadísticamente significativos entre los grupos de control y extremadamente obesos ($p>0,05$). No hubo diferencia estadísticamente significativa entre las puntuaciones totales de OHIP-14 de los grupos ($p>0,05$). El aumento del índice de placa aparente y los valores del índice gingival en pacientes obesos pueden afectar negativamente la salud periodontal.

PALABRAS CLAVE: Índice de masa corporal; Índice de placa; Índice gingival; Obesidad.

INTRODUCTION

Obesity is a chronic disease defined by the World Health Organization (WHO) as an abnormal increase in adipose tissue to the extent that it impairs human health. Obesity is a ratio of total body weight to the fat content of more than 25% in men and more than 30% in women (1). Body mass index (BMI) is a measurement parameter accepted as a standard by the WHO that can be applied to all individuals regardless of gender and obtained by dividing an individual's body weight in kilograms (kg) by the square of height in meters (m^2) (2). According to the BMI, individuals <18.5 kg/m^2 are underweight, 18.5-24.9 kg/m^2 are normal weight, 25.0-29.9 kg/m^2 are pre-obese, 30-34.9 kg/m^2 are class 1 obese, 35.0-39.9 kg/m^2 are class 2 obese, and those >40 kg/m^2 are classified as class 3 or extremely obese (3).

Obesity is associated with many systemic diseases, such as diabetes, hypertension, cholesterol, sleep apnea, infertility, and osteoarthritis (4). Obesity is also associated with oral conditions such as caries, periodontitis, and xerostomia (5,6). In obese individuals, the incidence of dental erosion due to reflux and bruxism due to stress increases, and oral and dental health, is adversely affected (7).

Stress, smoking, alcohol consumption, and dietary habits are common determinants in the development of both, obesity and periodontal diseases (8). TNF-α is one of the pro-inflammatory cytokines secreted due to obesity (9). Observations suggest a positive association between periodontal disease and increased levels of TNF-α in serum, a critical inflammatory mediator in periodontal disease. TNF-α is a predominant factor in the development of periodontal inflammation, but it is not per se effective in the development of periodontitis. IL-8, one of the pro-inflammatory cytokines secreted due to obesity, is also observed in the gingival pocket fluid of patients with periodontitis (10). A narrative review has indicated a possible relationship between obesity and periodontal disease (11).

Plaque and gingival index values are clinical parameters used to determine periodontal health. While dental plaque is evaluated to reveal an individual's oral hygiene status on the plaque

index, gingival bleeding, which is the main sign of gingival inflammation, is evaluated in the gingival index (12).

The Oral Health Impact Profile-14 (OHIP-14) is a scale used to determine the oral health-related quality of life (OHRQoL) based on questions related to seven aspects, namely functional limitation, physical pain, psychological discomfort, physical disability, social disability, psychological disability and handicap (13).

It is important to determine the risk factors that threaten oral and dental health in obese individuals and to raise the awareness of the patients in this direction in order to increase their quality of life. In this study, we aimed to measure the plaque index (Silness & Löe, 1964) (14) and gingival index (Löe & Silness, 1963) (15) in obese patients and to investigate the effect of obesity on oral and dental health by evaluating the OHRQoL using OHIP-14 questionnaire (Slade, 1997) (16).

MATERIALS AND METHODS

Approval for the study was obtained based on the decision of the Malatya Clinical Research Ethics Committee dated 06.01.2021 and numbered 2021/07, and the study was carried out in the Inonu University Faculty of Dentistry, Department of Restorative Dentistry.

All the individuals who applied to the Inonu University Turgut Ozal Medical Center Training and Research Hospital's Department of Internal Diseases and Department of Endocrinology and Metabolism Diseases between February 2021 and July 2021, according to the inclusion/exclusion criteria were enrolled in this study. In this framework, 45 extremely obese participants (37 females and 8 males) aged between 18-56, 45 obese participants (27 females and 18 males) aged between 19-58, and 45 normal-weight individuals (22 females and 23 males) aged between 30-53 participated in the study. The inclusion criteria were that the patients were older than 18 years of age, had no systemic disease, had not used antibiotics, anti-inflammatory, or other drugs in the last three months, and had not received periodontal treatment in the last three months. The exclusion criteria were that patients were not pregnant or lactating. The individuals that participated signed an informed consent. Third molars were not included in the study.

