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Set of heart failure early mortality prevention methods

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Abstract

Heart failure is a common chronic disease with a poor prognosis that often ends in death. The research thus aims to thoroughly investigate ways in which the prognosis of heart failure could be improved. For this purpose, a 9-month study was conducted with a group of people who followed the Mediterranean diet, and the effects of this diet on the cardiovascular system and the state of the body as a whole were assessed. The study found that adherence to the principles of the Mediterranean diet improved the quality of life of patients, according to the quality-of-life questionnaire (the average score was 81.3 at the beginning of the study and 87 points at the end of the study), and the level of adherence to the Mediterranean diet in the study group increased from 30 points to 39.7, according to the MedDietScore (MDS) scale. There was also an improvement in appetite and sleep quality. A decrease in the average blood pressure in the group was recorded (from 140/95 to 137/88 mmHg). It was found that due to proper nutrition, the participant's Body Mass Index (BMI) was reduced (from 31.2 kg/m² to 29.6 kg/m²), and the percentage of overweight people in the study group was also reduced from 44% to 26%. It was noted that no deterioration in heart failure class or functional class was recorded during the study. The left ventricular ejection fraction remained unchanged.

Introduction

More than 65 million people worldwide have heart failure.¹ It is a clinical syndrome characterised by structural or functional impairment of ventricular blood filling or ejection. The main symptoms include shortness of breath, peripheral edema, and coughing. The disease is categorised into acute and chronic forms. It is worth noting that about 80% of cardiovascular diseases, resulting in early deaths, can be prevented. To do this, it is necessary to identify all possible risk factors and understand which of them can be influenced to achieve the desired results. The list of uncontrollable factors includes age (older people have a higher risk of developing cardiovascular disease); gender (postmenopausal women are more sensitive to the onset of cardiovascular disease); a burdened family history and genetic characteristics. However, there is a much longer list of factors that are directly dependent on the individual: an unhealthy diet, low physical activity (or no physical activity at all), overweight/obesity, smoking, frequent alcohol consumption, chronic stress, high blood pressure, high cholesterol, and atrial fibrillation.

Thirty-nine percent of the world's adult population is overweight, and 18% of them are diagnosed with obesity. An increase in body weight of more than 10 kg above the individual norm increases the risk of coronary heart disease by 12%, an increase in systolic blood pressure by 3 mm Hg, and diastolic blood pressure by 2.3 mm Hg. Obese patients develop heart failure 10 years earlier than those who are not overweight. In addition, if there is a history of obesity lasting more than 20 years, the risk of heart failure increases by 70%, and over 30 years, by more than 87%. According to studies by Csige *et al.*, obese patients have a 1.5-fold higher risk of atrial fibrillation compared to the general population.² In addition, a 1-point increase in Body Mass Index (BMI) increases the risk of a new atrial fibrillation attack by 4%. The presence of atrial fibrillation in combination with obesity leads to an increased risk of stroke, heart attack, heart failure, thromboembolism, and sudden coronary death.

Poor food quality, ultra-processed foods, low physical activity, and stress all contribute to the development of inflammatory processes and oxidative stress. Smoking, alcohol consumption, and

obesity, together with the above factors, provoke the onset and exacerbation of hypertension, dyslipidaemia, diabetes mellitus, and sleep disorders, which subsequently lead to left ventricular remodelling, atherosclerosis, coronary heart disease, and subsequent heart failure. Many scientists have already comprehensively studied the features of heart failure and ways to combat it. For example, Polish scientists Niewada *et al.* studied and analysed the feasibility and effectiveness of using telerehabilitation for cardiac diseases.³ Based on information from the TELEREH-HF randomised clinical trial, which examined the effectiveness of telerehabilitation in comparison to conventional centre-based cardiac rehabilitation, the researchers carried out an economic analysis. The expenses of hospitalisation, interventions, and the use of healthcare resources were all examined by the authors in relation to telerehabilitation and traditional rehabilitation. In order to evaluate the cost-effectiveness of telerehabilitation, the researchers also took clinical outcomes like quality of life and functional capacity into consideration.

