



# Evaluation of nutritional counseling service provided within primary health care at a district level

İ Mehmet Akif Sezerol<sup>a,b,c,d</sup>, İ Zeynep Meva Altas<sup>e,\*</sup>

<sup>a</sup>Istanbul Medipol University, Institute of Health Sciences, Epidemiology Program, Istanbul, Türkiye

<sup>b</sup>Istanbul Medipol University, School of Medicine, Department of Public Health, Istanbul, Türkiye

<sup>c</sup>Maltepe University, Graduate Education Institute, Health Management Program, Istanbul, Türkiye

<sup>d</sup>Sultanbeyli District Health Directorate, Istanbul, Türkiye

<sup>e</sup>Ümraniye District Health Directorate, Istanbul, Türkiye

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## Abstract

**Aim:** It was aimed to investigate the effectiveness of nutritional counseling services provided in the diabetes and obesity unit of primary health care services for the control of obesity.

**Materials and Methods:** This study is a retrospectively descriptive research. People applied to the diabetes and obesity unit of a District Health Directorate in Istanbul between 01.01.2017-01.04.2022 constitute the population. Analysis about the first application (height, weight, sociodemographics) was made with 3,259 people; weight loss was evaluated within 1,282 people. Mean, standard deviation, median, minimum, maximum values, numbers (n) and percentages (%) were used for descriptive data. The Mann Whitney U was used if the data not normally distributed. Chi-square test was used for categorical variables. Multivariate analysis is made with Cox-regression analysis. Statistical significance level was  $p < 0.05$ .

**Results:** 2,973 (91.2%) of the participants were women. The median age was 38.0 (15.0-83.0). Height, weight and BMI median values were 158.0 cm (116.0-190.0), 83.6 kg (56.0-160.2), 33.0 kg/m<sup>2</sup> (25.0-64.7), respectively. Weight and BMI loss was observed in 90.8% of the patients. The median weight and BMI loss were 2.7 kg (-21.40-56.10) and 1.1 kg/m<sup>2</sup> (-8.79-22.69). According to univariate analysis, weight loss percentage of 5% and above was significantly higher in those with low educational status, but this significance was not observed in multivariate analysis.

**Conclusion:** Weight loss was achieved 90.8% of the participants. While it is encouraging to benefit from nutritional counseling at a high percentage; it is important to understand the barriers to weight loss for participants who can not benefit.



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## Introduction

The definition of health is; not only the absence of disease and disability, but also a state of complete physical, mental and social well-being according to the World Health Organization (WHO) [1]. One of the most important determinants of health is eating habits [2]. Unhealthy eating is a risk factor for non-communicable diseases such as cardiovascular diseases, diabetes, cancer and respiratory diseases [3].

The increasing burden of noncommunicable diseases contributes significantly to the global burden of disease, premature death and disability [4]. Although recommenda-

tions for healthy eating are repeated in most of the dietary guidelines for the prevention of chronic diseases, a large proportion of the world's population does not reach the recommended targets [5].

A Body Mass Index (BMI) of 25 and above is defined as overweight, while a body mass index of 30 and above is defined as obesity. According to WHO data, approximately 39% of the adult population in the world was overweight and 13% was obese in 2016 [6]. According to the results of a large sample study in Türkiye, 39.6% of individuals are overweight and 29.5% are obese. According to OECD (Organization for Economic Cooperation and Development) data, the percentage of overweight and obesity for 15 years and older in Türkiye was reported as 56.1% [7]. According to Turkish Household Health Survey (2017); the average body mass index of the popu-

\*Corresponding author:

Email address: [zeynep.meva@hotmail.com](mailto:zeynep.meva@hotmail.com) (İ Zeynep Meva Altas)

lation aged 15 and over in Türkiye is calculated as 26.6 kg/m<sup>2</sup> for men and 28.3 kg/m<sup>2</sup> for women [8]. According to the same study, while two out of every three people are overweight (BMI  $\geq$  25 kg/m<sup>2</sup>), 3 out of every 10 people are obese (BMI  $\geq$  30 kg/m<sup>2</sup>). The increasing prevalence of overweight and obesity needs to be prevented [6, 9]. In this way, it will be possible to control chronic diseases caused by overweight and obesity.