The BMI of the patients was calculated by dividing their weight in kilograms by the square of their height in meter (kg/m^2). Individuals with a BMI of 18.5-24.9 kg/m^2 were included in the normal weight group, individuals with a BMI of 30.0-39.9 kg/m^2 were classified as obese, and individuals with a BMI >40 kg/m^2 were included in the extremely obese group.

The examiner (one person) with three years of experience performed the practices in the present study. For the calibration process, the examiner was rotated in the Inonu University Faculty of Dentistry Department of Periodontology for one month.

To determine the plaque index of the patients, their dental plaque thickness was evaluated by probing the mesial, distal, buccal, and palatal surfaces of all teeth using a Williams periodontal probe. The plaque index of an individual was determined by summing the values obtained for each tooth and calculating the averages. To determine the plaque index, Silness & Löe (14) reference values were taken as a basis:

- Plaque index 0: No plaque is in the area adjacent to the gingiva.
- Plaque index 1: There is a plaque in the form of a thin film on the gingival margin.
- Plaque index 2: There is a visible plaque in the gingival pocket and gingival margin.
- Plaque index 3: There is a dense plaque in the gingival pocket and on the gingival margin.

To determine the gingival index of the patients, gingival bleeding caused by running a Williams periodontal probe inside the pocket on the mesial, distal, buccal, and palatal surfaces of all teeth was evaluated. The gingival index of an individual was obtained by summing the values determined for each tooth and calculating the averages. To determine the gingival index, Löe & Silness (15) reference values were taken as a basis:

- Gingival index 0: Healthy gums.
- Gingival index 1: Mild discolouration and oedematous gingiva. No bleeding on probing.
- Gingival index 2: Red, oedematous and shiny gingiva. There is bleeding on probing.
- Gingival index 3: Red, oedematous and ulcerated gingiva. There is spontaneous bleeding.

The OHIP-14 questionnaire was used to measure the OHRQoL. The following scoring scale was used: 0 for never, 1 for very seldom, 2 for sometimes, 3 for often, and 4 for always. The total score on the scale was obtained by summing the scores. Since all of the questions were negative, the total score approaching 0 points was evaluated as good oral and dental health quality of life, while a score approaching 56 points was evaluated as poor oral and dental health quality of life.

STATISTICAL ANALYSIS

The IBM SPSS Statistic 22.0 software program was used for the statistical evaluation of the research data. To evaluate the study data, descriptive statistical methods (mean, standard deviation, median, frequency, ratio, minimum, and maximum), as well as the distribution of the data were evaluated using the Shapiro-Wilk test. The Mann-Whitney test was used to compare the quantitative data between the two groups that did not indicate normal distribution. The Kruskal-Wallis test was used for comparisons of three or more groups of quantitative data that did not indicate normal distribution. After significant Kruskal-Wallis test, the Bonferroni-adjusted Mann-Whitney test was employed for the multiple comparisons. The chi-squared test was used to compare the qualitative data. The Spearman correlation analysis was used to determine the relationship between the quantitative data. Significance was evaluated at the $p<0.05$ level. A post-hoc power analysis revealed that the calculated power (1-beta) was 0.878, considering type I error (alpha) of 0.05, sample size of 45, and effect size of 0.75.

RESULTS

When the gender distributions of the patient groups were examined, there was a statistically significant difference between the groups ($p=0.004$, $p<0.05$). Of the normal-weight individuals (the control group), 48.9% are female and 51.1% are male. Of the obese individuals, 60% are female, and 40% are male. Of the extremely obese individuals, 82.2% are female, and 17.8% are male. The female population of extremely obese individuals was found to be significantly higher than the female population of the obese and control groups ($p<0.05$).

Table 1 includes the quantitative data distributions of the patient groups and reveals the following. No statistically significant difference was found between the mean ages of the groups ($p>0.05$).

