

ORIGINAL ARTICLE

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The relationship of depression and malnutrition with healthy eating index in elderly individuals

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Abstract

Depression, malnutrition, and the healthy eating index were assessed in this study of people aged 65 and up who sought treatment at an outpatient clinic for internal medicine. Participants were elderly people from Malatya, Türkiye, who had applied to the outpatient clinic for internal medicine. The three-day dietary recall method was used to obtain the records of food consumption among the elderly. The calculation of Healthy Eating Index-2015 (HEI-2015) scores from food consumption. Geriatric Depression Scale (GDS) was used to define probable depression, and Mini Nutrition Questionnaire-Short Form (MNA-SF) was used to determine nutritional status, using face-to-face interviews. The study were 185 individuals included. The mean age of individuals was 72.19±6.92 years. According to MNA-SF results, 32.3% of women and 27.4% of men were found to be malnourished. The mean body mass index (BMI) value of the individuals was 25.73±2.85 kg/cm², and the BMI value of 56.22% of the individuals was within the normal range. The depression score mean was 8.86±4.73. Depression scores are higher in women, those with low monthly education and income, those who use multiple drugs, those with a low HEI-2015 score, and those who use them. There is a relationship between depression score and eating score. As the nutrition score and the HEI-2015 score decrease, the depression score increases. This study indicates that depressed older people consume less food. Early detection of depression and malnutrition is beneficial. Older adults should routinely use brief, easy-to-obtain diagnostic tools such as the MNA and GDS questionnaires to treat these related health issues quickly and effectively.

Keywords: Depression, malnutrition, HEI-2015 score, elderly people

Introduction

The proportion of elderly people is increasing markedly around the world. Moreover, the population of very old people (aged ≥75 years) is expanding to 10·2% [1]. This demographic shift will change health-care problems, and continued good health of the elderly population will remain a major challenge in public health. Malnutrition is a common health problem in the elderly, causing a decline in the quality of life. Particularly in community-living elderly, chronic malnutrition is a widespread, but often unrecognized, problem that goes untreated [2].

Monitoring people's nutritional status on a regular basis is important for a number of reasons, one of which is that a healthy diet can help seniors improve their quality of life and reduce their risk of developing certain diseases. Records of food consumption, clinical symptoms and health histories, anthropometric measurements, biochemical and functional tests, and psychosocial data are some of the methods that are utilized in the process of evaluating an individual's nutritional status [3,4]. A common and easy method is keeping track of food intake. The individual's consumption of all foods and beverages

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over a specific time period is scrutinized [5]. Subjective Global Assessment (SGA), Nutritional Risk Index (NRI), Prognostic Nutrition Index, Hospital Nutritional Screening Tool (NST), Malnutrition Universal Screening Tool (MUST), Hospital Prognostic Index, Nutritional Risk Screening (NRS 2002), and Mini Nutritional Assessment are some of the screening techniques that are frequently used to assess a person's nutritional status [6]. The Mini Nutritional Assessment was discovered to be the most popular and effective test for identifying nutritional deficiencies in elderly people [7]. About 20 years ago, the MNA test was clinically introduced and approved. However, it has recently drawn more focus from medical professionals who are evaluating the elderly patient's nutritional status. The MNA test is a quick and easy method for determining a person's nutritional status [8,9]. Elderly people's psychological conditions should be closely monitored, and their nutritional status should be determined. Elderly people suffering from depression are more susceptible to nutritional disorders, including obesity and cachexia. These people experience depression more frequently due to the presence of medical conditions, a high number of unfavorable life events, dissatisfaction with one's physical appearance, perception of oneself as belonging to a low social group, and inadequate personal care. According to one study, older adults experience depression more frequently because they have higher expectations for their families and fewer opportunities to participate in the activities they want. As a result, they felt empty and didn't appear to be enjoying their daily lives [10]. It was discovered that patients with malnutrition had a significantly higher risk of developing depression than people with normal nutritional status. People who are depressed typically eat fewer fruits and vegetables and more refined sugar, which are both unhealthy food choices. Increased consumption of fruit and vegetables, fish, and fish showed a positive association with mental and cognitive health. Depression risk can be lowered with a healthier, more varied diet that includes a balanced diet. Additionally, it has been reported that elderly malnutrition may worsen the signs of depression by causing physical weakness [11].