Jozwiak *et al.* estimated the prevalence of cardiovascular diseases and their risk factors among the Polish population.⁴ The researchers collected data on various cardiovascular risk factors, such as smoking, obesity, hypertension, diabetes, and dyslipidemia, as well as the presence of cardiovascular diseases, including coronary artery disease, myocardial infarction, and stroke. The study included a sizable sample of patients in primary care and offered insightful information about the prevalence of illnesses and cardiovascular risk factors in Polish patients seeking primary care. Driggin *et al.* assessed the role of diet in heart failure.⁵ The authors emphasise how a healthy diet can help people with heart failure live better lives and achieve better clinical results. The review examines a number of nutritional assessment topics, such as body composition, dietary intake patterns, and nutritional status evaluation. It also looks at various dietary approaches and how well they might work to control heart failure. The review looks at the research on the effects of particular dietary patterns on heart failure and cardiovascular health, including the DASH diet, the Mediterranean diet, and plant-based diets. The writers also cover the function of particular nutrients in the diet, including potassium, salt,

and protein, in the treatment of heart failure. At the same time, despite a significant number of studies, there is still controversy about the optimal and most beneficial type of diet for heart failure.

As such, the research aims to investigate whether adherence to the Mediterranean diet can improve the prognosis and slow the progression of heart failure. In particular, this study intends to investigate in detail the impact of a Mediterranean diet on cardiovascular health and overall health in patients with chronic heart failure and preserved left ventricular ejection fraction. The ultimate goal is to ascertain whether implementing a Mediterranean diet can have a beneficial impact on these variables and possibly improve the prognosis for heart failure patients.

Materials and Methods

A study was conducted to investigate the effect of the Mediterranean diet on the cardiovascular system and general health in patients with chronic heart failure with preserved left ventricular ejection fraction. The study involved 200 patients (100 women and 100 men). It was noted that all study participants were adults and legally capable. All patients signed a voluntary informed consent to participate in the study. Patient inclusion criteria: age over 40 years, preserved left ventricular ejection fraction (50% and above), New York Heart Association class 2-3, functional class 2-3, compensated heart failure, absence of uncompensated mental disorders.⁶ Exclusion criteria: minor age of patients, presence of severe mental disorders, and decompensated diseases. Participants were aged 40 to 69 years. Monitoring was conducted for 9 months on an outpatient basis.

The patients were thoroughly examined before the study. An echocardiographic assessment was performed using a multifrequency transducer and tissue Doppler imaging. The left ventricular ejection fraction was estimated using the Simpson method.⁷ The BMI was calculated using the standard formula (body weight measured in kilograms divided by height squared, calculated in m). The patient's blood pressure was measured using a standard method (sitting, at rest). Biochemical blood tests were carried out, and glucose levels were determined. A questionnaire was conducted to assess the quality of sleep and appetite of participants before the study and after 9 months. It was

proposed to evaluate the quality of sleep from 0 to 3 points, where 0b means no sleep problems and 3b means regular insomnia, the presence of apnoea. The level of appetite is determined by the following criteria: 0b – no appetite disorders; 1b – periodic lack of appetite; 2b – frequent lack of appetite; 3b – craving for inedible objects (chalk, clay).

The nutrition was assessed using the MetDietScore scale.⁸ The scale consists of eleven items that describe the quantitative and qualitative consumption of foods that are part of the Mediterranean diet. Each item is rated from 0 to 5 points. 0 points are given in the absence of consumption of foods that are part of the Mediterranean diet; 1 point – for the consumption of 1 to 4 servings per month of foods characteristic of the above type of diet; 2 points – for the consumption of 5-8 servings per month; 3 points – 9-12 servings per month; 4 points – 13-18 servings per month. The following criteria are defined for alcohol consumption: 0 points – more than 700 mL/day; 1 point – 700 mL/day; 2 points – 600 mL/day; 3 points – 400-500 mL/day; 4 points – 300 mL/day; 5 points – less than 300 mL/day. The maximum number of points was 55. A higher score indicated greater dietary adherence. The scaling was completed two times: before the start of the study and nine months after the start of the study. Participants were also asked to fill out a quality-of-life questionnaire to subjectively assess their well-being before the study and 9 months after compliance with the required conditions.⁹ The questionnaire contains 16 questions, each of which is rated from 1 to 7 points.

The survey was conducted using an individual questionnaire. The results were assessed by adding up the points for each item (7 points in total). The number of points ranges from 16 (terrible quality of life) to 112 (excellent quality of life); the higher the score, the better the quality of life. The patients were trained and counseled by qualified nutritionists and nurses before the trial began. Mandatory consultations were held every month during the trial, as well as when necessary (at the patients' request). The results of the study were evaluated by nutritionists, cardiologists, and functional diagnosticians nine months after the start of the study. The main assessment parameters were subjective (adherence to the Mediterranean diet, sleep quality, appetite, and general condition

according to the quality-of-life questionnaire) and objective (left ventricular ejection fraction, body mass index, blood pressure, blood glucose).