There was a statistically significant difference between the plaque index values of the groups ($p<0.05$). In the pairwise comparisons of the groups in terms of the plaque index, while those of the obese group were found to be significantly higher than those of both the control ($p=0.006$) and the extremely obese ($p=0.038$) groups ($p<0.05$), no significant difference was found between the extremely obese and the control groups ($p=0.614$, $p>0.05$).

There was also a statistically significant difference between the gingival index values of the groups ($p<0.05$). In the pairwise comparisons of the groups in terms of gingival index values, while those of the obese group were significantly higher than those of the control group ($p<0.001$, $p<0.05$), there was no significant difference between the extremely obese and obese ($p=0.051$), or the extremely obese and control ($p=0.071$) groups ($p>0.05$).

When the correlation analysis in Table 2 is examined, there is a statistically positive and very weak significant correlation between BMI and gingival index values ($r=0.182$, $p<0.05$). There is no statistically significant relationship between BMI and plaque index values ($p>0.05$). There is a statistically positive and highly significant correlation between plaque index values and gingival index values ($r=0.789$, $p<0.01$).

When Table 3, which includes the OHIP-14 results of the patient groups, is examined, a statistically significant difference is found between the groups being embarrassed because of problems related to their teeth, mouth, or prostheses ($p=0.001$). It was found statistically significant that the expression of 'seldom in embarrassment' was higher for the control group compared to the obese and extremely obese groups ($p=0.001$).

No statistically significant difference was observed between the groups for other problems related to their teeth, mouth, or prostheses ($p>0.05$). Table 3 presents the percentages for all data according to the groups.

When Table 4, which includes the OHIP-14 total score distribution of the patient groups, is examined, there is no statistically significant difference between the OHIP-14 questionnaire total scores of the groups ($p>0.05$).

Table 1. Quantitative data distributions of patient groups (n=45 in each group).

Variables	Control		Obese		Extremely Obese		
	Mean±Sd	Median (Min-Max)	Mean±Sd	Median (Min-Max)	Mean±Sd	Median (Min-Max)	p value
Age	38.04±5.37	-	40.49±10.29	-	36.62±10.25	-	0.120*
BMI	-	22.7 (19.03-24.80)	-	34.6 (30.47-39.19)	-	43.8 (40.23-54.69)	<0.001**
Plaque Index	-	1.0 (0-3)	-	2.0 (0-3)	-	1.0 (0-3)	0.016**
Gingival Index	-	1.0 (0-3)	-	2.0 (0-3)	-	1.0 (0-3)	<0.001**

Abbreviations: BMI, Body Mass Index.
*: One-Way Analysis of Variance (ANOVA), **: Kruskal-Wallis Analysis of Variance.

Table 2. Correlation analysis findings.

		BMI	Plaque Index	Gingival Index
Body Mass Index	r	1.000		
	p	.		
Plaque Index	r	0.027	1	
	p	0.759	.	
Gingival Index	r	0.182	0.789	1
	p	0.035*	0.0001**	.

Spearmen Correlation Test, *p<0.05, **p<0.01.

Table 3. Frequency distribution of problems related to teeth, mouth or prostheses of patient groups.

Variables	Control (n=45)	Obese (n=45)	Extremely Obese (n=45)	p value*
Trouble pronouncing words				
Never	40 (88.9%)	39 (86.7%)	41 (91.1%)	
Seldom	2 (4.4%)	3 (6.7%)	3 (6.7%)	
Sometimes	3 (6.7%)	2 (4.4%)	0 (0%)	0.663
Often	0 (0%)	0 (0%)	0 (0%)	
Always	0 (0%)	1 (2.2%)	1 (2.2%)	
Sense of taste worse				
Never	33 (73.3%)	34 (75.6%)	34 (75.6%)	
Seldom	8 (17.8%)	4 (8.9%)	3 (6.7%)	
Sometimes	3 (6.7%)	7 (15.6%)	6 (13.3%)	0.489
Often	1 (2.2%)	0 (0%)	1 (2.2%)	
Always	0 (0%)	0 (0%)	1 (2.2%)	
Painful aching in mouth				
Never	10 (22.2%)	5 (11.1%)	5 (11.1%)	
Seldom	15 (33.3%)	12 (26.7%)	7 (15.6%)	
Sometimes	17 (37.8%)	22 (48.9%)	27 (60.0%)	0.222
Often	3 (6.7%)	3 (6.7%)	3 (6.7%)	
Always	0 (0%)	3 (6.7%)	3 (6.7%)	
Uncomfortable to eat				
Never	17 (37.8%)	17 (37.8%)	21 (46.7%)	
Seldom	12 (26.7%)	8 (17.8%)	4 (8.9%)	
Sometimes	14 (31.1%)	15 (33.3%)	16 (35.6%)	0.514
Often	1 (2.2%)	1 (2.2%)	2 (4.4%)	
Always	1 (2.2%)	4 (8.9%)	2 (4.4%)	