Nutritional counseling is recognized as a first-line approach to the management of numerous chronic diseases [10]. Nutritional counseling is a service in which a patient's nutritional habits are evaluated, after then the patient's nutritional problems and goals are determined. The future steps are determined in line with these goals [10, 11]. In a study, long-term weight loss was achieved in overweight hypertensive patients with nutritional counseling [12]. In another study, it was stated that overweight and obese patients can achieve weight loss of up to 10% compared to baseline with well-designed programs, thereby significantly reducing the severity of obesity-related risk factors [13]. The purpose of nutritional counseling is not only to provide weight loss in patients. In some patients, healthy eating habits can be gained through nutritional counseling, and weight gain can be achieved properly for these patients [14, 15].

It is obvious that effective nutritional counseling services will help weight loss in obese and overweight people. It is very important for public health to evaluate the extent of benefit from nutritional counseling services, which are more accessible in primary care. For this reason, it was aimed to investigate the effectiveness of nutritional counseling services provided in primary health care for the control of obesity, and to investigate the extent of weight loss of individuals in the follow-up. In addition, it was aimed to examine some sociodemographic characteristics of people who applied for nutritional counseling such as age, gender, presence of chronic disease.

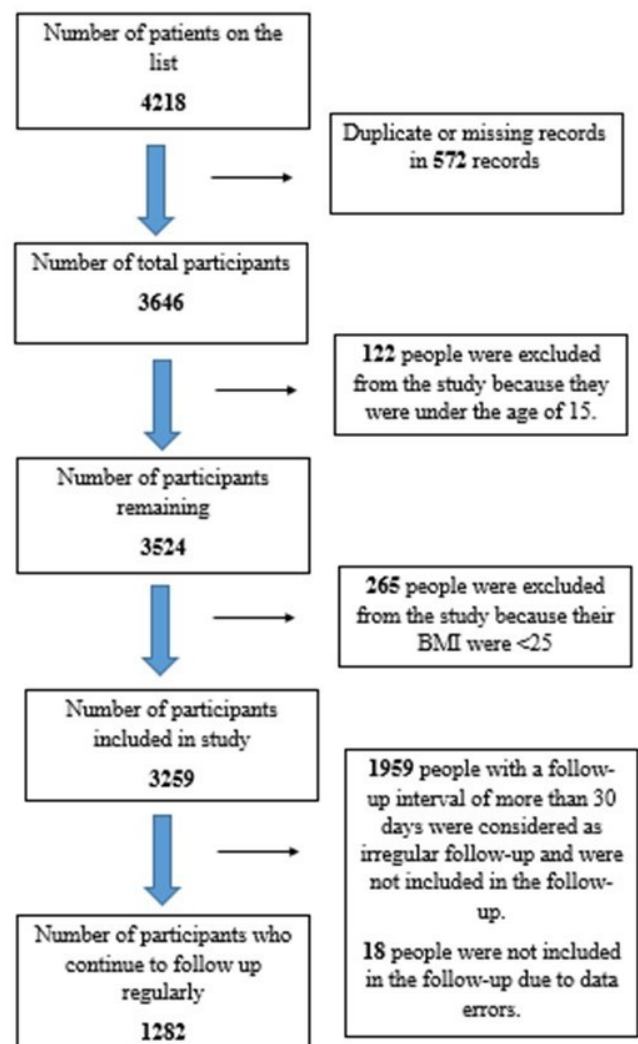
## Materials and Methods

### *Study design, sample size and population*

This study is a retrospectively descriptive research and its population consists of people who applied to the dietitian in the diabetes and obesity counseling unit of a District Health Directorate in Istanbul between 01.01.2017 and 01.04.2022. People came to the counseling units by making an appointment at their first application and received individual counseling from a dietitian. The interviews of the dietitians who provided consultancy services lasted for 30 minutes on average, and all the patients were provided with nutritional counseling in a similar time and content. After the consultation, a personalized nutrition and exercise plan was made by the dietitian and the next control appointments of the people were planned. The next control appointments after the nutritional counseling are planned by the dietitians for 7-30 days later. In this study, 4218 people applied to the dietitian in a 5-year period. The total number of consultancy was 15464. There are a total of 3646 people with complete first application data, since the first application record was opened repeatedly in some people and there were missing data in some patients. Since 122 people were under the age of 15 and

265 people had a BMI below 25 kg/m<sup>2</sup>, these people were also excluded from the evaluation. After making the above exclusions, the remaining 3259 people were included in the study among all applications on the relevant dates without calculation of a sample size (Figure 1). The maximum period between follow-ups was accepted as 30 days for effective use of nutritional counseling service in our study, since there is usually a 14-30 day interval between control appointments in similar studies which evaluate the effect of nutritional counseling services on weight loss [16-18]. For this reason, 1959 people with a follow-up interval of more than 30 days were considered as irregular follow-up and were not included in the follow-up analysis. Additionally, 18 people were not included in the follow-up due to data errors (Figure 1).

