RESEARCH ARTICLE

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Investigation of DMFT Index and Saliva Values in Morbidly Obese and Obese Patients

ABSTRACT

Objective: Obesity is a global chronic disease that affects both developed and developing countries. The purpose of this study was to examine the effect of morbid obesity and obesity on the decayed, missing, and filled teeth (DMFT) index and saliva values.

Method: This study included 50 morbidly obese, 50 obese, and 50 control group patients aged 18–68 years. The DMFT index of the patients was determined through a clinical examination. The saliva kit was used to determine the saliva values [unstimulated saliva flow rate (USFR), stimulated saliva flow rate (SSFR), saliva viscosity (SV), saliva pH (SpH), and saliva buffering capacity (SBC)]. The patients were surveyed to learn about their oral health habits, nutritional habits, and socioeconomic status.

Results: No significant difference was found in the number of decayed teeth, filled teeth, USFR, or SV between the groups ($p > 0.05$). The DMFT index, number of missing teeth, SSFR, SpH, and SBC all showed significant differences between the groups ($p < 0.05$). The significant variables associated with DMFT, according to the multiple linear regression model, were the frequency of dental visits ($\beta = 0.365$), age ($\beta = 0.322$), and SSFR ($\beta = -0.256$).

Conclusion: Obese patients have a low saliva rate, low saliva pH, low buffering capacity, high DMFT index, and a high number of missing teeth.

Keywords: DMFT, Obesity, Salivary, Tooth Decay.

Morbid Obez ve Obez Hastalarda DMFT İndeksi ve Tükürük Değerlerinin İncelenmesi

ÖZET

Amaç: Obezite gelişmiş ve gelişmekte olan ülkeleri etkileyen küresel ve kronik bir hastalıktır. Bu çalışmanın hedefi morbid obezite ve obezitenin çürük, kayıp ve dolgulu dişler (DMFT) indeksi ve tükürük değerleri üzerindeki etkilerini araştırmaktır.

Gereç ve Yöntem: Çalışmaya 18-68 yaş arası 50 morbid obez, 50 obez ve 50 normal kilolu hasta dahil edildi. Hastaların DMFT indeksi klinik muayene ile belirlendi. Tükürük değerleri ise [uyarılmamış tükürük akış hızı(USFR), uyarılmış tükürük akış hızı(SSFR), tükürük viskozitesi(SV), tükürük pH'ı(SpH) ve tükürük tamponlama kapasitesi(SBC)] tükürük kiti yardımıyla belirlendi. Hastalar ağız bakım alışkanlıkları, beslenme alışkanlıkları ve sosyoekonomik durumlarını belirlemek amacıyla ankete tabi tutuldu.

Bulgular: Gruplar arasında çürük diş sayısı, dolgulu diş sayısı, USFR ve SV açısından anlamlı fark görülmedi ($p>0.05$). DMFT indeksi, kayıp diş sayısı, SSFR, SpH ve SBC açısından gruplar arasında anlamlı fark bulundu ($p<0.05$). Çoklu lineer regresyon modeline göre diş hekimine gitme sıklığı (Beta=0,365), yaş (Beta=0,322) ve uyarılmış tükürük akış hızı (Beta=-0,256) DMFT ile ilişkili anlamlı değişkenlerdi.

Sonuç: Obez hastalar düşük tükürük akışı, düşük tükürük pH'ı, düşük tamponlama kapasitesi, yüksek DMFT indeksi ve yüksek kayıp diş sayısına sahiptir.

Anahtar Kelimeler: Diş Çürüğü, DMFT, Obezite, Tükürük.

INTRODUCTION

Obesity is a disease characterized by an increase in body fat mass in comparison with lean body mass when the energy consumed exceeds the energy consumed with food (1). Obesity is one of the most serious health problems faced by both developed and developing countries and is considered one of the 10 riskiest diseases by the World Health Organization (WHO) (2).

