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The effect of Mediterranean diet instructions on depression, anxiety, stress, and anthropometric indices: A randomized, double-blind, controlled clinical trial

Nima Radkhah [a], Ahmadreza Rasouli [a,b], Amin Majnouni [a], Eslam Eskandari [c], Karim Parastouei [c,*]

[a] Nutrition Research Center, Department of Clinical Nutrition, Nutrition, and Food Sciences, Tabriz University of Medical Sciences, Tabriz, Iran
[b] Student Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran
[c] Health Research Center, Life Style Institute, Baqiyatallah University of Medical Sciences, Tehran, Iran

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ABSTRACT

Evidence suggests that adopting a healthy diet, such as the Mediterranean Diet (MD), can positively affect mental health. To further explore this, a study was conducted to determine the impact of MD instruction over 12 weeks on depression, anxiety, stress, and anthropometric indices. The study is a randomized, double-blind, controlled clinical trial with sixty participants who reported stress, anxiety, and depression conducted in Tabriz, Iran (2022–2023). They were randomly assigned to either the intervention group (n = 30), which received MD instruction, or the control group (n = 30), which received standard healthy nutrition education. Both groups were asked to follow their respective nutrition education plans for 12 weeks. After 12 weeks, depression, anxiety, and stress levels were measured using the DASS-21 questionnaire, and anthropometric indices were assessed. Initially, the unadjusted DASS-21 scores for depression, anxiety, and stress did not show significant differences between the two groups. However, after adjusting for baseline variables (model 2), all scores decreased significantly (the P-value for all scores was < 0.001). There was no significant difference in weight and BMI between the intervention and control groups. However, after adjusting the results based on baseline values (Model 2) and adherence to the program (Model 3), weight and BMI were significantly reduced in the MD group (P-values for both cases and both models were < 0.001). Overall, despite some significant findings, the results were not noticeable from a clinical perspective. The study provides some indications that following the Mediterranean diet may lead to improvements in weight and mental well-being.

1. Introduction

Mental disorders are a significant issue worldwide, as stated by the Global Burden of Disease. Despite the availability of multiple treatment options, the burden of mental disorders has not decreased since 1990 (Global Burden of Disease Study, 2019). Many experts urge mental disorders to be included in the "big four" non-communicable disease framework, which includes cancer, diabetes, respiratory and cardiovascular diseases (Stein et al., 2019; O'Neil et al., 2015). Mental disorders such as severe depression and anxiety affect 4.7 % and 7.3 % of the global population, respectively (Baxter et al., 2013; Ferrari et al., 2013). In Iran, almost 21 % of adults have mental disorders, with depression and anxiety being the most prevalent (Noorbala et al., 2004).

To effectively reduce the burden of mental disorders, it is crucial to understand the factors contributing to their incidence and prevalence comprehensively (1). It is widely known that poor dietary habits can increase the risk of mental disorders (Marx et al., 2017; Marx et al., 2021). Specifically, studies have primarily focused on the link between poor diet and depression (Li et al., 2017; Lassale et al., 2019). This connection has been studied by analyzing diet quality indices, dietary patterns, and specific food items such as red meat, processed meat, refined grains, saturated fat, and sugar intake (Li et al., 2017; Lassale et al., 2019; Rahe et al., 2014; Jacka et al., 2014).

Moreover, studies have found an association between consuming

Abbreviations: HLS, Healthy Lifestyle Score; WHO, World Health Organization; DASH, Dietary Approaches to Stop Hypertension; MD, Mediterranean Diet.

* Corresponding author at: Health Research Center, Life Style Institute, Baqiyatallah University of Medical Sciences, Tehran, Iran.
E-mail address: parastouei@gmail.com (K. Parastouei).