Since the study was conducted retrospectively via system records without communicating with the patients, informed consent was not obtained from the patients. The research was carried out in accordance with the Declaration of Helsinki Principles, no personal information that would reveal the private lives and/or identities of the participants was included, and the security of the data was ensured. Ethics committee approval was obtained from Istanbul Medipol University Non-Interventional Clinical Re-



**Figure 1.** Participants included in study.

search Ethics Committee with the decision number 759 on 13/09/2022.

### Measures

Gender, age, height, weight, BMI, amount of fat, presence of obesity in first-degree relatives, presence of chronic disease, food allergy, anemia and use of food supplements were evaluated retrospectively from the health records. The repeat results of weight (kg) and BMI ( $\text{kg}/\text{m}^2$ ) measurements at the control appointments of those who applied to the diabetes and obesity unit were also evaluated and the changes in these measurements compared to the first application were analyzed. For height and weight assessment, regularly calibrated scales and height meters were used and measurements were made by dietitians during applications for nutritional counseling. Those with a BMI between 25.0-29.9  $\text{kg}/\text{m}^2$  are overweight, between 30.0-34.9  $\text{kg}/\text{m}^2$  Type 1 obese, between 35.0-39.9  $\text{kg}/\text{m}^2$  Type 2 obese, 40  $\text{kg}/\text{m}^2$  and above are classified as morbidly obese [19]. According to the literature, metabolic and cardiovascular risk factors are improved after moderate (5% of the weight) weight loss [20-22]. Thus, the target value in weight loss after nutritional counseling was determined as 5% weight loss.

### Statistical analysis

SPSS (Statistical Package for Social Sciences) for Windows 25.0 program was used for statistical analysis and data recording. In the study, mean, standard deviation, median, minimum and maximum values, numbers (n) and percentages (%) were used for descriptive data. Conformity of continuous variables to normal distribution was examined by visual (histogram and probability charts) and analytical methods (Kolmogorov-Smirnov/Shapiro-Wilk tests). The Mann Whitney U test was used to compare the two groups for data that did not fit the normal distribution. The relationship of categorical variables was evaluated with the chi-square test. In order to evaluate the weight and BMI losses, the difference between the weight and BMI values on the last application date and the weight and BMI values on the first application date of the patients with regular follow-up was taken. Cox Regression analysis, which also takes into account the follow-up times, was used as a multivariate analysis. In the Cox Regression analysis, factors that may be associated with weight loss were included in the model as an independent variable, while the dependent variable was 5% weight loss. The follow-up period is the time elapsed between the first and last nutritional counseling appointments of the patients with follow-up data. Statistical significance level was determined as  $p < 0.05$ .

### Results

As stated in the method part of the study, 7.5% (n=265) of those who applied to nutritional counseling were not included in the study because they applied for weight gain. All of the 3259 patients evaluated within the scope of the study were individuals who applied for weight loss, and 2973 (91.2%) were women. Educational status of 45.6% of the patients was literate. Majority of the patients were

**Table 1.** Descriptive findings of participants.

	n	%
<b>Gender</b>		
Female	2973	91.2
Male	286	8.8
<b>Educational status</b>		
Illiterate	124	3.8
Literate	1188	36.5
Primary school	439	13.5
Middle school	480	14.7
High school	210	6.4
University	107	3.2
Master	60	1.8
Non available	651	20.0
<b>Category of participants according to application weight</b>		
Overweight	853	26.2
Type 1 Obese	1224	37.6
Type 2 Obese	733	22.5
Morbidly Obese	449	13.8
<b>Obesity in first degree relatives</b>		
No	1386	42.5
Yes	1873	57.5
<b>Chronic disease</b>		
No	2190	67.2
Yes	1069	32.8
<b>Anemia</b>		
No	2603	79.9
Yes	633	19.4
Non available	23	0.7
<b>Food allergy</b>		
No	3125	95.9
Yes	84	2.6
Non available	50	1.5
<b>Use of food supplement</b>		
No	2262	69.4
Yes	997	30.6
<b>Total</b>	<b>3259</b>	<b>100.0</b>

Type 1 obese (37.6%). The percentage of obesity in first-degree relatives was 57.5%. The percentages of those with chronic disease and anemia were 32.8% and 19.6%, respectively. Of the patients 30.6% were using food supplements. There were 84 (2.6%) people with food allergy (Table 1).