Variables	Control (n=45)	Obese (n=45)	Extremely Obese (n=45)	p value*
Self-conscious				
Never	4 (8.9%)	4 (8.9%)	0 (0%)	
Seldom	10 (22.2%)	15 (33.3%)	19 (42.2%)	
Sometimes	16 (35.6%)	19 (42.2%)	18 (40.0%)	0.084
Often	9 (20.0%)	6 (13.3%)	7 (15.6%)	
Always	6 (13.3%)	1 (2.2%)	1 (2.2%)	
Felt tense				
Never	17 (37.8%)	27 (60.0%)	29 (64.4%)	
Seldom	10 (22.2%)	9 (20.0%)	2 (4.4%)	
Sometimes	15 (33.3%)	6 (13.3%)	12 (26.7%)	0.056
Often	1 (2.2%)	1 (2.2%)	2 (4.4%)	
Always	2 (4.4%)	2 (4.4%)	0 (0%)	
Unsatisfactory diet				
Never	34 (75.6%)	30 (66.7%)	34 (75.6%)	
Seldom	5 (11.1%)	6 (13.3%)	2 (4.4%)	
Sometimes	4 (8.9%)	9 (20.0%)	7 (15.6%)	0.412
Often	2 (4.4%)	0 (0%)	1 (2.2%)	
Always	0 (0%)	0 (0%)	1 (2.2%)	
Unsatisfactory diet				
Never	34 (75.6%)	30 (66.7%)	34 (75.6%)	
Seldom	5 (11.1%)	6 (13.3%)	2 (4.4%)	
Sometimes	4 (8.9%)	9 (20.0%)	7 (15.6%)	0.412
Often	2 (4.4%)	0 (0%)	1 (2.2%)	
Always	0 (0%)	0 (0%)	1 (2.2%)	
Had to interrupt meals				
Never	27 (60.0%)	30 (66.7%)	31 (68.9%)	
Seldom	11 (24.4%)	3 (6.7%)	5 (11.1%)	
Sometimes	7 (15.6%)	10 (22.2%)	8 (17.8%)	0.315
Often	0 (0%)	1 (2.2%)	0 (0%)	
Always	0 (0%)	1 (2.2%)	1 (2.2%)	
Difficult to relax				
Never	33 (73.3%)	33 (73.3%)	32 (71.1%)	
Seldom	5 (11.1%)	6 (13.3%)	7 (15.6%)	
Sometimes	7 (15.6%)	3 (6.7%)	6 (13.3%)	0.240
Often	0 (0%)	3 (6.7%)	0 (0%)	
Always	0 (0%)	0 (0%)	0 (0%)	
Embarrassed				
Never	18 (40%)	29 (64.4%)	25 (55.6%)	
Seldom	14 (31.1%)	2 (4.4%)	2 (4.4%)	
Sometimes	9 (20%)	4 (8.9%)	9 (20.0%)	0.001
Often	1 (2.2%)	5 (11.1%)	1 (2.2%)	
Always	3 (6.7%)	5 (11.1%)	8 (17.8%)	