This study utilised robust methods to evaluate the effects of adhering to the Mediterranean diet on various health parameters in patients with chronic heart failure and preserved ejection fraction. Comprehensive data on cardiac function, metabolic indicators, and changes in body composition were obtained using objective clinical examinations such as echocardiography, blood tests, and anthropometric evaluations. This methodological approach, which included regular monitoring and monthly consultations, allowed for a thorough investigation of the long-term effects of the Mediterranean diet on several risk factors and outcomes in this particular heart failure population.

Results

Before the study, all participants were diagnosed with chronic heart failure of stages 2-3 according to the New York Heart Failure Scale (2a – 30%, 2b – 60%, and 3 – 10%) with preserved left ventricular ejection fraction. It was determined that in the study group of patients, 70% had FC 2, FC 3 – 30%. The left ventricular ejection fraction in the group of participants averaged 52.2% (from 50 to 54%). Blood pressure levels averaged 140/95 mmHg, with a maximum of 150/100 mmHg in the group. The average score for adherence to a healthy diet before the study, according to the MedDietScore (MDS) questionnaire, was 30 points (indicating moderate adherence to the Mediterranean diet) (Figure 1).

At the beginning of the study, 52% of respondents had sleep problems, with 10% scoring the maximum of 3 points. Impaired appetite was detected in 42%, of whom 8% scored a maximum of 3 points (craving for inedible objects can be explained by the possible presence of anemia, which is common in patients with chronic heart failure, but this study did not include red blood cell, haemoglobin, iron, and ferritin levels, so the presence of chronic anemia can only be assumed). The average value of the indicators according to the quality-of-life questionnaire was 81.3 points. The average BMI of the participants was 31.2 kg/m², with 44% of the participants being diagnosed as

overweight. Glucose levels averaged 4.9, which was within the normal range (3.3-5.5 mmol/L). None of the participants had been diagnosed with diabetes before the study (Figure 2).

Nine months after the start of the study, all participants re-filled out the MDS questionnaire. It was found that the level of adherence to the above type of diet increased among patients, with an average score of 39.7. This can be explained by the fact that at the beginning of the study, all participants were explained in detail the principles and benefits of the Mediterranean diet, the key points of this type of diet were described, and an exhaustive list of adequate recipes was presented. It was also explained that for better adherence to this type of diet, it is worth eating food from beautiful, favourite dishes, preparing bright, appetising dishes, and trying to spend more time with oneself and one's inner state. In addition, the patients themselves were able to observe changes in their health status and its improvement over the course of 9 months as a result of correcting their eating habits, which probably contributed to a higher score on the MDS questionnaire when they completed it again (Figure 3).

As a result of the study, all participants were re-diagnosed with chronic heart failure of stages 2-3 according to the New York Heart Failure Scale (2a – 30%, 2b – 60%, and 3 – 10% of people) with preserved left ventricular ejection fraction, FC 2 had 70%, FC 3 – 30%. It is concluded that in this study, adherence to the Mediterranean diet did not affect the functional class of chronic heart failure. The left ventricular ejection fraction averaged 52.8% (50 to 54%). There were slight changes in the ejection fraction (52.8 vs 52.2 at the beginning of the study), but these changes are not significant and can be considered an error in the calculations. The average blood pressure level was 137/85, indicating a slight decrease in the group. None of the participants had significant fluctuations in their blood pressure during the study. The average value of the quality-of-life questionnaire was 87 points (Figure 4).

Sleep problems were detected in 36% of respondents. At the same time, none of the participants scored 3 points during the repeat test 9 months later. This is explained by the improvement in the general condition due to nutritional correction and weight loss, which contributed to the improvement of sleep quality. Appetite disorders were detected in 16%, of whom 2% scored the maximum of 3

points. Eating a lot of fruit and vegetables helped improve appetite. The average body mass index of the participants was 29.6 kg/m², with 26% of participants diagnosed as overweight. It was concluded that adherence to the Mediterranean diet contributed to the normalisation of weight among the participants. The performance of each patient depended on their individual adherence to this type of diet. Glucose levels averaged 4.8. Among the study participants, glucose levels were initially within the physiological range. After nine months, no significant changes in individual or total values were detected. None of the participants was diagnosed with diabetes at the end of the study.