The median age of the participants was 38.0 years, while the minimum and maximum ages were 15.0 years and 83.0 years, respectively. Median height of the participants was 158.0 cm (116.0-190.0), median weight was 83.6 kg (56.0-160.2), median BMI value was 33.0  $\text{kg}/\text{m}^2$  (25.0-64.7). The median value of fat amount was 40.0 kg (15.6-65.2). The median age of women was 37.0 years (15.0-83.0), while it was 39.0 years (15.0-77.0) for men. Median height of

**Table 2.** Age, weight, height, BMI, fat of participants.

Parameters	Median	Minimum	Maximum
<b>All participants</b>			
Age (years)	38.0	15.0	83.0
Height (cm)	158.0	116.0	190.0
Weight (kg)	83.6	56.0	160.2
BMI (kg/m <sup>2</sup> )	33.0	25.0	64.7
Fat (kg)	40.0	15.6	65.2
<b>Female</b>			
Age (years)	37.0	15.0	83.0
Height (cm)	158.0	116.0	184.0
Weight (kg)	82.7	56.0	160.2
BMI (kg/m <sup>2</sup> )	33.2	25.0	64.7
Fat (kg)	40.5	15.60	65.2
<b>Male</b>			
Age (years)	39.0	15.0	77.0
Height (cm)	172.0	149.0	190.0
Weight (kg)	94.9	56.3	140.0
BMI (kg/m <sup>2</sup> )	32.1	25.0	52.1
Fat (kg)	29.7	17.6	52.0

**Table 3.** Sociodemographic characteristics of participants with and without follow-up data.

		Participants without follow up (n=1977)		Participants with follow up (n=1282)		P value
		n	%	n	%	
Age (years)		38 (15-77)		38 (15-83)		0.579*
(median, min-max)						
Weight at application (kg)		83.2 (56.0-160.2)		84.3 (57.1-143.3)		<b>0.006*</b>
Gender	Female	1789	90.5	1184	92.4	0.066**
	Male	188	9.5	98	7.6	
Educational status	<High school	1085	68.1	726	71.6	0.056**
	>High school	509	31.9	288	28.4	
Obesity in first degree relatives	No	1117	56.5	756	59.0	0.163**
	Yes	860	43.5	526	41.0	
Chronic disease	No	666	33.7	403	31.4	0.181**
	Yes	1311	66.3	879	68.6	
Food allergy	No	1878	96.9	1247	98.2	<b>0.021**</b>
	Yes	61	3.1	23	1.8	
Anemia	No	1572	80.2	1031	80.9	0.624**
	Yes	389	19.8	244	19.1	
Use of food supplement	No	1419	71.8	843	65.8	<b>&lt;0.001**</b>
	Yes	558	28.2	439	34.2	

\*Mann Whitney U test, \*\*Chi square test.

women was 158.0 cm (116.0-184.0), median weight was 82.7 kg (56.0-160.2), and median BMI was 33.2 kg/m<sup>2</sup> (25.0-64.7). The median weight of women was 40.5 kg (15.6-65.2). Median height for men was 172.0 cm (149.0-

**Table 4.** Weight and BMI losses during the follow-up of the participants.

Parameters	Median	Minimum	Maximum
<b>All participants</b>			
Weight loss (kg)	2.70	-21.40	56.10
BMI loss (kg/m <sup>2</sup> )	1.09	-8.79	22.69
Weight loss (%)	3.26	-28.53	56.45
<b>Female</b>			
Weight loss (kg)	2.70	-21.40	56.10
BMI loss (kg/m <sup>2</sup> )	1.09	-8.79	22.69
Weight loss (%)	3.27	-28.53	56.45
<b>Male</b>			
Weight loss (kg)	3.25	-2.80	23.70
BMI loss (kg/m <sup>2</sup> )	1.11	-0.88	8.92
Weight loss (%)	3.13	-3.11	17.11