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nutrients like zinc, magnesium, B vitamins, healthy fats (such as olive oil), and certain food groups, including seafood and fish, and a lower risk of depression (Quirk et al., 2013). Certain diets, like the Mediterranean diet (MD) and Dietary Approaches to Stop Hypertension (DASH), have also been linked to a reduced risk of depression (Valipour et al., 2017; Jacka et al., 2010). Conversely, stress has been linked to an increase in snacking and fast food consumption (Sangsefidi et al., 2020). Traditional diets have been associated with higher rates of mental health issues, and in one study, a diet high in hydrogenated vegetable oil, meats, and salts was linked to an increased risk of anxiety and depression in women (Heidari et al., 2019). As a result, dietary patterns are increasingly being examined as predictors (Quirk et al., 2013).

Furthermore, mental disorders such as anxiety and stress have a two-way relationship with obesity (Simon et al., 2006). However, this relationship has not been extensively researched, but evidence is being gathered on the link between obesity and various psychiatric conditions (Rajan and Menon, 2017). Studies have shown that depression and obesity are positively correlated, especially among women in the general population (Ouakinin et al., 2018). Moreover, common mental disorders, particularly anxiety, are associated with a greater risk of obesity (He et al., 2021). Current evidence indicates that obese individuals have a 55 % higher risk of depression, and those with depression have a 58 % higher risk of obesity (Luppino et al., 2010).

Maintaining a healthy lifestyle and following a proper diet has been proven to lower the likelihood of experiencing depression and other mental health problems (Bonnet et al., 2005). The MD, one of the well-known healthy diets, focuses on consuming extra virgin olive oil, a variety of vegetables (particularly green leafy ones), fruits, seeds, and legumes, a moderate amount of meat and dairy, red grape juice, and limiting the intake of eggs and sweeteners (Willett et al., 1995). Research suggests that following the MD can lower the risk of cardiovascular disease, Alzheimer's, cognitive impairment, type 2 diabetes, cancer, and obesity (Keys, 1995; Sofi et al., 2008). While initial research has suggested that there may be a positive correlation between MD and mental health, there is a lack of clinical trials that have thoroughly explored this connection. In order to address this gap in knowledge, this study aims to evaluate the effect of MD instruction on depression, anxiety, stress, and anthropometric measurements.

2. Methods

2.1. Study protocol

This study is a double-blind, randomized, controlled trial, which was registered in IRCT (https://www.irct.ir, registration: IRCT20180201038585N8). Moreover, this article was reported based on Consolidated Standards of Reporting Trials (CONSORT) statements. The primary outcome is changes in depression, anxiety, and stress after 12 weeks of MD instruction. Secondary outcomes included the effect of 12 weeks MD on anthropometric parameters.

This study was conducted according to the guidelines in the Declaration of Helsinki, and the Baqiyatallah University approved all procedures involving research study participants of Medical Sciences. Written informed consent was obtained from all subjects/patients after full knowledge of the objectives and procedure of the study.

2.2. Study population and randomization

The clinical trial was conducted in Tabriz, Iran, from 2022 to 2023. The study included 20–59 years old individuals referred to Psychiatric Clinic with depression, stress, or anxiety diagnosed for over a month. In addition, this study excluded: 1- Individuals with a BMI of less than 18.5 and more than 40 kg/m2. 2- Individuals with over-reporting or under-reporting food intake (<800 and > 4200 Kcal/day), stresses such as divorce, financial bankruptcy, love failure, and death history of first-degree relatives and close friends in the last six months. 3- Individuals diagnosed with inflammatory diseases and other specific diseases such as diabetes, cardiovascular, cancer, hypertension, kidney diseases, liver diseases, hyperthyroidism, epilepsy, and MS. 4- Pregnant and lactating females. Participants who failed to complete the questionnaires and follow instructions correctly were also excluded.

Neither the participants nor the researchers were informed about who was receiving a particular treatment. A team member, who was not involved in other parts of the study, utilized Random Allocation Software to generate a random allocation sequence with an allocation ratio of 1:1 and randomly assigned participants to either the MD or control groups. In addition, this member provided dietary instructions to the participants.