Thus, it was concluded that adherence to the Mediterranean diet had a positive effect on the general condition of patients, contributed to weight normalisation and improved sleep quality and quality of life in general. This is because this type of food consists of a unique complex of fats, proteins, carbohydrates, starch, fiber, minerals, vitamins, and a large number of biologically active components: phytosterols, terpenes, and polyphenols. Together, they help reduce oxidative stress and chronic inflammation, improve lipid metabolism, and normalise platelet aggregation. It is worth noting that the Mediterranean type of diet is not just a certain set of products but rather a way of life that includes eating food in moderate portions, cooking in a good mood using favourite utensils, moderate daily physical activity, including walks, healthy, high-quality, full sleep. All of this together significantly improves the prognosis for heart failure. Over the past decades, researchers have focused on the benefits of certain dietary patterns rather than just individual components. Thus, the most well-known and relevant nutritional models are the Mediterranean diet (the benefits of which were described in this study), approaches to the treatment of hypertension, and the Nordic diet. These types of nutrition are considered the most beneficial, as they reduce the risks of the onset and progression of most currently known non-communicable diseases (Table 1).¹⁰⁻¹⁴

Regular physical activity ensures better cardiovascular functioning, improves the prognosis of heart failure, and reduces the risk of early mortality. This requires 150 to 180 minutes of activity per week. This can include cycling, daily walks, walking up and down the stairs, and playing with children. Studies by Wang *et al.* have reported that in a group of patients with heart disease, a 13% reduction

in mortality risk was recorded after a 12-week moderate-intensity exercise program.¹⁵ At the same time, regular exercise reduces oxidative stress, the level of pro-inflammatory cytokines, anxiety, and stress. Exercise leads to an increase in the production of neurotransmitters and hormones and improves appetite, sleep quality, and overall well-being. Smoking cessation and low/no alcohol consumption are important factors in preventing early mortality. Smoking increases the risk of heart attack several times in middle-aged people. At the same time, smoking cessation for 5 years or more significantly reduces the risk of premature death. Frequent consumption of alcoholic beverages contributes to high blood pressure, lipid metabolism, and overweight or obesity.

Stress causes an increase in heart rate and blood pressure due to the increased release of adrenal hormones. Prolonged exposure to stress factors increases blood flow, increases the heart's need for oxygen, and can lead to the development of coronary heart disease, hypertension, heart attacks, and arrhythmias.¹⁶ In addition, prolonged exposure to stress worsens the quality of sleep and contributes to excessive consumption of alcohol and medical and psychotropic substances. To combat stress, walking is useful, as it produces myokines that help improve overall health and reduce anxiety; discussing the problem with loved ones and trying to find rational ways to solve it; and, if necessary, consulting a psychologist to prevent several chronic diseases, including cardiovascular diseases. Sleep quality affects the state of the cardiovascular system. Short-term inadequate sleep is associated with an increased risk of developing hypertension, coronary heart disease, stroke, metabolic syndrome, and chronic heart failure. The recommended sleep duration for adults is 6-8 hours per day. It is useful to fall asleep at 10-12 p.m. with the lights off, as this is when the necessary hormone melatonin is produced. Thus, in conclusion, the main ways to improve the prognosis of heart failure are daily consumption of healthy food (in particular, the Mediterranean type of diet), physical activity of 150 to 180 minutes per week, alcohol restriction and smoking cessation, healthy sleep, and reduction of stress factors.

Discussion

Polish researchers Kasprzak *et al.* found that about 1.2 million people in Poland have symptomatic heart failure, with mortality rates of more than 140 thousand patients per year.¹⁷ Therefore, scientists have considered new strategies to improve the prognosis of heart failure. It has been shown that the presence of anemia significantly worsens the prognosis. At the same time, its occurrence is not related to the age of patients and ventricular ejection fraction. Therefore, it is recommended that all patients with heart failure be screened for hemoglobin and blood iron levels; intravenous iron supplementation in the form of an iron-carboxy-terminal complex should be prescribed, if necessary, to reduce symptoms and improve exercise tolerance in patients with a left ventricular ejection fraction less than 45% and a ferritin level less than 100 µg/L. The study also described that the prognosis of heart failure depends on the level of macronutrient and trace element concentrations. In particular, it was found that limiting salt (sodium) intake to 2000-2300 mg/day has a positive effect on blood pressure and cardiovascular health.