**Table 5.** Examination of the factors affecting the weight loss of 5% of the participants.

	P*	OR	95.0% CI OR	
			Lower	Upper
Gender (Reference: female)	0.459	1.196	0.744	1.923
Educational status (Reference: <high school)	0.142	1.182	0.900	1.552
Obesity in first degree relatives (Reference: no)	0.247	1.136	0.915	1.411
Chronic disease (Reference:no)	0.367	1.120	0.875	1.434
Anemia (Reference: yes)	0.695	1.052	0.817	1.355
Age	0.225	0.993	0.981	1.004
Weight at application	0.983	1.000	0.993	1.007

\*Cox regression analysis.

190.0), median weight was 94.9 kg (56.3-140.0), and median BMI was 32.1 kg/m<sup>2</sup> (25.0-52.1). The median amount fat in men was 29.7 kg (17.6-52.0) (Table 2).

The first application dates of the patients were examined according to the years as follows; 12.8% applied in 2017, 35.1% in 2018, 43.6% in 2019, 6.1% in 2020, 2.4% in 2021. The mean number of referrals of the counselees was 4.27±5.12, and the median value was 2.0. The minimum number of applications was 1 and the maximum number of applications was 38. Of the participants 60.7% (n=1977) did not continue their nutritional counseling follow-ups regularly. Since the follow-ups of these patients were not regular, only anthropometric and sociodemographic data related to the first application were evaluated. Data on weight loss after nutritional counseling service were analyzed with 1,282 participants who had regular follow-ups. The sociodemographic characteristics of the participants

with and without regular follow-up data were compared. There was no statistically significant difference between the two groups, except for classification according to the weight of admission, the presence of food allergy, and the use of food supplements (Table 3).

The weight and BMI differences between the first and last measurements were evaluated in 1282 people who continued their follow-up regularly and had less than 30 days between each control application. While the mean follow-up period was  $7.5 \pm 11.8$  months for 1,282 patients; the minimum and maximum follow-up periods were 7 days and 4.7 years, respectively.

Weight loss was not observed in 118 (9.2%) of 1,282 participants who were followed up regularly. In the last measurement, the weight of 106 people increased compared to the first application, and the weight of 12 people did not change compared to the first application. Weight and BMI loss was observed in the remaining 1164 (90.8%) people compared to the first application. The median weight loss of all participants was 2.7 kg (-21.40-56.10), and the median BMI loss was 1.1 kg/m<sup>2</sup> (-8.79-22.69). While the median weight loss of female participants was 2.70 kg (-21.40-56.10), the median BMI loss was 1.09 kg/m<sup>2</sup> (-8.79-22.69); the median weight loss of male participants was 3.25 kg (-2.80-23.70), and the median BMI loss was 1.11 kg/m<sup>2</sup> (-0.88-8.92). While the median weight loss percentage of all participants (according to their initial application weight) was 3.26% (-28.53-56.45); the median weight loss percentages in female participants and males were 3.27% (-28.53-56.45) and 3.13% (-3.11-17.11), respectively (Table 4).

Weight loss of 5% or more was observed in 34.1% (n=437) of the participants compared to their initial admission weight. When the characteristics of the patients with and without 5% weight loss were evaluated; there was no significant difference between the two groups in terms of age, gender, initial weight, presence of obesity in first-degree relatives, presence of chronic disease and anemia ( $p>0.05$ ). While 28.4% (n=81) of the patients with high school and higher educational level had a weight loss of more than 5%; this was significantly higher with a percentage of 36.9% (n=268) in those with less than high school educational level ( $p=0.011$ ). Cox regression analysis was used in the multivariate analysis of factors that may be associated with weight loss at 5% of the participants. According to the results of the analysis, no statistically significant relationship was found (Table 5).

## Discussion

The increasing problem of overweight and obesity around the world shows that there is a need for interventions in this regard [23, 24]. One of the most important ways to prevent obesity and overweight and to help these people lose weight is providing a healthy diet. For this purpose, nutritional counseling services are easily accessible services in nutrition and obesity counseling units in primary health care institutions. In our research, it was aimed to evaluate the applications to the unit that provides nutritional counseling service in a district of Istanbul, and to evaluate the effectiveness of these units over the weight loss of the patients and to what extent these units can be utilized.