2.3. Intervention and instruction

2.3.1. Intervention group (MD)

At the beginning of the trial, an independent team member instructed and asked participants in the MD group to follow the MD guidelines for 12 weeks. The education on the MD includes the following: 1- Change protein type. Use more vegetable proteins such as beans, peas, and nuts. 2- Eat fish at least two to three times a week. Use oily fish such as salmon. 3- Try not to cook fish in a fried way. Use white meats such as chicken and turkey every 2–3 days. 4- Limit red meat, such as beef and veal, to once a week. Avoid processed meats such as sausages. 5- Modify oil intake and use olive oil and remove solid oils. 6- Reduce the consumption of butter and replace it with healthy oils. If olive oil is not available, use canola oil. 7- Increase consumption of vegetables; consume at least three glasses of different vegetables with different colors daily. 8- Eat more fruits; eat at least two seasonal fruits daily. 9- If possible, consume 30 g of raw nuts daily, such as pistachios, walnuts, almonds, and hazelnuts. 10- Choose whole-meal and whole-grain bread. Whole grains are darker in color than bran-free bread. Reduce rice consumption to a maximum of twice a week. 11- Limit the consumption of simple sugars such as sweets, cakes, candies, desserts, and soft drinks.

2.3.2. Control group

At the beginning of the trial, an independent team member instructed and asked participants in the control group to follow the Healthy eating pattern for 12 weeks. The guideline for the control group is as follows: 1- Remove solid and saturated oils. Use liquid oils. 2- Reduce the consumption of animal fats. 3- Reduce salt consumption and remove table salt. 4- Drink at least two glasses of milk a day. 5- Try to have three times of physical activities during the week, such as walking. 6- Reduce the consumption of fatty foods. 7- Avoid eating large amounts of food per meal. 8- Do not remove any meal. 9- Always eat breakfast. 10- Eat three main meals and snacks daily. 11- Wait 2 h after eating to drink tea or coffee.

2.4. Assessments

2.4.1. General information

Demographic data about the participants was obtained using a questionnaire at the first visit. Information on age, marital status, drug history, home address, education level, occupation, smoking and drinking habits, family history of diabetes and estrogen stroke, and multivitamin supplementation in the last month were collected.

2.4.2. Patient compliance

The patient's adherence to the training was monitored by phone at four-week intervals during the intervention. The patients were asked to rate their adherence on a scale from 0 to 10 at the end of the study. This data was used to adjust the results by adherence of the patients.

2.4.3. Evaluation of mental health indices

Three states of depression, anxiety, and stress were measured to evaluate mental health at the beginning and the end of the intervention.

Shortened Persian version of the 21-item DASS questionnaire, which Samani and Jokar have validated (Samani and Jokar, 2008), was used to assess the state of depression, anxiety, and stress. In order to complete the questionnaire, individuals must determine the status of symptoms during the past week. Each of the three DASS scales consists of 7 questions; each score from zero (It does not apply to me at all) to three (This is absolutely true of me). Each question includes answers 1 (low), 2 (medium), and 3 (high). Participants answered the questions based on last week's condition. The final score of each subscale was obtained by summing the scores of the questions related to that subscale, and finally, the scores for each subscale were counted together, and the total score, which is a number between 7 and 21, was calculated.

2.4.4. Healthy lifestyle score evaluation

The Healthy Lifestyle Score (HLS) questionnaire was completed at the first of the study. This questionary includes five items: smoking, alcohol consumption, BMI, diet quality, and amount of physical activity. Each item has 1 point. BMI between 18.5 and 40, not consuming alcohol and not smoking, adherence to any healthy diet including DASH, TLC, or the Mediterranean, and regular weekly activity receive one point. The total score represents the total score of the HLS.