Daubert and Douglas studied the risks of developing heart failure in women.¹⁸ It has been shown that women with heart failure have a higher BMI and a higher left ventricular ejection fraction, and are more likely to have concomitant hypertension and renal failure compared to men. According to the research of the authors, 63% of women with heart failure have coronary heart disease and ischaemic cardiomyopathy. It is also more difficult for women to achieve adequate blood pressure control compared to men (44.8% vs 51.1%), and this figure becomes even lower with age; after the age of 70, only 29% of women have controlled blood pressure. This is due to increased stiffness of the arteries, excessive activation of the renin-angiotensin system, and impaired water and salt metabolism as a result of age-related postmenopausal changes in hormone metabolism.^{19,20} At a young age, due to the influence of estrogen, women regulate blood pressure and protect the vascular endothelium from the development of atherosclerosis, but with age, this protective effect of estrogen significantly decreases.²¹

Female and male gender hormones have different effects on medication metabolism, which leads to different required dosages of medicine and manifests itself in different side effects. Women have a better response to diuretics, angiotensin-converting enzyme inhibitors, and beta-blockers, so a lower dosage of these medicines is sufficient. Correct lowering of blood pressure in women (systolic blood pressure <120 mmHg) was associated with fewer cases of acute uncompensated heart failure. In the presence of gestational diabetes, pre-eclampsia, eclampsia and preterm birth, the risk of heart failure increases by 80%, and the likelihood of an early stroke in such patients doubles. There is also a link between type 2 diabetes in women and the development of chronic heart failure and a reduced left ventricular ejection fraction.²² It has been shown that older women with diabetes mellitus have a 5-fold increased risk of developing coronary heart disease and ejection fraction disorders compared to men. Physical interventions are quite effective for women. With 60-150 minutes of brisk walking per week, postmenopausal women showed a 10% reduction in the development of heart failure. The study also noted that about 150-180 minutes of moderate physical activity per week are required for adequate cardiovascular functioning. Mu *et al.*, Trautwein and McKay, Cena and Calder studied the role of sodium restriction in the course of cardiovascular failure.¹⁰⁻¹² In patients with heart disease, the renin-angiotensin-aldosterone system is activated, and vasopressin levels increase, leading to increased sodium and water retention in the body and, accordingly, increased stress on the cardiac system. Therefore, many diets recommend limiting the amount of sodium to reduce the burden on the heart, normalise blood pressure, and reduce the symptoms of heart failure.

Bojang and Manchana, Monteiro *et al.*, S.A. Jebb have also shown that reducing the consumption of polyunsaturated fatty acids and replacing them with polyunsaturated ones reduces the risk of developing cardiac disease.²³⁻²⁵ Replacing 5% of the total intake of polyunsaturated fatty acids with polyunsaturated fatty acids reduced the likelihood of coronary heart disease by 10%. Increasing the consumption of dietary fibre (contained in vegetable peels, potatoes, nuts, and whole grain products) leads to normalisation of the gastrointestinal system, reducing the risk of cardiovascular disease and type 2 diabetes. For example, daily consumption of 3.5 g of oat beta-glucan helped to reduce low-

density lipoprotein by 4.8% compared to the control group. This study also confirmed the benefits of fiber and whole grain products, which are important components of the Mediterranean diet.

Kasprzak *et al.* found that about 40% of Polish patients with chronic heart failure die within 5 years of diagnosis.¹⁷ As such, scientists described in detail the necessary pharmacological interventions for heart failure. For example, to minimise symptoms of cardiac disease, patients should be prescribed loop diuretics, while this group of medicines is not prescribed for a long time and does not improve the prognosis in the long term. It has been shown that patients with a reduced left ventricular ejection fraction should be prescribed Renin-Angiotensin-Aldosterone System Inhibitors (iRAAS), beta-blockers (bisoprolol, carvedilol, metoprolol), mineralocorticoid receptor antagonists (spironolactone), sodium and glucose co-transporter type 2 inhibitors (dapagliflozin, empagliflozin). iRAAS inhibit the activity of the angiotensin-converting enzyme and blocks receptors for angiotensin 2. It has been proven that they improve prognosis, provided that the dosage is correctly selected and used continuously at the recommended maximum doses.