The most preferred criterion in obesity classification is body mass index (BMI). BMI is calculated by taking one's weight in kilograms and dividing it by one's height in meters squared (3, 4). Individuals are classified as overweight, obese, and morbidly obese according to their BMI (5). Although obesity can be caused by a number of different factors, it is believed that an increase in calorie consumption and physical inactivity contributes to the development of obesity. Nevertheless, many genetic, environmental, neurological, psychological, and sociocultural factors cause obesity (6).

Obesity is associated with many diseases, such as cardiovascular diseases, hypertension, diabetes, cancer, and metabolic syndrome, as well as social, economic, and psychological problems (7, 8). Obesity negatively affects oral and dental health by causing problems such as dental caries, periodontal problems, tooth erosion, tooth loss, and dry mouth (8).

Carbohydrate-rich eating habits, genetic predisposition, socioeconomic level, lack of oral hygiene, saliva amount, and changes in saliva characteristics are common predisposing factors in the occurrence of obesity and tooth decay (9). Tooth loss may increase with the effects of caries and periodontitis, which increase with obesity (10). Due to dry mouth in obese individuals, the role of saliva in protecting oral and dental health may be negatively affected (11).

The decayed, missing, and filled teeth (DMFT) index, which is defined as the sum of decayed, missing, and filled teeth, is one of the most commonly used index systems in the evaluation of dental caries (12). The use of the DMFT index is recommended by the WHO for the measurement and comparison of dental caries in a community (13). The limitations of the DMFT index are that initial enamel lesions are not included in the classification and that the calculation of the DMFT index differs between individuals and between evaluations of the same person at various times (14).

The relationship between morbid obesity and the DMFT index, unstimulated saliva flow rate (USFR), saliva pH (SpH), saliva buffering capacity (SBC), and saliva viscosity (SV) has been recognized in the literature, but more research is needed. The purpose of this study is to investigate the effects of morbid obesity and obesity on the risk of caries in morbidly obese, obese, and normal-weight patients by measuring the DMFT index, USFR, stimulated saliva flow rate (SSFR), SBC, SpH, and SV. The null hypothesis of this study is that morbid obesity and obesity do not negatively affect the DMFT index and saliva values.

MATERIAL AND METHODS

This study was conducted in the Department of Internal Diseases and the Department of Endocrinology and Metabolism Diseases of Inonu University Turgut Ozal Medical Center Training and Research Hospital between September 2019 and February 2020. The study was approved by the Malatya Clinical Research Ethics Committee on April 24, 2019, with decision number 2019/85.

The calculated power (1- β) was 0.826, considering a type I error (alpha) of 0.05, a sample size of 50 in each group (150 in total), and an effect size of 0.67 for the DMFT index. The study included 50 morbidly obese (41 females and 9 males, aged 18–68 years), 50 obese (41 females and 9 males, aged 19–68 years), and 50 normal-weight (26 females and 24 males, aged 25–53 years) patients. Necessary information was given to these patients in both written and verbal forms. With their permission, signed informed consent forms were obtained, and the study commenced.

Calculation of BMI: The weight and height of the patients who participated in the study were measured with a weight/height scale, and their BMI was calculated by taking their weight in kilograms and dividing it by their height in meters squared. Among the individuals whose BMI was calculated, individuals with a BMI value in the range of 18.5–24.9 were classified as normal weight, those in the range of 30–39.9 as obese, and those with a BMI > 40 as morbidly obese (15).

Calculation of the DMFT Index: The DMFT index of the patients was calculated using the criteria published by the WHO in 1997 (16). Clinical examinations were undertaken by a single dentist under a light source with the help of a mirror and a probe. The DMFT indexes of the individuals obtained through clinical examination were recorded in the patient information form.

Determination of Saliva Values: A ready-made GC Saliva Check Buffer kit was used to evaluate the saliva parameters. The patients were informed that they should not smoke, consume food and drinks, brush their teeth, or use mouthwash within 1 h before the procedure. Saliva collection was performed between 9:00 AM and 11:00 AM.