2.4.5. Anthropometric assessments

Anthropometric indices, including weight and height, were measured according to the WHO standard protocol at the beginning and at the end of the intervention. The height was measured with a wall-mounted height gauge (Seca, Germany) with an accuracy of 1 mm. During this procedure, participants removed their shoes and attached their heels to the wall while facing forward. Using a digital scale (Seca, Germany), the weight was measured with minimal clothing, bare feet, and while fasting. The accuracy of weight measurement was about 100 g. The measurements were rounded to the nearest 0.5 cm and 0.1 kg.

2.4.6. Food intake evaluation

Dietary data were collected using a 148-item food frequency questionnaire (FFQ) which was previously validated (Brunner et al., 2001; Willett et al., 1985) at the first visit. Participants were asked how often, on average, they had consumed that amount of the item during the last three months, with nine responses ranging from 'never or less than once per month' to 'six or more times per day.' Moreover, participants were asked to include additional drinks and foods and frequency of consumption by manual entry.

2.4.7. Physical activity assessment

The physical activity level of participants was assessed using the International Physical Activity Questionnaire (IPAQ) at the first visit. This scale evaluates three types of physical activities: low-intensity, moderate-intensity, and vigorous-intensity. It classifies participants into three activity levels: high, moderate, and low. These different intensities of activities are considered as follows: <3 METs, 3–6 METs, and >6 METs, respectively.

2.4.8. Statistical analysis

In order to determine the sample size for the study, the mean difference in the DASS-21 score variable between the intervention and control groups from the Parletta et al. (Parletta et al., 2019) study was used. This difference was found to be 4.39, with a standard deviation of 3.73. Using Stata 14 (Stata Corp, college station, Texas, USA) and considering 95 % confidence, study power of 80 %, and 10 % dropout, a sample size of 60 was calculated. Normal distributed quantitative data were reported as Mean ± SD, and non-normal quantitative data as Median (Min and Max). In addition, qualitative data were presented as frequency and percentage. The normality of the distribution of variables was assessed using a histogram and Kolmogorov-Smirnov test. For variables that did not have a normal distribution, the logarithmic equivalent of the variable (Ln transformation) was used in the analysis. Data were presented as Mean ± SD and 95 % confidence interval. The ANCOVA test was used to examine the score changes in the intervention and control groups before and after the study to compare the data obtained from the DASS questionnaire. For model 2, the data was adjusted for age, gender, HLS, and MET variables at the baseline. As for model 3, the data was adjusted based on the patient's adherence. Statistical analysis was conducted using SPSS software version 24 (SPSS Inc., Chicago, IL, USA), with significance considered at P-value < 0.05.

3. Results

This research examined 60 individuals aged 20 to 59 who were experiencing depression, anxiety, or stress and had a BMI ranging from 18.5 to 40. The participants were divided into two groups - intervention and control (Fig. 1). The intervention group was provided training on the MD, including its components and implementation, and was asked to follow the diet for 12 weeks. On the other hand, the control group was given general nutrition education and asked to follow the instruction for 12 weeks.

Table 1 presents the general characteristics of the participants. The intervention group had 26 females and 3 males, while the control group had 26 females and 4 males. The average age of the intervention group was 35.3 (9.36), and the control group was 39.14 (8.99). There were no significant differences between the two groups in terms of age, gender, marital status, education level, employment status, or alcohol consumption at the start of the study. Additionally, there were no statistical differences between the two groups in terms of HLS and MET.

Table 2 reported the overall adherence score for instruction, which was 3.22 (2.41) for the MD group and 2.74 (2.25) for the control group. In addition, the reasons for not following diet-related training are displayed. The only significant difference between the groups is their economic power (P-value < 0.001).

At the beginning of the study, both groups had similar mental health factors (Table 3). There were no significant changes within each group in terms of mental health factors. Based on the unadjusted ANCOVA test, depression, stress, and anxiety did not indicate any significant differences between the two groups. However, after accounting for baseline values with Model 2, all three scores indicated a significant decrease (P-value < 0.001). In addition, after adjusting the results based on Model 3, there were no significant differences in the examined scores between the groups (Table 3).