Valsartan is recognised as a first-line medicine in the treatment of chronic heart failure in patients with reduced left ventricular ejection fraction.^{26,27} However, before prescribing this group, it is necessary to determine the level of potassium in the blood serum, assess kidney and liver function, and measure blood pressure. The results of randomised placebo-controlled trials using beta-blockers in patients with heart failure showed a 35% reduction in the risk of death compared to placebo. It was found that spironolactone reduced the risk of hospitalisation in patients with chronic heart failure and a left ventricular ejection fraction >45%. However, when prescribing this medicine, it is necessary to carefully monitor the level of creatinine blood electrolytes (potassium, sodium), and glomerular filtration rate.

Dapagliflozin is a representative of a relatively new but highly effective group of medicines. The medicine functions by reducing glucose reabsorption, lowering the renal threshold for glucose, and, accordingly, increasing glucose excretion, nephroprotective effect, and reduction of preload and postload on the left ventricle (by increasing osmotic diuresis, lowering plasma levels, and reducing

blood pressure).²⁸ A study found that patients taking dapagliflozin had a 17% reduction in the relative risk of all-cause mortality, a 25% reduction in the risk of death from heart failure, and improved general health and quality of life.

The results of this investigation offer strong proof that individuals with preserved ejection fraction and chronic heart failure can benefit in a variety of ways from implementing the Mediterranean diet. Notably, subjective quality of life measurements and objective clinical markers significantly improved when the Mediterranean diet's tenets were followed. Notably, favourable benefits were noted in important cardiovascular risk indicators, such as a drop in the percentage of patients who were overweight and an average blood pressure reduction. The Mediterranean diet's capacity to encourage weight loss highlights its potential to help heart failure patients with obesity-related problems. The Mediterranean diet is a potentially effective non-pharmacological intervention for enhancing prognosis and quality of life in the treatment of chronic heart failure, as demonstrated by these multifaceted favourable outcomes.

Conclusions

The study concluded that many millions of people around the world suffer from heart failure. This disease significantly worsens the quality of life, reduces its duration, and is incurable. At the same time, the development of heart failure can be prevented by reducing the impact of pathological factors. Pathologically controllable factors that worsen the prognosis of heart disease are poor nutrition, lack of sufficient physical activity, insufficient sleep, overweight and obesity, exposure to stress, alcohol consumption and smoking, high uncontrolled blood pressure, high cholesterol and abnormal lipoprotein ratios, and atrial fibrillation. All of these factors can be influenced by maintaining a healthy diet, getting 150 to 180 minutes of physical activity per week, quitting bad habits, and controlling stress.

The study found that adherence to the principles of the Mediterranean diet improved the quality of life of patients, according to the quality-of-life questionnaire (the mean score was 81.3 at the beginning of the study and 87 at the end of the study), and the level of adherence to the Mediterranean diet in the study group increased from 30 points to 39.7, according to the MDS scale. There was also an improvement in appetite and sleep quality. A decrease in the average blood pressure in the group was recorded (from 140/95 to 137/88 mmHg). It was found that due to proper nutrition, the participant's BMI was reduced (from 31.2 kg/m² to 29.6 kg/m²), and the percentage of overweight people in the study group was also reduced from 44% to 26%. It was noted that no deterioration in heart failure class or functional class was recorded during the study. The left ventricular ejection fraction remained unchanged. The main mechanisms that contribute to the improvement of the cardiovascular system when following the Mediterranean diet are the reduction of oxidative stress, normalisation of lipid metabolism, and platelet aggregation. At the same time, further research is needed on the pathophysiological mechanisms of the Mediterranean diet's effect on heart failure and its prognosis.