Of the patients evaluated within the study, 91.2% were women. According to the literature, overweight and obesity are more common in women than in men [25]. For this reason, the need for nutritional counseling service may be higher in female individuals. In addition, an increased risk of obesity was found in those with a first-degree relative with obesity [26]. More than half (57.5%) of the patients in our study had first-degree relatives of obese individuals. According to the literature, overweight and obesity are also associated with chronic diseases, especially cardiovascular diseases and diabetes, and anemia [27, 28]. In a study, the percentage of anemia in overweight and obese individuals was found to be higher than in individuals with normal weight [29]. Approximately one third (32.8%) of the patients in our study had a chronic disease and one fifth (19.6%) had anemia. According to the results, it can be thought that the presence of obesity in first-degree relatives, the presence of chronic disease and anemia are associated with overweight and obesity, and necessary preventive measures can be taken in individuals with this feature.

According to a systematic review in the literature, the use of health centers during the pandemic period decreased by about 1/3 [30]. In our study, similar to the literature, the number of applications to nutritional counseling services offered in the primary health care center decreased significantly in 2020 and 2021 compared to previous years. It can be thought that this situation stems from the fear of being infected with COVID-19. In our study, 60.1% (n=1959) of the participants did not continue their nutritional counseling follow-up or there was more than 30 days between two control appointments. In a similar study conducted in our country before the pandemic (between 2017 and 2018), the percentage of those without a regular follow up on primary care nutritional counseling services was less than our study (34.3%) [31]. Participants who do not follow up regularly may also be affected by their attendance to follow-up appointments due to pandemic conditions. In addition, in our study, while the initial weights and the use of food supplements were significantly lower in those who did not attend their control appointments regularly; the percentage of food allergy is higher in those who do not attend their appointments regularly. In a study conducted for weight control in obese individuals; those who do not attend regular follow-ups are those with lower education levels and more severe obesity [32]. Identification of patients who have compliance problems with weight control programs will contribute to the effectiveness of weight loss interventions [33].

It was observed that 90.8% of the patients who went to the control appointments regularly had weight loss at their last application compared to their first application. Further studies should clarify the reasons why some obese and overweight patients can not lose weight after nutritional counseling services.

While the median weight loss of the patients in our study was 2.7 kg, the median value of the percentage of loss was found to be 3.26%. In the literature, an average of 3.2% kg weight loss was observed in overweight hypertensive individuals after 6 months of follow-up after nutritional counseling services, similar to our study [12]. An average

of 3.1 kg of weight loss (mean follow-up period of 72 days) was observed in those who applied to primary care nutritional counseling services in our country [31]. Similarly, in another study, an average of 3.1 kg of weight loss was observed after applications to primary obesity counseling centers. In the same study, the percentage of those with 5% or more weight loss was reported as 30.3% [34]. Similarly, in our study, the percentage of those with weight loss over 5% was 34.1%.

In our study, the percentage of those with 5% or more weight loss was significantly higher in those with low educational level in univariate analysis. This significance was not observed in the multivariate analysis. According to Cox regression analysis, no significant relationship was found between age, gender, educational level, obesity in first-degree relatives, presence of chronic disease, presence of anemia, first admission weight, and weight loss above 5%. In a study in the literature, the amount of weight loss in obese individuals was found to be significantly higher in males and younger age groups [32]. Different results between studies may be due to the fact that the studies were conducted in different populations. Due to the social and cultural norms of different societies, the roles attributed to individuals of different ages and genders and factors such as daily living habits that may be associated with weight loss may also be different. This may explain the differences between study results. In addition, weight loss seen in individuals applying to nutritional counseling services; can be affected by many factors such as their individual motivations, environmental support and compliance with the recommendations. For this reason, we recommend evaluating the confounding factors that may affect weight loss in further studies where the effectiveness of nutritional counseling services will be evaluated.