In this study, participants aged 65 and older who applied to the internal medicine outpatient clinic were evaluated for depression, malnutrition, and healthy eating index.

Material and Methods

Place, timing, and sample selection for the study

All steps of the study were carried out in accordance with the Helsinki declaration. Verbal and written consent was obtained from the individuals participating in the study that they voluntarily participated in the study. This study was carried out between March-April 2023.

Elderly people who applied to the internal medicine outpatient clinic in the province of Malatya participated in the study. The study included 185 people over the age of 65 years, including 81 women and 104 men. Patients with inflammation, disease-related

malnutrition and patients with diseases that may affect food intake such as cancer, ischemic cerebrovascular disease, chewing and swallowing disorders were not included in the study. Face-to-face information collection methods were used to collect study data. The data collection form includes anthropometric measurements, a one-day food consumption record, the geriatric depression scale, and demographic data.

The status of food consumption in the last one days was calculated. Information from food consumption records was transferred to the food information system program BEBIS. HEI-2015 values were computed using the BEBIS program's outputs. Individuals' malnutrition status was assessed using the MNA-SF (Figure 1).

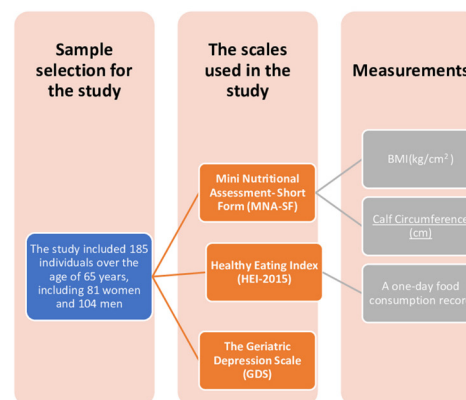


Figure 1. The sample of the study and the scales used

The study's inclusion criteria were that participants had to be over 65, were not taking any medication for a psychological disorder, and could be reached. The Mardin Artuklu University Non-Interventional Research Ethics Committee provided the study's ethics committee on January 12, 2023. The decision of the ethics committee was followed by the gathering of study data.

The geriatric depression scale

The Geriatric Depression Scale (GDS), developed by Yaseve et al. in 1983, was used to screen for depression in the elderly. Durmaz et al. conducted a validity and reliability study of the scale in our nation produced in 2018 [12,13]. It was composed of 30 self-reported questions that were easy for seniors to mark and respond to with a yes or no. When the scale is scored, 1 point is awarded for each response that indicates depression and 0 points for the other response. This total depression score is then taken into consideration. Scores on the scale ranged from 0 to 10 for "no depression," 11 to 13 for "possible depression," and 14 and higher for "definite depression." The scale yields scores with a minimum of 1 and a maximum of 30.

Calculation of the healthy eating index

The Healthy Eating Index-2015 (HEI-2015) is the most up-to-date index based on the "2015-2020 American Dietary Guidelines". HEI-2015 consists of 13 components. These components are; total fruit, fruit, total vegetables, green leafy vegetables and

beans, whole grains, milk and dairy products, total protein foods, seafood and plant proteins, fatty acids, refined grains, sodium, saturated fats, added sugars. The healthy eating index score is expressed over 100 by adding the scores obtained from each component. The amount of energy received by the individual in a day is used in the calculation. Component scores are in the range of "0-5" or "0-10", and if the total score corresponds to 100%, it means that the individual meets the recommended amounts in terms of adequate and balanced nutrition. The lowest score that can be obtained from HEI-2015 is "0" and the highest score is "100". While calculating the score, the foods consumed by the individual are classified. The consumption amount is determined for each relevant nutritional component. For each relevant component, the consumption amount is determined over 1000 kcal. As a result of the listed processes, the score obtained by the individual from the relevant food is obtained. The above-mentioned processes are calculated for all the nutrients consumed by the individual, and the scores obtained are summed to obtain the individual's one-day HEI-2015 score. The intersection points of HEI-2015 are as follows: A HEI 2015 score of ≤ 50 means "poor diet quality", a range of 51-80 means "diet quality to be improved", and a score of ≥ 80 means "good diet quality" [14].