Variables	Control (n=45)	Obese (n=45)	Extremely Obese (n=45)	p value*
Irritability with others				
Never	37 (82.2%)	35 (77.8%)	39 (86.7%)	
Seldom	2 (4.4%)	2 (4.4%)	2 (4.4%)	
Sometimes	5 (11.1%)	6 (13.3%)	4 (8.9%)	0.890
Often	0 (0%)	1 (2.2%)	0 (0%)	
Always	1 (2.2%)	1 (2.2%)	0 (0%)	
Difficulty doing usual jobs				
Never	35 (77.8%)	34 (75.6%)	36 (80.0%)	
Seldom	6 (13.3%)	2 (4.4%)	3 (6.7%)	
Sometimes	4 (8.9%)	8 (17.8%)	6 (13.3%)	0.451
Often	0 (0%)	1 (2.2%)	0 (0%)	
Always	0 (0%)	0 (0%)	0 (0%)	
Felt life less satisfying				
Never	36 (80%)	36 (80%)	38 (84.4%)	
Seldom	6 (13.3%)	2 (4.4%)	2 (4.4%)	
Sometimes	3 (6.7%)	5 (11.1%)	5 (11.1%)	0.246
Often	0 (0%)	2 (4.4%)	0 (0%)	
Always	0 (0%)	0 (0%)	0 (0%)	
Totally unable to function				
Never	40 (88.9%)	42 (93.3%)	41 (91.1%)	
Seldom	5 (11.1%)	1 (2.2%)	2 (4.4%)	
Sometimes	0 (0%)	1 (2.2%)	2 (4.4%)	0.294
Often	0 (0%)	1 (2.2%)	0 (0%)	
Always	0 (0%)	0 (0%)	0 (0%)	

*: Chi-squared Test.

Table 4. OHIP-14 total score distribution of patient groups.

	Control (n=45)	Obese (n=45)	Extremely Obese (n=45)	p value*
	Median (Min-Max)	Median (Min-Max)	Median (Min-Max)	
Total Score	8.0 (0-26)	7.0 (1-42)	7.0 (2-38)	0.957

*: Kruskal-Wallis Analysis of Variance.

DISCUSSION

This study revealed that plaque index and gingival index values are higher in obese patients compared to the control group of normal-weight individuals. Although there is a positive relationship between BMI and gingival index values, no significant relationship was found between BMI and plaque index values. Considering the OHIP-14 data, no significant difference was found between the groups regarding total scores.

Obesity is accepted as the most important risk factor, after smoking, for the development of periodontal inflammation (17-19). Periodontitis is associated with obesity as it affects host susceptibility by increasing the inflammatory mediators that cause periodontitis (17,20,21). Although many studies in the literature examine the relationship between obesity and periodontal health, there are limited studies in which OHRQoL is evaluated in obese individuals using the OHIP-14 questionnaire. At the same time, this is the first study in which OHRQoL is evaluated in obese individuals in the Turkish population using the OHIP-14 questionnaire.

Dhaifullah *et al*. (22) evaluated the correlation between BMI, plaque index values, and gingival index values in dentistry students aged 21 to 35 and found plaque index and gingival index values to be significantly higher in obese individuals compared to normal-weight individuals. Our study found a positive correlation between BMI and gingival index values, but no significant correlation was found between BMI and plaque index values.

Dursun *et al*. (23) found gingival index values to be higher in obese patients compared to the control group, as in our study, but they did not find any difference in the plaque index values between the groups, unlike our study. Duran *et al*. (24), in their study on 23 morbidly obese, 19 obese, and 12 normal weight individuals aged 24 to 67 years, found the gingival index values to be similar for all three groups, but they found the plaque index values to be higher in the morbidly obese individuals, compared to the obese and normal weight individuals. In our study, although the plaque index and gingival index values were higher in obese patients than in the control group, no significant difference was found between the extremely obese and the control group.

Some studies in the literature have stated that the incidence of periodontal disease in men is higher than in women due to the better oral hygiene habits of women (25,26). The fact that the female population was higher in our study may be one of the reasons why there was no significant difference between the control group and the extremely obese group in terms of plaque index and gingival index evaluations.

Studies in the literature found a correlation between obesity and periodontal diseases. Gulati *et al*. (27) reported a relationship between obesity and chronic periodontitis in their study. Khan *et al*. (28) also found higher plaque index values and a higher prevalence of chronic periodontitis in the obese Malaysian population.