#### *Limitations and strengths*

Physical activity plays a major role in weight loss as much as eating habits. A diet list and exercise prescriptions were created for the participants in our study within the scope of nutritional counseling services, and the extent to which they adhered to these lists could not be evaluated. This is one of the limitations of our study. Another limitation may be that some confounding factors such as motivation, social support, anxiety and depression, which may have effect on weight loss, were not evaluated. Some such confounding factors may have played a role in patients without weight loss. Since our study was carried out with individuals who applied to the primary health care service of a district, evaluations could be made in large sample numbers. In addition, since the applications before and after the pandemic were examined, the evaluation of the use of nutritional counseling services in a wide range of time is another strength of the study.

#### **Conclusion**

The percentage of patients who can lose weight with the nutritional counseling service offered in a primary health care center was 90.8%. Although other factors that may be associated with weight loss such as high motivation and social support are effective on this situation, we think that the contribution of nutritional counseling services to

weight loss is great. The effect of nutritional counseling services on weight loss of obese or overweight individuals can be evaluated with randomized controlled studies to be planned in the future. While the high percentage of individuals who lost weight after nutritional counseling is promising, it is extremely important to understand the barriers to weight loss for patients without weight loss and regular follow-ups. Interventions should be planned on this issue in the control of obesity and therefore chronic diseases. As of 2020, the beginning of the COVID-19 pandemic, the number of patients' applications to nutritional counseling services decreased, and this decrease continued in 2021. Fear of being infected with COVID-19 may be the reason for this decrease. For individuals who need this service but do not apply to a health institution that provides the service, online nutritional counseling services can be planned in line with their needs.

#### *Ethical approval*

The research was carried out in accordance with the Declaration of Helsinki Principles, no personal information that would reveal the private lives and/or identities of the participants was included, and the security of the data was ensured. Ethics committee approval was obtained from Istanbul Medipol University Non-Interventional Clinical Research Ethics Committee with the decision number 759 on 13/09/2022.

#### **References**

1. World Health Organization. Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948. [http://www.who.int/governance/eb/who\\_constitution\\_en.pdf](http://www.who.int/governance/eb/who_constitution_en.pdf). 1948.
2. Pekcan G. Beslenme durumunun saptanması. *Diyet El Kitabı*. 2008;67-141.
3. World Health Organization. European food and nutrition action plan 2015–2020. 2015.
4. Timmis A, Townsend N, Gale CP, et al. European Society of Cardiology: cardiovascular disease statistics 2019. *European Heart Journal*. 2020;41[1]:12-85.
5. Burkert NT, Freidl W, Großschädel F, Muckenhuber J, Stronegger WJ, Rásky É. Nutrition and health: different forms of diet and their relationship with various health parameters among Austrian adults. *Wiener Klinische Wochenschrift*. 2014;126[3]:113-8.
6. World Health Organization. Obesity and overweight: World Health Organization. 2020. <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight> access date 08.10.2022.
7. OECD. Overweight or obese population (indicator). doi: 10.1787/86583552-en 2022 access date 09.10.2022.
8. Türkiye Hanehalkı Sağlık Araştırması Bulaşıcı Olmayan Hastalıkların Risk Faktörleri 2017. [https://www.euro.who.int/\\_\\_data/assets/pdf\\_file/0009/383985/turkey-risk-factors-tur.pdf](https://www.euro.who.int/__data/assets/pdf_file/0009/383985/turkey-risk-factors-tur.pdf)) access date 08.10.2022.
9. Agha M, Agha R. The rising prevalence of obesity: part A: impact on public health. *International Journal of Surgery Oncology*. 2017;2[7]:e17.
10. Vasiloglou MF, Fletcher J, Pouliak K-A. Challenges and perspectives in nutritional counselling and nursing: A narrative review. *Journal of Clinical Medicine*. 2019;8[9]:1489.
11. Mann J, Truswell AS. *Essentials of human nutrition*: Oxford University Press; 2017.
12. Torres MRSG, da Silva Ferreira T, de Paula Nogueira L, et al. Dietary counseling on long-term weight loss in overweight hypertensive patients. *Clinics*. 2011;66[10]:1779-85.