At the end of the trial, there was no significant difference in the weight and BMI of each group compared to their initial values (Table 4). The unadjusted ANCOVA test found no statistical difference between the two groups. However, when the results were adjusted based on the baseline values (Model 2) and the adherence to the diet training variable (Model 3), the outcome reported a significant reduction in anthropometric indices (P-value < 0.001) (Table 4).

4. Discussion

Recently, much focus has been on studying the relationship between dietary patterns and different diseases. One such eating pattern that has been extensively researched is the MD. Some initial studies suggest that there may be a positive link between MD and mental disorders; however, there is a lack of clinical trials in this area. Therefore, this study aimed to examine the effect of MD instructions on depression, anxiety, and stress.

There are varying definitions of the MD, with certain food categories being emphasized in some definitions. Nevertheless, the MD typically consists of fresh and seasonal fruits and vegetables, fish, olive oil, whole grains, and other nutritious and high-quality foods (Wojda et al., 2021). In order to put it simply, this diet promotes the consumption of more fruits, vegetables, whole grains, legumes, nuts, seeds, and heart-healthy fats while discouraging the consumption of processed foods, added sugars, and refined grains (Wojda et al., 2021).

Over the past few years, various *meta*-analyses have explored the link

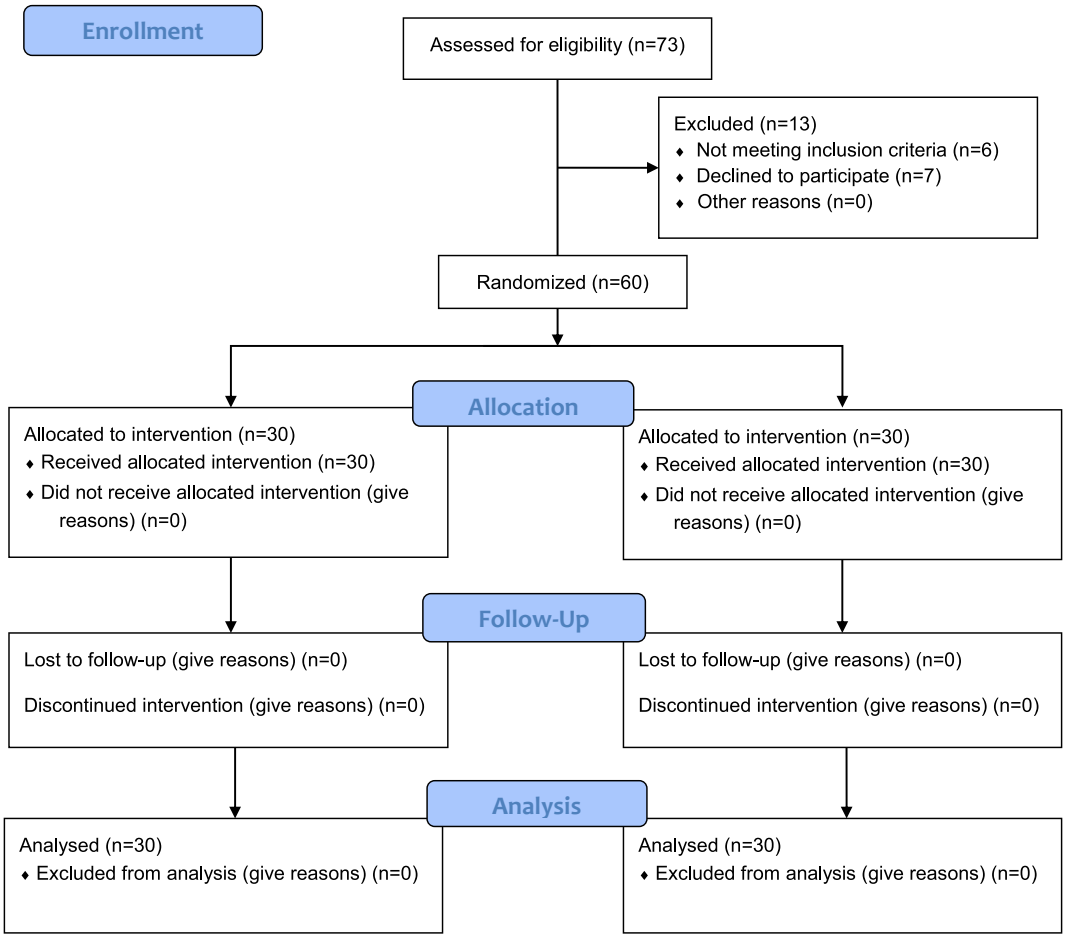

Fig. 1. The CONSORT flow diagram of the study.

between "healthy" and MD (Mediterranean Diet) patterns and the likelihood of depression. However, the results have been inconsistent, and comparing them is challenging due to differences in inclusion criteria, participant age, and analyzed outcomes. Nevertheless, previous *meta*-analyses in general populations have indicated that "healthy" dietary patterns can reduce depression risk over time (Lassale et al., 2019; Matison et al., 2021; Wu et al., 2021; Molendijk et al., 2018).

The initial findings of the present study indicate that the use of MD did not have a significant impact on mental disorders such as depression, anxiety, and stress. It is important to mention that both groups had low adherence to the instructions given, which could explain the lack of significant results. Nonetheless, after adjusting for confounding variables based on the baseline values (model 2), there was a significant decrease in depression, anxiety, and stress (Table 3). The Parletta et al. study conducted in 2019 involved 152 participants who were chosen based on the initial reports gathered from the DASS questionnaire. The MD group was given nutrition instruction from dietitians and