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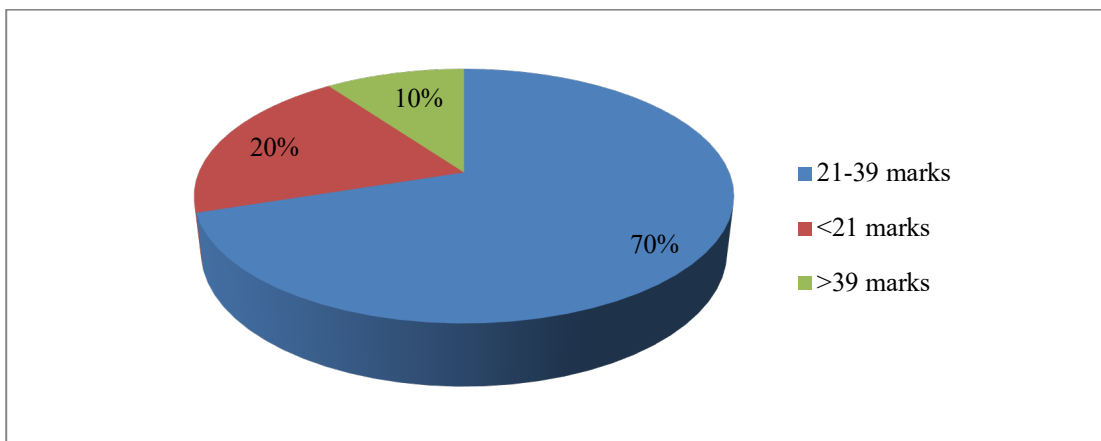


Figure 1. Indicators of compliance with the Mediterranean diet before the study.

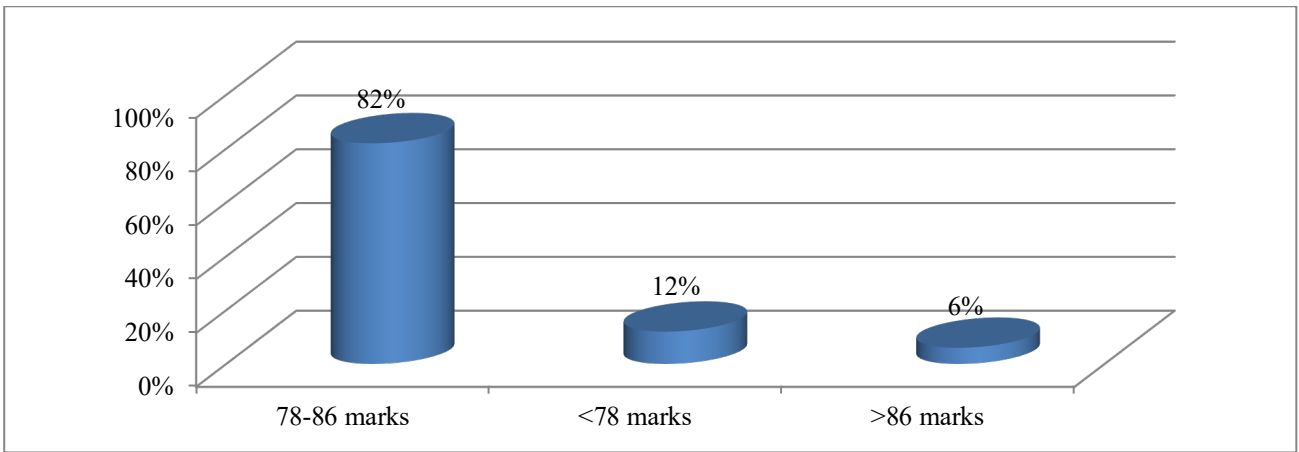


Figure 2. Assessment of quality of life before the study.

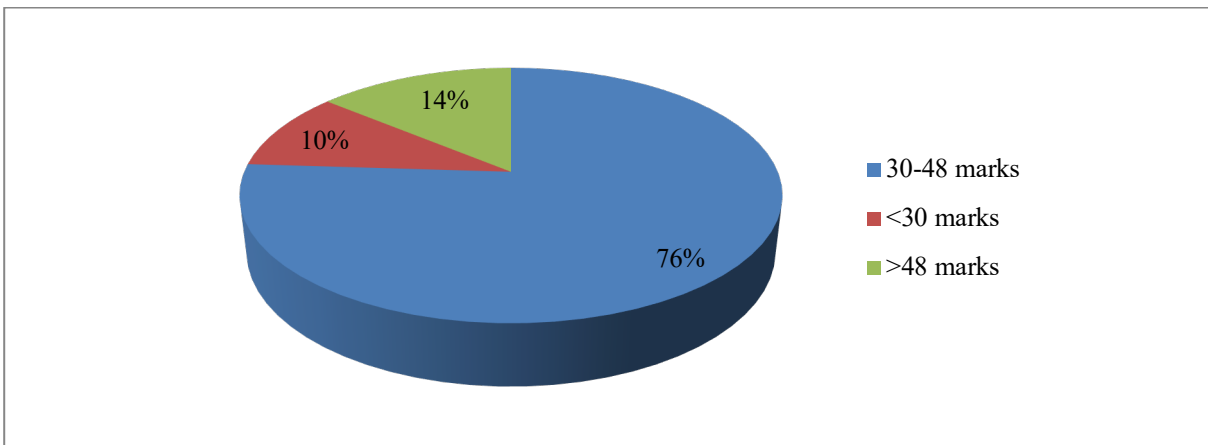


Figure 3. Mediterranean compliance rates after a nine-month study.