Determination of the USFR: The patients were asked to swallow all of their saliva to determine the USFR. The saliva accumulated for 5 min was collected in a millimeter graduated measuring cup. The amount of unstimulated saliva was measured according to the milliliter (ml) mark on the container, and the flow rate of unstimulated saliva was calculated in milliliter/minute (ml/min) by dividing the value found by 5.

Determination of SpH and SV: The pH band was maintained for 10 s in the container where a patient's unstimulated saliva flow was collected. The pH measurement was made by comparing the color received by the pH band with the scale included in the package. SV was determined by visually evaluating a patient's unstimulated saliva density.

Determination of SSFR: In determining SSFR, paraffin tablets were chewed by the patients to stimulate salivary secretions. After chewing the paraffin tablet for 30 s, each patient was told to spit into the millimeter-grade saliva collection container. The chewing of a paraffin tablet was continued by repeating the spitting process every 15–20 s for 5 min. The quantity of stimulated saliva shown at the millimeter marking on the cup was measured and calculated in ml/min.

Determination of the SBC: Some saliva was extracted from the container containing the patient's stimulated saliva using a pipette, and a drop was deposited on the triple pad on the saliva tamponade test band. The tape was brought upright to spread the saliva onto the absorbent surface. When the band started to change color within 2 min, points were given using a scale according to the color of each pad. The SBC was determined by calculating the total score.

Evaluation of the Survey Findings: The patients completed the survey shown in Table 4 to determine the information to be used in evaluating their education level, socioeconomic status, oral health habits, and nutritional habits. The questionnaires were completed under the dentist's supervision.

Statistical Evaluation: The research data were statistically analyzed using IBM SPSS for Windows, version 22.0. Data related to the quantitative variables were defined as the arithmetic mean (AO) ± standard deviation and median (minimum–maximum). The definition of the data related to the qualitative variables is indicated by a number (n) and percentage (%). To examine the quantitative data, the Shapiro–Wilk normality test was used. One-way analysis of variance (ANOVA) or the Kruskal–Wallis ANOVA was used to compare more than two groups based on the test results (group number > 2). To compare the groups pairwise, the least significant difference method or the Mann–Whitney U test with Bonferroni correction was used. In the analysis of the qualitative variables, Pearson's chi-square test was used. For the Mann–Whitney U test with Bonferroni correction, general analyses with $p < 0.017$ and $p < 0.05$ were considered statistically significant. Age, gender, BMI, SSFR, USFR, SpH, SBC, educational level, frequency of going to the dentist, oral hygiene equipment, socioeconomic status, dessert consumption, and acidic drink consumption, which could be related to the relationship between the DMFT score and the factors, were modeled using multiple linear regression analysis. The stepwise technique was applied in the variable selection process. In testing the significance of the relevant model and its coefficients, p values < 0.05 were considered significant.

RESULTS

The mean ages of the patients in the morbidly obese, obese, and control groups differed significantly statistically ($p = 0.029$, $p<0.05$). A significant difference was found between the obese and control groups when the groups' ages were compared ($p = 0.008$) but not between the morbidly obese and control groups ($p = 0.298$) or between the morbidly obese and obese groups ($p = 0.106$).

Table 1 shows the anthropometric data and the DMFT index distribution of the groups. A statistically significant difference was found between the groups' average weight, height, and BMI ($p < 0.05$). A significant difference was observed between the morbidly obese and obese groups ($p < 0.001$), between the morbidly obese and control groups ($p < 0.001$), and between the obese and control groups ($p < 0.001$) when the groups' weight and BMI were compared. A significant difference was found in height between the morbidly obese and control groups ($p = 0.006$) but not between the obese and control groups ($p = 0.020$) or between the morbidly obese and obese groups ($p = 0.793$). The control group's average BMI and weight were lower than those of the morbidly obese and obese groups. The control group's average height was higher than that of the morbidly obese group.