took part in Mediterranean-based cooking workshops. They were also provided with fish oil capsules. The study results showed that the DASS depression score of the intervention group improved compared to the control group, which contradicts the present study. The significant outcomes were attributed to the group and practical training on cooking and healthy food menus that led to healthier food choices, as well as the availability of free food. This highlights the impact of socioeconomic status and affordability on food preferences (Parletta et al., 2019).

Our initial findings showed that weight and BMI did not significantly decrease. This could be due to the low adherence to the MD. Additionally, the two groups had a noticeable difference in economic power to follow instructions. However, after adjusting the results based on models 2 and 3 (Table 4), significant differences were observed between the groups. In a study conducted by Schroder et al., it was found that there is a significant correlation between an increase in the MD score and a decrease in BMI for both Spanish males and females (Schröder et al., 2004). Another study by Romaguera et al. on a sample of 351,730 individuals from 9 European countries revealed that adherence to the MD is significantly associated with lower prevalence of abdominal obesity in both genders (Romaguera et al., 2009).

Previous studies may have varying findings compared to the current study due to differences in how the Mediterranean Diet (MD) is defined and how food is prepared across different cultures. Additionally, the present study's low adherence to the prescribed MD may also account for these differences. Several mechanisms explain how healthy diets such as MD can offer protection against mental disorders. The nutrient content of a Mediterranean-style diet, which includes fiber, MUFA, omega-3 fatty acids, magnesium, vitamin B1, B2, B6, B12, and folate, may be responsible for its protective effects against mental disorders. While the exact mechanism is unclear, previous studies have demonstrated the positive impact of these nutrients on mental health (Skarupski et al., 2010; Xu et al., 2014; Rajizadeh et al., 2017). Moreover, the low glycemic index in MD may play a role in reducing the risk of insulin resistance. This, in turn, can help prevent neurological deficits in individuals with mental disorders (Haghighatdoost et al., 2016).

Noncompliance with the MD is linked to circulatory inflammation, a condition closely tied to mental health disorders (Pariante, 2017). A healthy diet can reduce the risk of depression through several mechanisms:

1. It contains much tryptophan, which is a precursor to serotonin.

Table 1
General characteristics of participants in the Mediterranean and control groups (Tabriz, Iran, 2022–2023).