Scores for individual components are given for total fruit (maximum 5 points), whole fruit (maximum 5 points), total vegetables (maximum 5 points), dark green and orange vegetables (maximum 5 points), other vegetables and legumes (maximum 5 points), total grains (maximum 5 points), whole grains (maximum 5 points), milk (maximum 10 points), meat and beans (maximum 10 points), and oils (maximum 10 points). The standards are expressed as a percentage of Higher total and component HEI-2015 scores indicate greater compliance with the Dietary Guidelines for Adults when compared to lower scores on both scales.

Mini nutritional assessment- short form (MNS-SF)

It is comprised of six items that have been determined to have a high correlation with conventional nutritional assessment. Scoring on the MNA-SF involves determining whether the patient's appetite has changed, whether he has lost weight in the past three months, his mobility, whether he has experienced psychological distress or acute illness in the past three months, the presence of neuropsychological problems, and his body mass index. After the revision of the MNA-SF, patients whose BMI could not be calculated were given the option of calf circumference as an alternative to BMI. MNA-SF can be used independently as a screening test or in conjunction with the MNA long form. When MNA-SF is used alone, individuals are classified as normally fed (11-14), at risk (7-11), or severely malnourished (0-7). When MNA-SF is used in conjunction with the MNA long form, nutritional assessment should be performed in two stages; first, the 6-item MNA-SF should be administered; if the score is 11 or less, the long MNA form should be administered, presuming the

patient is at risk for malnutrition. MNA-SF's maximum possible score is 14 [15].

Anthropometric measurements

Body Weight (kg): Body weight is a physical measurement that is inexpensive, easy to obtain, and indicative of the elderly's protein and fat stores. In this study, the body weight of senior citizens was determined using a calibrated Tanita BC 730® scale with minimal clothing and no footwear.

Height (cm): It was measured with a stadiometer without shoes, with the feet touching the floor with the heels together, in an upright position, with the elderly patient looking forward, with the upper part of the ears and the outer corner of the eyes in a straight line (Frankfort Plane).

Body Mass Index (BMI) (kg/m²): The BMI is the most useful anthropometric measurement. BMI is utilized to assess protein-energy malnutrition and obesity, and it correlates well with total body fat. In this study, the BMI of the patients was calculated by dividing their body weight (kg) by their height (m²), using the results of body weight and height measurements, and assessed according to the European Society of Parenteral and Enteral Nutrition [ESPEN].

Calf circumference (cm)

During the calf circumference measurement, the foot's sole was pressed against a hard, flat surface to support the leg. The widest circumference of the calf was found by moving the measuring tape up and down, and the measurement was taken at the widest point [16].

Statistical analysis of data

The statistical package program IBM SPSS 23.0 was used to perform the analysis on the collected data. In order to evaluate the normal distribution of continuous variables, the decoupling and kurtosis coefficients were applied; the range of values between (-1.5) and (+1.5) was considered to represent the normal distribution. The number, the percentage, the mean, and the standard deviation were the presentation formats for the descriptive statistics. For the purpose of comparing the descriptive characteristics and scale scores, we utilized the Independent Samples t-test, the Mann-Whitney U-test. With continuous data to assess the relationship between scale scores, Pearson was used for the analysis; a linear regression was conducted to determine the effect of independent variables on dependent variables. The significance of the findings was determined using the p value less than 0.05 and the confidence interval of 95%.

Results

The demographic, health characteristics, antropometric measurements and nutritional indicators of subjects(n=185) were given in Table 1. The mean (SD) age was 72.19 (6.92) years for participants of study.