Table 1. Anthropometric data and DMFT index distribution of the groups (n=50 in each group)

Variables	Control	Obese	Morbidly Obese	p value*
	Median (Min-Max)	Median (Min-Max)	Median (Min-Max)	
Weight	65 (48-82)	92 (71-123)	120.5 (85-170)	**<0.001**
Height	1.68 (1.55-1.82)	1.64 (1.40-1.85)	1.62 (1.44-1.90)	**0.013**
BMI	22.7 (19.03-24.80)	34.8 (30.47-39.19)	44.3 (40.23-54.69)	**<0.001**
D	1.0 (0 – 4)	1.0 (0 – 8)	1.5 (0 – 8)	0.057
M	1.0 (0 – 4)	3.0 (0 – 23)	2.0 (0 – 20)	**0.002**
F	4.0 (0 – 15)	2.0 (0 – 16)	1.0 (0 – 15)	0.375
DMFT	6.0 (0 – 20)	10.0 (0 – 24)	9.0 (0 – 25)	**0.020**

Abbreviations: D, decayed tooth; M, missing tooth; F, filling tooth; DMFT, decayed, missing and filled teeth.
*: Kruskal-Wallis Analysis of Variance

No statistically significant difference was found between the groups in terms of D (decayed tooth) and F (filled tooth) values ($p > 0.05$). A statistically significant difference was found in the M (missing tooth) and DMFT index values between the groups ($p < 0.05$). A significant difference was observed between the obese and control groups when the M values of the groups were examined ($p < 0.001$) but not between the morbidly obese and control groups ($p = 0.032$) or between the morbidly obese and obese groups ($p = 0.232$). A significant difference was found between the obese and control groups when the groups were compared using the DMFT index ($p = 0.006$) but not between the morbidly obese and control groups ($p = 0.078$) or between the morbidly obese and obese groups ($p = 0.351$). When compared with the control group, obese patients had a higher number of missing teeth and a higher DMFT index.

Table 1: Anthropometric data and DMFT index distribution of the groups (n = 50 in each group)

When the endocrinological findings of the groups were compared, a statistically significant difference was found in diabetes diagnosis between the obese and morbidly obese groups ($p < 0.001$). Diabetes was observed in 60% of the obese patients, while no diabetes was observed in 40%. Diabetes was detected in 22% of the morbidly obese patients, while no diabetes was detected in 78%.

Table 2 shows the distribution of the groups' saliva values. A statistically noticeable difference was found between the groups according to the SSFR, SBC, and SpH averages ($p < 0.05$). When the groups were compared according to the SSFR, there was a noticeable difference between the morbidly obese and control groups ($p < 0.001$) and between the obese and control groups ($p < 0.001$) but not between the morbidly obese and obese groups ($p = 0.753$). When the groups were compared according to the SBC, a noticeable difference was found between the morbidly obese and control groups ($p = 0.001$) and the obese and control groups ($p = 0.002$) but not between the morbidly obese and obese groups ($p = 0.883$). The control group had a higher SSFR and SBC than the morbidly obese and obese groups. When the groups were compared according to pH distribution, there was a noticeable difference between the obese and control groups ($p = 0.014$) but not between the morbidly obese and control groups ($p = 0.115$) or between the morbidly obese and obese groups ($p = 0.373$). Obese patients had lower SpH than the control group.

Table 2. Saliva values distribution of the groups (n=50 in each group)

Variables	Control	Obese	Morbidly Obese	p value*
	Median (Min-Max)	Median (Min-Max)	Median (Min-Max)	
Stimulated Saliva Flow Rate	2.1 (0.4-3.4)	1.2 (0.2-3.0)	1.4 (0.4-3.4)	**<0.001**
Unstimulated Saliva Flow Rate	0.6 (0.20-1.60)	0.4 (0.10-1.04)	0.5 (0.20-1.80)	0.186
Saliva pH	6.8 (6.0-7.4)	6.6 (6.0-7.4)	6.8 (5.8-7.2)	**0.045**
Buffering Capacity	10.0 (3-12)	9.0 (2-12)	8.0 (3-12)	**0.001**

*: Kruskal-Wallis Analysis of Variance

No statistically noticeable difference was found in the groups' mean USFR or SV ($p > 0.05$). The control group had an SV of 8% red (high viscosity), 76% yellow (increased viscosity), and 16% green (normal viscosity); the obese group had 20% red, 56% yellow, and 24% green; and the morbidly obese group had 20% red, 50% yellow, and 30% green.