Variables		Intervention group (n = 30)	Control group (n = 30)	P
Age (year) [Mean (SD)]		35.03(9.36)	39.14(8.99)	0.643[c]
Gender [n (%)]				0.628[a]
	Females	26(43.3)	27(45)	
	Males	4(6.7)	3(5)	
Marital status [n (%)]				0.558[a]
	Single	13(22.0)	13(22.0)	
	Married	17(28.8)	16(27.1)	
Education Level [n (%)]				0.765[b]
	Diploma and High school degree	7(11.6)	10(16.6)	
	Associate Degree and bachelor's degree	15(25.0)	14(23.4)	
	Higher than a bachelor's degree	8(13.3)	6(10)	
Employment status [n (%)]				0.258[a]
	Housewife	18(30)	15(25)	
	Employee	11(18.3)	15(25)	
Addiction [n (%)]				0.119[a]
	Yes	0(0.0)	3(5)	
	No	30(50.0)	27(45)	
HLS [Mean (SD)]		2.72(0.581)	2.68(0.909)	0.830[c]
MET [Mean (SD)]		578.46 (904.03)	683.67 (1069.50)	0.938[c]

HLS: Healthy lifestyle score; MET: Metabolic Equivalent.
[a] Fisher's exact test.
[b] Chi-Square.
[c] Independent samples *t*-test.

Table 2
Comparison of the reasons for noncompliance with the relevant training in the Mediterranean and control groups (Tabriz, Iran, 2022–2023).

Variables		Intervention group (n = 30)	Control group (n = 30)	P
Overall Score (0–10)		3.22 (2.41)	2.74 (2.25)	0.421[a]
Unwillingness				1.000[b]
	Yes	28(46.7)	28(46.7)	
	No	2(3.3)	2(3.3)	
Economic power				0.001[b]
	Yes	12(20)	25(41.7)	
	No	18(30)	5(8.3)	
Incompatibility				0.783[b]
	Yes	7(11.7)	9(15)	
	No	23(38.3)	21(35)	
Disbelieve				0.764[b]
	Yes	5(8.3)	7(11.7)	
	No	25(41.7)	23(38.3)	

[a] Independent samples *t*-test.
[b] Fisher's exact test.

2. It is rich in omega-3 and omega-6 compounds involved in anti-inflammatory pathways.
3. It contains high levels of folic acid, associated with lower levels of depression.
4. An increase in homocysteine in the body is linked to an increase in methionine, of which S-adenosyl methionine plays a crucial role in neurotransmitters.

Inflammatory mediators released from macrophages are responsible for the most significant mechanism. During illness or injury, microglia produce cytokines such as INF, IL2, and IL1. These agents stimulate the pathway of tryptophan to quinoric acid (an N-methyl-aspartic acid antagonist) and quinolinic acid (an N-methyl-aspartic acid agonist) by the indolamine dioxygenase. As a result, the level of tryptophan and serotonin decreases according to the mentioned mechanism. Moreover, increased levels of linolenic acid and its accumulation in the cell cause cell death, which may be another reason for protection against depression by increasing nerve growth factors (McIntyre et al., 2010).

Despite its strengths, this study had a small sample size and a short follow-up period. In addition, due to issues such as a lack of funding, the participants' adherence to their instruction was only investigated via

Table 3
Comparison of DASS depression, anxiety, stress, and total scores between the Mediterranean and control groups before and after the intervention (mean and standard deviation)(Tabriz, Iran, 2022–2023).