Table 1. General characteristics of the individuals participating in the study

Gender	n=185	%
Male	104	56.2
Female	81	43.8
Age (years) (mean±SD)	72.19±6.92	
Marital status		
Single	59	31.89
Married	126	68.11
Education status		
Uneducated	86	46.5
Literate only	61	33.0
Primary school	13	7.0
High school	12	6.5
University	13	7.0
Labor status		
Unemployed	57	30.81
Worker	36	19.46
Retired	92	49.73
Residential area		
City	112	60.54
Rural	73	39.46
Smoking habit		
Yes	48	25.9
No	137	74.1
Number of drugs taken per day		
Not taking any medication	24	12.97
1 or 2 medication	88	47.57
3 or 4 medication	56	30.27
Over 5 medication	17	9.19
Chronic diseases**		
Diabetes	87	47.03
Cardiovascular diseases	114	61.62
Bone joint diseases	56	30.27
Neurological diseases	63	34.05
Anthropometric measurements		
BMI (kg/cm ²) (mean±SD)	25.73±2.85	
BMI category 65-70 years (kg/cm ²)	n	%
BMI<20 (malnutrition)	16	8.65
20.0≤BMI<27 (normal)	47	25.41
BMI≥27 (obesity)	17	9.19
BMI category 70 years and above (kg/cm ²)	n	%
BMI<22 (malnutrition)	40	21.62
22.0≤BMI<27 (normal)	43	23.24
BMI≥27 (obesity)	22	11.89
Calf circumference (mean±SD)	33.05±4.63	
MNA SF (mean±SD)	10.23±3.14	
HEI-2015 (mean±SD)	54.13±11.45	
GDS (mean±SD)	8.86±4.73	

*** Multiple responses were received. BMI: body mass index, MNA-SF: mini nutritional assessment- short form, HEI: healthy eating index, GDS: geriatric depression scale

Figure 2 presents the results of a statistical analysis done to determine how the severity of an individual's depression correlates with their level of malnutrition. It was determined that 22.71 percent of people were suffering from malnutrition. In particular, the researchers discovered that 21.2% of people who had a depression score of 14 points or higher were also found to be severely malnourished. It was found that 53.8% of people who were at risk of malnutrition had a score of 14 or higher on the depression scale.

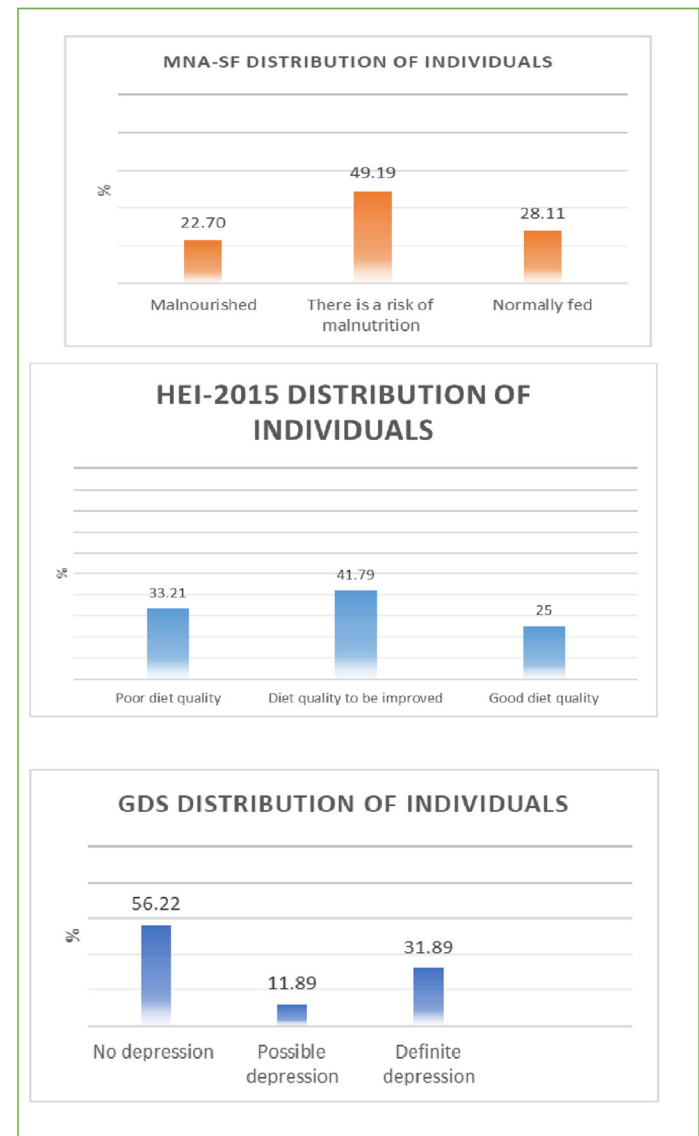


Figure 2. In the study, the distribution of individuals according to the MNA-SF, GDS and HEI -2015 scales

Table 2 presents the findings of an investigation into the connection that exists between the factors associated with the geriatric depression scale and the Spearman correlation coefficient. The value of the correlation between GDS and MNA-SF was found to be $r=-0.204$, and it was found to be significant. There was found to be a positive correlation between the three

factors that led to an increase in the GDS score of the individuals: the rise in the number of chronic diseases, the rise in the number of drugs taken on a daily basis, and the rise in age.