Table 3 presents the distribution of the groups' survey data. A statistically noticeable difference was found between the morbidly obese, obese, and control groups in terms of gender, educational status, oral hygiene equipment, tooth brushing frequency, frequency of dental floss use, socioeconomic status, sweets consumption, and acidic beverage consumption ($p < 0.05$). No statistically significant difference was observed in their visits to the dentist, the last time they went to the dentist, the reasons for going to the dentist, and their smoking ($p > 0.05$).

Table 4 shows the three significant variables based on the multiple linear regression model results. The variables that contributed the most to the model based on the standardized β coefficient were frequency of going to the dentist ($\beta = 0.365$), age ($\beta = 0.322$), and SSFR ($\beta = -0.256$).

Table 3. Distribution of the groups' survey data (n=50 in each group)

Variables	Control	Obese	Morbidly Obese	p value*
Gender				
Female	26 (52%)	32 (64%)	41 (82%)	**0.006**
Male	24 (48%)	18 (36%)	9 (18%)	
Education level				
Illiterate	0 (0%)	1 (2%)	4 (8%)	
Primary education	2 (4%)	18 (36%)	16 (32%)	
Secondary education	3 (6%)	9 (18%)	6 (12%)	**<0.001**
High school	9 (18%)	15 (30%)	11 (22%)	
University	36 (72%)	7 (14%)	13 (26%)	
Frequency of going to the dentist				
Never go	3 (6%)	3 (6%)	4 (8%)	
Once	1 (2%)	2 (4%)	2 (4%)	0.734
Twice	7 (14%)	2 (4%)	4 (8%)	
Three and more	39 (78%)	43 (86%)	40 (80%)	
When did you last go to the dentist				
Never been	3 (6%)	3 (6%)	4 (8%)	
Less than 3 months ago	15 (30%)	11 (22%)	12 (24%)	
4-6 months ago	8 (16%)	7 (14%)	5 (10%)	
7-12 months ago	12 (24%)	12 (24%)	10 (20%)	0.774
2-4 years ago	8 (16%)	15 (30%)	12 (24%)	
5-7 years ago	3 (6%)	0 (0%)	3 (6%)	
8-10 years ago	1 (2%)	2 (4%)	3 (6%)	
More than 11 years	0 (0%)	0 (0%)	1 (2%)	
Reason for attendance at the dentist				
Never been	3 (6%)	3 (6%)	4 (8%)	
Pain	8 (16%)	9 (18%)	6 (12%)	
Decay	11 (22%)	10 (20%)	11 (22%)	
Extraction	8 (16%)	17 (34%)	12 (24%)	0.139
Periodontal Treatment	11 (22%)	3 (6%)	4 (8%)	
Control	7 (14%)	2 (4%)	4 (8%)	
Other	2 (4%)	6 (12%)	9 (18%)	
Oral hygiene equipment				
None	0 (0%)	1 (2%)	3(6%)	
Toothbrush (TB)	26 (52%)	37 (74%)	32 (64%)	
Floss (F)	0 (0%)	0 (0%)	0 (0%)	
Mouthwash (MW)	0 (0%)	1 (2%)	0 (0%)	**0.002**
TB and F	16 (32%)	3 (6%)	6 (12%)	
TB and MW	5 (10%)	7 (14%)	9 (18%)	
TB, F and MW	3 (6%)	1 (2%)	0 (0%)	
Brushing frequency				
Twice a day or (+)	24 (48%)	9 (18%)	11 (22%)	
Once a day	21 (42%)	18 (36%)	17 (34%)	**0.001**
Rarely	5 (10%)	17 (34%)	18 (36%)	
Never	0 (0%)	6 (12%)	4 (8%)	
Flossing frequency				
Twice a day or (+)	2 (4%)	0 (0%)	0 (0%)	
Once a day	9 (18%)	0 (0%)	1 (2%)	**<0.001**
Rarely	8 (16%)	3 (6%)	5 (10%)	
Never	31 (62%)	47 (94%)	44 (88%)	
Smoking				
Non-smoker	28 (56%)	37 (74%)	31 (62%)	
Light smoker (1-5**)**	7 (14%)	0 (0%)	6 (12%)	0.108
Medium smoker (5-10)	6 (12%)	2 (4%)	5 (10%)	
Heavy smoker (10-15)	9 (18%)	11 (22%)	8 (16%)	
Socioeconomic status				
Low	0 (0%)	8 (16%)	3 (6%)	
Medium	37 (74%)	35 (70%)	40 (80%)	**0.018**
High	13 (26%)	7 (14%)	7 (14%)	
Dessert consumption				
None	1 (2%)	7 (14%)	3 (6%)	
Little	16 (32%)	20 (40%)	18 (36%)	**0.001**
Medium	29 (58%)	12 (24%)	13 (26%)	
Too much	4 (8%)	11 (22%)	16 (32%)	
Asidic drink consumption				
None	14 (28%)	24 (48%)	11 (22%)	
Little	30 (60%)	17 (34%)	23 (46%)	**0.013**
Medium	6 (12%)	6 (12%)	11 (22%)	
Too much	0 (0%)	3 (6%)	5 (10%)	