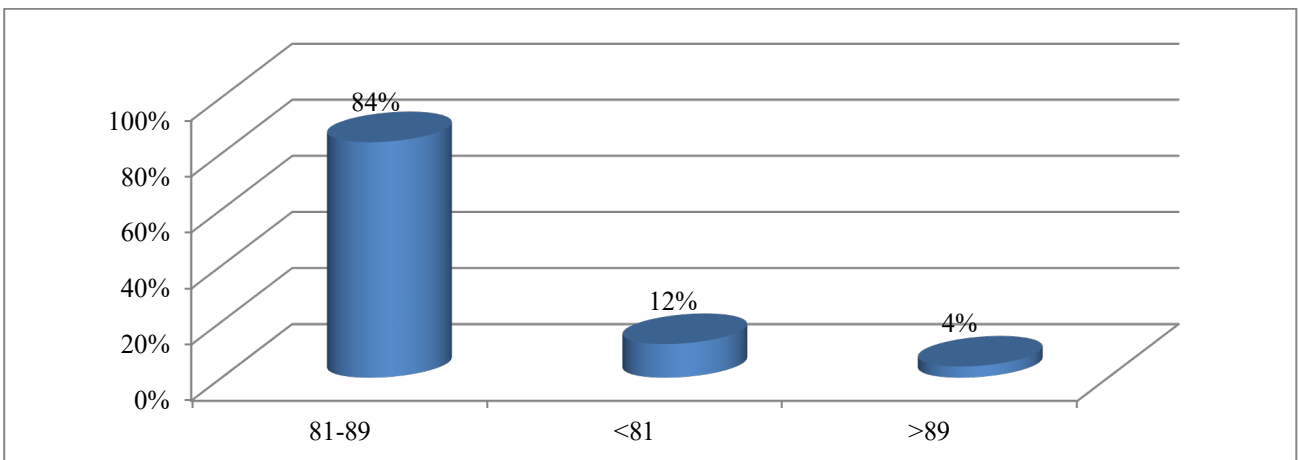


Figure 4. Assessment of quality of life after the study.

Table 1. Models of healthy eating.¹⁰⁻¹⁴

Product name	Mediterranean diet	Anti-hypertension diet	Northern diet
Fruit	1-2 servings per day, daily consumption	5 servings daily	200-250 g/day
Vegetables	2 or more servings per day, daily consumption	5 servings daily	200-250 g/day
Whole grain products (bread, pasta, rice)	2 servings per day, daily consumption	7-8 servings daily	5 slices of bread per day; pasta 3 times a week
Dairy	Low-fat foods 1-2 times a day (usually yoghurts)	Low-fat products; 2-3 servings daily	Low-fat dairy
Seeds, nuts and beans	Seeds and nuts 1-2 servings daily; beans more than 2 servings per week	4-5 servings daily	Preferably almonds 10-20 g/day
Meat	Red meat 1-2 servings per week; white meat 2 or more servings per week	Low-fat varieties 1 portion per day (preference is given to white meat)	Red meat less than 500 g/week; poultry less than 300g/week
Seafood and fish	>2 times a week	Low-fat types 1 serving per day ¹ ; 1 serving daily	3-5 servings weekly
Unsaturated fats, oils	1-2 servings per day, including daily consumption of olive oil	2-3 servings per day (unrefined oils, including sunflower and olive).	1-2 servings daily
Sweets	Less than 2 servings per week	Less than 2-3 servings weekly	2 or less times a week
Alcohol	Wine in moderation	Women 1 or less drink per day; men 2 or fewer drinks per day	In moderation

Other	Water as a primary drink; eggs 2-3 servings per week; potatoes less than 3 servings per week; daily consumption of herbs and spices; sweets and cakes – rarely	The main idea of this diet is to reduce the intake of table salt to 2000-2300 mg/day	Eggs 1-2 servings per week; potatoes 100-250 g/day
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