13. Stelmach-Mardas M, Mardas M, Warchoł W, et al. Successful maintenance of body weight reduction after individualized dietary counseling in obese subjects. *Scientific Reports*. 2014;4[1]:1-7.
14. Wong A, Huang Y, Sowa PM, et al. Effectiveness of dietary counseling with or without nutrition supplementation in hospitalized patients who are malnourished or at risk of malnutrition: A systematic review and meta-analysis. *Journal of Parenteral and Enteral Nutrition*. 2022.
15. Pajanivel R, Boratne AV, Raj RV. Impact of dietary counselling on the nutritional status and quality of life among pulmonary tuberculosis patients-A randomized control trial. *Indian Journal of Tuberculosis*. 2022;69[2]:201-6.
16. Everett ST, Wolf R, Contento I, et al. Short-term patient-centered nutritional counseling impacts weight and nutrient intake in patients with systemic lupus erythematosus. *Lupus*. 2015;24[12]:1321-6.
17. Lee M-S, Kang H-J, Oh H-S, et al. Effects of worksite nutritional counseling for health promotion; twelve-weeks of nutritional counseling has positive effect on metabolic syndrome risk factors in male workers. *Korean Journal of Community Nutrition*. 2008;13[1]:46-61.
18. Löser A, Ramke K, Grohmann M, et al. The impact of nutritional counseling on thyroid disorders in head and neck cancer patients after (chemo) radiotherapy: results from a prospective interventional trial. *Strahlentherapie und Onkologie*. 2022;198[2]:135-48.
19. WHO Consultation on Obesity (1999: Geneva, Switzerland) & World Health Organization. (2000). Obesity : preventing and managing the global epidemic : report of a WHO consultation. World Health Organization. <https://apps.who.int/iris/handle/10665/42330>.
20. Magkos F, Fraterrigo G, Yoshino J, et al. Effects of moderate and subsequent progressive weight loss on metabolic function and adipose tissue biology in humans with obesity. *Cell Metabolism*. 2016;23[4]:591-601.
21. Ryan DH, Yockey SR. Weight loss and improvement in comorbidity: differences at 5%, 10%, 15%, and over. *Current Obesity Reports*. 2017;6[2]:187-94.
22. Williamson DA, Bray GA, Ryan DH. Is 5% weight loss a satisfactory criterion to define clinically significant weight loss? *Obesity*. 2015;23[12]:2319.
23. Bray GA. Health hazards of obesity. *Endocrinology and Metabolism Clinics of North America*. 1996;25[4]:907-19.
24. Yumuk VD. Prevalence of obesity in Turkey. *Obesity Reviews*. 2005;6[1]:9-10.
25. Chooi YC, Ding C, Magkos F. The epidemiology of obesity. *Metabolism*. 2019;92:6-10.
26. Katzmarzyk PT, Pérusse L, Rao D, Bouchard C. Familial risk of overweight and obesity in the Canadian population using the WHO/NIH criteria. *Obesity Research*. 2000;8[2]:194-7.
27. Gregg EW, Shaw JE. Global health effects of overweight and obesity. *Mass Medical Soc*; 2017. p. 80-1.
28. Zhao L, Zhang X, Shen Y, et al. Obesity and iron deficiency: a quantitative meta-analysis. *Obesity Reviews*. 2015;16[12]:1081-93.
29. Kaner G, Pekcan G, Pamuk G, et al. Is iron deficiency related with increased body weight? A cross-sectional study. *Progress in Nutrition*. 2016;18[2]:102-10.
30. Moynihan R, Sanders S, Michaleff ZA, et al. Impact of COVID-19 pandemic on utilisation of healthcare services: a systematic review. *BMJ Open*. 2021;11[3]:e045343. doi: 10.1136/bmjopen-2020-045343.
31. Şahin ÇE, Sezerol MA, Muhammed A. Türkiye'deki Birinci Basamak Sağlık Merkezlerinde Sağlık Beslenme ve Obezite Hizmetlerinin Değerlendirilmesi. *Anatolian Clinic the Journal of Medical Sciences*. 2021;26[1]:60-9.
32. Ortner Hadžiabdić M, Mucalo I, Hrabač P, et al. Factors predictive of drop-out and weight loss success in weight management of obese patients. *Journal of Human Nutrition and Dietetics*. 2015;28:24-32.
33. Moroshko I, Brennan L, O'Brien P. Predictors of dropout in weight loss interventions: a systematic review of the literature. *Obesity Reviews*. 2011;12[11]:912-34.
34. Kahraman HG, Orbaççi BM, Alpay S, et al. Evaluation of Follow-up of Obese and Overweight Persons over the Age of 18 Applied to Obesity Counseling Unit in Primary Care. *ESTÜ-DAM Halk Sağlığı Dergisi*. 4[3]:314-21.