*: Pearson chi-square test

Table 4. Results of the multiple linear regression analysis modeling

	Unstandardized Coefficients		Standardized Coefficients	t	P	95.0% Confidence Interval for B	
Variables	**B**	**Std. Error**	**Beta**			**Lower Bound**	**Upper Bound**
(Constant)	-5.025	2.674		-1.879	0.062	-10.309	0.259
Age	0.190	0.040	0.322	4.734	**<0.001**	0.111	0.269
Frequency of going to the dentist	2.788	0.507	0.365	5.494	**<0.001**	1.785	3.791
Stimulated saliva flow rate	-2.400	0.634	-0.256	-3.784	**<0.001**	-3.654	-1.146

*: Multiple Linear Regression Analysis; p<0.05.

DISCUSSION

Obesity is a systemic disease with an increasing prevalence and a higher risk of morbidity and mortality (17). Multifactorial factors, such as genetics, dietary habits, age, gender, socioeconomic level, and physical activity, are involved in the etiology of obesity (18). Obesity causes health problems, such as type 2 diabetes mellitus, hypertension, hyperlipidemia, cardiovascular diseases, metabolic syndrome, cancer, infertility, and respiratory system diseases (19). It is also associated with tooth decay (20), periodontal diseases (21, 22), dental erosion (23, 24), and xerostomia (25).

In the data analysis, the number of lost teeth and the DMFT index were higher in the obese group than in the control group, while SSFR, SpH, and SBC were lower in the obese group than in the control group. Thus, the study's null hypothesis was rejected.

Various findings have been obtained in studies looking into the connection between the number of decayed teeth and the DMFT index and obesity in the literature. Isaksson et al. (26) found that obese individuals had a noticeably higher prevalence of caries than normal-weight individuals in their study, which included 494 individuals aged 20 years. Similar to our study, Östberg et al. (27) found no link between the number of carious lesions and obesity in their study, in which 999 women from Gothenburg, Sweden, participated and clinical and radiographic examinations were carried out together.

In the present study, there was no noticeable distinction in the number of decayed teeth between the obese, morbidly obese, and control groups. One of the reasons for this is that no noticeable distinction was found in the USFR values of the groups.