Variables	Intervention group (n = 30)	Control group (n = 30)	P[a]
DASS Depression Score			
Pre-intervention	13.06(6.82)	13.28(5.27)	0.714[a]
Post-intervention	12.88(5.49)	11.86(4.46)	0.429[c], <0.001[d], 0.302[e]
P[b]	0.701	0.130	
DASS Anxiety Score			
Pre-intervention	9.61(4.51)	11.12(3.74)	0.142[a]
Post-intervention	9.64(4.15)	10.94(4.28)	0.876[c], <0.001[d], 0.054[e]
P[b]	0.946	0.729	
DASS Stress Score			
Pre-intervention	13.58(4.56)	13.43(3.40)	0.648[a]
Post-intervention	13.36(3.43)	12.83(2.79)	0.670[c], <0.001[d], 0.588[e]
P[b]	0.394	0.161	
DASS Total Score			
Pre-intervention	36.46(13.70)	37.93 (10.47)	0.611[a]
Post-intervention	35.87(11.27)	35.92 (10.39)	0.694[c], <0.001[d], 0.915[e]
P[b]	0.591	0.213	

DASS: Depression Anxiety Stress Scales.
[a] Independent samples *t*-test.
[b] Paired Samples *t*-test.
[c] Analysis of covariance (ANCOVA) unadjusted (Model 1).
[d] Analysis of covariance (ANCOVA) after adjusting baseline values (Model 2).
[e] Analysis of covariance (ANCOVA) after adjusting compliance with relevant training (Model 3).

Table 4
Comparison of anthropometric indices (weight and BMI) between the Mediterranean and control groups before and after the intervention (mean and standard deviation) (Tabriz, Iran, 2022–2023).

Variables	Intervention group (n = 30)	Control group (n = 30)	P[a]
Weight			
Pre-intervention	68.54(12.05)	65.97(10.70)	0.362[a]
Post-intervention	68.62(11.78)	65.96(11.46)	0.352[c], <0.001[d], <0.001[e]
P[b]	0.862	0.954	
BMI			
Pre-intervention	25.19(4.30)	24.82(3.38)	0.701[a]
Post-intervention	25.21(4.15)	24.78(3.46)	0.296[c], <0.001[d], <0.001[e]
P[b]	0.891	0.836	

BMI: Body Mass Index, MET: Metabolic Equivalent.
[a] Independent samples *t*-test.
[b] Paired Samples *t*-test.
[c] Analysis of covariance (ANCOVA) unadjusted (Model 1).
[d] Analysis of covariance (ANCOVA) after adjusting baseline values (Model 2).
[e] Analysis of covariance (ANCOVA) after adjusting compliance with relevant training (Model 3).

phone, and the adherence rate was low in both groups, which may have impacted the validity of our findings. Therefore, better decisions in this field require studies with a larger sample size and a more extended study period.

5. Conclusion

Our initial findings showed that following the Mediterranean diet did not have an impact on mental disorders and body measurements. This could be attributed to the participants' low adherence to the instructions, which was mainly due to their financial situation. However, our results changed after adjusting for other factors that could have influenced the outcome. We observed a decrease in scores related to mental disorders and body measurements. Despite some significant findings, the results were not noticeable from a clinical perspective. Based on our findings and the study's limitations, there are indications that individuals who follow the Mediterranean diet may benefit from the advice to improve their weight and mental well-being.

6. Authorship

NR, EE, and KP conceived and designed the analysis; NR, AR, and AM collected the data; NR and AR contributed data or analysis tools; NR and KP performed the analysis; NR, EE, and KP wrote the paper.

7. Financial support

None.

Declaration of competing interest

All authors declare that they have no conflicts of interest.

CRediT authorship contribution statement

Nima Radkhah: Conceptualization, Methodology, Investigation, Writing – original draft, Writing – review & editing. **Ahmadreza Rasouli:** Methodology, Investigation, Writing – original draft, Writing – review & editing. **Amin Majnouni:** Investigation, Writing – review & editing. **Eslam Eskandari:** Conceptualization, Methodology, Writing – review & editing. **Karim Parastouei:** Conceptualization, Methodology, Software, Formal analysis, Writing – review & editing, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

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