Periodontal tissue health has been reported to improve with approximately 10% weight loss in obese patients (29). Vivekananda & Faizuddin (30), in their study conducted on 20 periodontally healthy obese individuals, 20 obese individuals with gingivitis, and 20 obese individuals with periodontitis, found that a 10% weight loss in all three groups decreased the severity of periodontal disease due to an increase in serum adiponectin levels and decreased serum TNF-α levels.

Jaiswal *et al*. (31), in their study on 224 class 3 and class 4 obese individuals, evaluated plaque index and gingival index values before and six months after bariatric surgery. Although the patients did not receive any periodontal treatment between these two periods, a significant decrease

was found in their plaque index and gingival index values, together with weight loss achieved by surgery and diet therapy. Treatment, motivation, and follow-up of patients at the point of lowering BMI in obese patients are important for preventing and reducing periodontal diseases.

Oral health-related quality of life is a field of study used in oral health research, clinical research, and the examination of the outcome of clinical procedures, revealing patients' interest in oral health (32,33). Although many different scales have been developed to evaluate OHRQoL, the OHIP-14 is the most widely used of these (34,35). Therefore, the OHIP-14 scale was used to evaluate OHRQoL in our study.

Various studies have examined the effect of obesity on OHRQoL. Karaman & Sadry (36) examined the relationship between temporomandibular disorder and BMI in 1,528 obese, overweight, and healthy individuals and found total OHIP-14 scores to be significantly higher in obese individuals; they stated that this indicates lower OHRQoL in obese individuals. Makhija *et al*. (37) investigated the correlation between BMI and OHRQoL in elderly individuals using a 54-item questionnaire; they emphasized that the obese and underweight groups had poor OHRQoL. Contrary to these studies, our study found no statistically significant difference between OHIP-14 total score distribution among the overweight, obese, and normal weight groups. In line with these data, it can be argued that obesity does not adversely affect OHRQoL.

A study by Almoznino *et al*. (38), which examined the effect of periodontitis on OHRQoL, found a positive correlation between periodontitis and BMI; the researchers stated that OHRQoL was negatively affected because the OHIP-14 scores of periodontitis patients were higher than those of the control group. In our study, a positive correlation was observed between BMI and gingival index values for the obese and control groups, considering the OHIP-14 data; we cannot say that OHRQoL is negatively affected.

De Carvalho Sales-Peres *et al*. (39) found that the plaque index, pocket depth, and bleeding index on probing were higher in obese patients than in obese women with a BMI ≥40 kg/m² and normal weight premenopausal women with a BMI of 18.5-24.9 kg/m². In terms of the OHIP-14 scores, they did not find any difference between the groups, except for functional limitation, which was higher in obese patients. In our study, there was no significant difference between the groups regarding their OHIP-14 scores, except for embarrassment.

The limitations of this study include the limited samples, the higher female-male ratio in the extremely obese group compared to the other groups, and the fact that variables such as cigarette smoking, alcohol, and education level, which play a role in the evaluation of plaque index and gingival index values, were excluded from the evaluation.

The strongest contribution our study makes is that it will shed light on other studies conducted in this field, as it is the first study to evaluate the effect of obesity in the Turkish population using the OHIP-14 questionnaire. Our study found a positive correlation between BMI and gingival index values, but no significant correlation was found between BMI and plaque index values. However, both plaque and gingival index values were higher in obese patients than in the control group. According to the OHIP-14 data, there was no significant difference between the groups, so an increase in BMI does not negatively affect OHRQoL.

CONCLUSION

In conclusion, our study suggests that obesity seems to negatively affects periodontal health by causing an increase in plaque index and gingival index values. However, based on evaluation using the OHIP-14, no negative effect of obesity

on OHRQoL was observed. Further studies on the effect of obesity on OHRQoL are important to reveal the effects of obesity on oral and dental health.

AUTHOR CONTRIBUTION STATEMENT

Conceptualisation: G.A. and B.D.
Methodology: G.A. and B.D.
Coordination: G.A.
Data collection and analysis: G.A.
Interpretation of results: G.A. and B.D.
Original draft preparation: G.A. and B.D.
Revision: B.D.
Reading and approval of the final manuscript: G.A. and B.D.

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