Table 2. The relationship between the factors related to the depression scale and the Spearman correlation coefficient

	Geriatric depression scale
MNA-SF	-0.204*
HEI-2015	-0.109
Age	0.278**
BMI	0.107
Number of drugs taken daily	0.392**
Number of chronic diseases	0.245**

MNA-SF: mini nutritional assessment-short form, HEI: healthy eating index, BMI: body mass index

An examination of the effect of the factors associated with the malnutrition status of individuals was accomplished through the use of linear regression analysis (Table 3). The findings of the study using multiple logistic regression indicate that the risk of malnutrition is increased by 1.201 times when depression is present in addition to the fact that women have a risk of malnutrition that is 0.609 times higher than that of men. It has been observed that a reduction in the risk of malnutrition occurs alongside an increase in the score on the healthy eating index. The MNA-SF increased by 1.107 points for every single increment of one point gained in the HEI score. One of the demographic factors that contributes to an increased likelihood of malnutrition is an individual's advancing age. It has been observed that a rise in BMI is associated with a decrease in the likelihood of suffering from malnutrition.

Table 3. The relationship between MNA and GDS in the whole sample according to multiple logistic regression analysis, and the effect of HEI and demographic characteristics

	OR (95% CI)	p
Gender	Female (ref)	
	Male	0.609 0.193
GDS	Yes depression (ref.)	
	No depression	1.201 <0.05
HEI-2015		1.107 <0.001
Demographic factors		
Age		1.601 <0.001
BMI		0.991 <0.01
Income status		0.090 0.201
Number of drugs taken daily		0.604 <0.05

GDS: geriatric depression scale, HEI: healthy eating index, BMI: body mass index

Discussion

According to the findings of this study, elderly people who suffer from depression have a significantly increased risk of malnutrition and unhealthy diets, whereas those who do not show signs of depression have a significantly improved

nutritional status. This association has been described in a number of studies that were conducted on elderly people who lived in the community in Türkiye [10], Iran [8], Brazil [17], the Czech Republic [18], and the Netherlands [5]. In addition, more recent research conducted on older adults has provided further confirmation of the aforementioned findings. In point of fact, according to the findings of a recent study conducted by Hallit et al. [19] on elderly people residing in nursing homes, having a higher MNA score was associated with a better GDS score. However, when the same questionnaires were administered to geriatric outpatients, depression was found to be associated with malnutrition, and severe depression was associated with a higher prevalence of malnutrition in elderly people [20]. It was also discovered that this association was mediated by a lower level of eating pleasure in elderly women, but not in elderly men [21].

The severity of one's depression is linked to an increased likelihood of suffering from malnutrition [22]. According to the findings of this study, 30.27% of those in individuals are malnourished. When looking at the relationship between individuals and the risk of depression measured by the GDS questionnaire, the risk of malnutrition measured by the MNA questionnaire, and the HEI score measuring healthy nutrition indices, significant negative correlation results were found ($p<0.01$). In particular, researchers discovered that 21.2% of people with high depression were also significantly malnourished. It was discovered that 53.8% of people who were at risk of malnutrition had a high level of depression. In a study that was very similar to this one, Centuri3n et al. [23] found that the GDS score of individuals who were at risk of malnutrition was higher than the GDS score of individuals who had a normal nutritional status. They also discovered that there was a negative correlation between the risk of malnutrition and the degree of depression ($r=-0.653$; $p<0.001$) in this study. On the other hand, Mu3noz D3az and colleagues found no significant relationship in their research despite employing the same methodology [24].

According to Al-Rasheed et al. [25], the relationship between depression and malnutrition is interactive and cyclical, as both conditions share risk factors that put one at risk of the other. Dec More scientific evidence is needed to determine whether the risk of depressive symptoms in older adults is caused by malnutrition, or whether the risk of depressive symptoms in older adults is caused by malnutrition. When compared to older adults who have adequate nutritional status, those who are malnourished have a higher likelihood of depression, and the prevalence of depression is increased by 31.3% [26]. Inadequate nutrition, including a lack of both macro- and micronutrients in one's diet, can contribute to the onset of biological changes by causing changes in neuronal function within the body [25,27,28]. Nonetheless, it seemed reasonable at first to believe that depression comes before malnutrition.