In their study involving 41 obese and 41 normal-weight adolescents aged 12–18 years, Bailleul-Forestier et al. (28) found that the DMFT index of obese adolescents was noticeably higher than that of normal-weight adolescents. In their study of 70 obese and 70 normal-weight women, Şimsek et al. (29) found that the USFR was noticeably lower in obese women than in normal-weight women. Moreover, obese women had significantly higher DMFT and DMFS values than normal-weight women. Unlike our study, Yetkiner et al. (30) found no noticeable differences in BMI and DMFT scores between groups in their study of 527 children classified as underweight, normal, overweight, or obese. Our results demonstrated that the DMFT index was significantly higher in obese individuals than in the control group. Furthermore, the increased number of missing teeth in obese individuals compared with the control group produced a significantly higher DMFT index in obese individuals than in the control group.

Different results were obtained from studies investigating the relationship between SSFR and USFR and obesity. In their study examining the USFR and SSFR of 1,427 dental patients, Flink et al. (31) found that hyposalivation was associated with disease and high BMI (BMI > 25) in young adults and with drugs used in those aged 50 and above. Fenoll-Palomares et al. (32) revealed that obesity, smoking, and alcohol consumption did not affect saliva parameters such as USFR, SpH, and SBC in their study involving 159 healthy volunteers.

The current study found that the SSFR values were significantly greater in the control group than in the morbidly obese and obese groups. This finding confirms that obesity increases the tendency for the occurrence of xerostomia. Moreover, the control group had a significantly higher SpH than the obese group. The SBC values were significantly higher in the control group than in the obese and morbidly obese groups. In this study, a high SpH and the protective effect of SBC were two of the reasons why the DMFT index was significantly lower in the control group than in the obese group.

Among the studies examining the connection between obesity and diabetes, Astrup et al. (33) suggested that the term "diabesity" should be adopted, stating that type 2 diabetes is related to obesity and is primarily caused by obesity. In their study on 195,005 adults over the age of 18 in the United States in 2001, Mokdad et al. (34) examined the connection between obesity and diabetes and found that the prevalence of diabetes increased by 7.3%, with an obesity prevalence rate of 5.6%.

In our study, diabetes was observed in 41% of both groups, 60% of obese individuals, and 22% of morbidly obese individuals. Diabetes causes oral complications, such as hyposalivation, xerostomia, caries, and periodontal diseases (35, 36). As the source of the shortage of statistical importance between the two groups in terms of the number of missing teeth, DMFT index, SSFR, SpH, and SBC,

which are expected to have a worse outcome in morbidly obese patients than in obese patients in proportion to their BMI, the known negative effects of diabetes, which are observed more in obese individuals, on oral and dental health can be shown.

In their study involving 100 morbidly obese and 50 normal-weight individuals, Yamashita et al. (37) found that, consistent with our findings, SSFR and SpH were noticeably lower in obese patients than in the control group. Moreover, they discovered that obese patients had a noticeably higher risk of diabetes and a lower socioeconomic status than the control group.

Although there was an obvious difference in the socioeconomic levels of the participants in our study, no noticeable difference was found in the individuals' status in terms of going to the dentist, the last time they went to the dentist, and the reasons for going to the dentist. These findings show that the difference in socioeconomic level does not have a noticeable difference in the status of going to the dentist, the time, and the reason for going to the dentist. The fear of dentists, which is still common in today's society, and the lack of sufficient awareness in our country about going to the dentist may also be considered factors.

Unlike our findings, Forslund et al. (38) found no significant relationship between education level and obesity in their study of middle-aged, normal-weight, obese, and extremely obese women. Nevertheless, they discovered a noticeable difference in the number of teeth and daily energy intake in normal-weight, obese, and extremely obese women.

The limitations of the study are the small sample size of 50 for each group, the difference in the age variable between the groups, and the inability to completely eliminate systemic diseases from the obese and morbidly obese groups.

CONCLUSION

The findings showed that the DMFT index and the number of lost teeth increased, whereas SSFR, SpH, and SBC decreased in obese individuals. Therefore, obesity has negative effects on oral and dental health. Raising the awareness of obese individuals about oral and dental care and gaining the habit of going to the dentist regularly for obese individuals can contribute to their oral and dental health.

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