Depressive symptoms, polypharmacy, frailty, and a poor self-assessment of one's own health were found to be associated with nutritional status in the VERSIDUE study [29]. These factors

were shown to be associated with nutritional status. The current study confirmed the findings of previous substantial evidence by demonstrating that a decline in nutritional status occurs with increasing age. In addition to this, research found that women, not men, were more likely to be malnourished or at risk for it. In the studies that were conducted by Torres et al. [30] and Cuervo et al. [31], it was found that female gender was associated with lower nutritional status. The findings of this study also demonstrated that the risk of malnutrition increased by a factor of 1.201 when depression was present. There was a correlation between the amount of drugs that were used on a daily basis and the presence of depressive symptoms. The risk of malnutrition is also increased as a result of this relationship. In addition, it was discovered that an improvement of points in the evaluation of malnutrition was associated with an increment of one point in an individual's score for healthy nutrition. It has been hypothesized that a decline in cognitive abilities is one of several factors that play a significant part in the deterioration of nutritional status [32,33]. It is of the utmost importance to avoid malnutrition by adhering to healthy eating habits, as this can delay the decline in cognitive ability [34].

The body mass index, as well as the circumference at the mid-arm and the calf, were found to be independently associated with one's nutritional status. In the course of the MNA, these measurements were carried out. According to the ESPEN Consensus Statement, one diagnostic criterion for malnutrition is BMI [35]. In addition, the body mass index has been shown to be independently associated with malnutrition in elderly Turkish people who live in community settings [10]. The results of this study indicate that an increase in malnutrition is associated with BMI decreased risk of being affected by malnutrition. The mid-arm and calf circumferences are both measures that are included in the MNA questionnaire and can be routinely measured in elderly patients [36,37]. It is important to note that both of these circumferences can be measured. Along with BMI, arm circumference, as well as mid-arm circumference, has been shown to be a reliable muscle mass index. This has also been shown to be able to predict MNA classification. In hospitalized elderly patients, the risk of malnutrition, as determined by MNA, was proportional to arm circumference, body mass index, and calf circumference [38]. In addition, earlier studies have shown a positive correlation between the mid-arm and calf circumferences, as well as nutritional status, in older adults who are either hospitalized or live at home. This correlation was found in both populations [36-39].

Our study, like all other studies, has a few significant drawbacks. The fact that the study was cross-sectional is one of the limitations, along with the small number of participants in the study. Due to the fact that the study population consisted solely of elderly people who visited an outpatient clinic in Malatya, the findings cannot be extrapolated to the entirety of the Turkish population. Utilizing the MNA questionnaire allowed for the completion of a nutritional analysis. In addition to measuring MNA, evaluating a

person's nutritional status with anthropometric and biochemical measurements would be preferable.

Conclusions

The prevalence of malnutrition in the elderly brings up serious public health concerns; consequently, the prevention and treatment of this condition are of the utmost importance for the elderly person's quality of life as well as their ability to continue living. According to the findings of this study, senior citizens who suffer from depression are at an increased risk for malnutrition, and this risk grows with increasing age. The elderly care process will be improved, which will result in an increase in the elderly population's quality of life. Early detection of the risk of depression and/or malnutrition will be beneficial. Therefore, it is strongly recommended that diagnostic tools with a short form that are easy to obtain, such as MNA and GDS questionnaires, be applied as a routine clinical practice in the elderly, in order to timely and effectively address and treat these closely related, prominent health problems.

Limitations

Our study has some limitations. The main limitation of this study was lack of a control group. We highly recommend a case-control designed study in this field. Also, the study was conducted in a single center. The second limitation is the lack of further parameters in terms of nutrition due to budget constraints.

Conflict of Interests

The authors declare that there is no conflict of interest in the study.

Financial Disclosure

The authors declare that they have received no financial support for the study.

Ethical Approval

The Mardin Artuklu University Non-Interventional Research Ethics Committee provided the study's ethics committee on January 12, 2023. All steps of the study were carried out in accordance with the Helsinki declaration. Verbal and written consent was obtained from the individuals participating in the study that they voluntarily participated in the study.

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