

Research Article

Effect of the Composition of the Mediterranean Diet on Body Mass Index, Waist Circumference, Fat Level, and Visceral Fat in Patients with Obesity

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Abstract.

Excessive and unhealthy fat storage is known as obesity. Both monounsaturated and polyunsaturated fatty acids are highly encouraged in the Mediterranean diet. Obese patients at a Bandung clinic were studied to examine how the Mediterranean diet affects their BMI, waist size, fat percentage, and visceral fat. Analytical observational methods utilizing prospective cohort observations were employed. A systematic random sample technique was used to carry out the sampling. Participants were 34 overweight individuals who had twelve monthly food pattern assessments and two monthly examinations for body mass index (BMI), waist size, fat percentage, and visceral fat. To compare proportions between the rMED adherence groups and to look for differences in the composition of the Mediterranean diet on BMI, waist circumference, fat content, and visceral fat, we used the ANOVA test and Tuckey's post-hoc test. In addition, the eight tenets of the Mediterranean diet were assessed using linear regression. The average age of the obese patients who followed the Mediterranean diet was 57.54 years, and 79.41% of them were female. It was found that the components of vegetables, fruits, nuts, seafood, and dairy products had a substantial impact on the body mass index of the participants, while the components of vegetables, fruits, nuts, legumes, seeds, meat, fish, olive oil, and dairy products did not have a significant impact on the waist circumference, fat content, or visceral fat.

Keywords: body mass index, fat content Mediterranean diet composition, obesity, visceral fat, waist circumference

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1. Introduction

Obesity is defined by the World Health Organization (WHO) as an abnormal accumulation of fat in the body that causes a variety of health concerns. According to World Health Organization report, 1.9 billion adults were overweight in 2016, with an additional 650 million classified as obese [1]. Obesity rates in Indonesia increased from 7.5% in 2007 to 14.8% in 2013 and 21.8% in 2018, as reported by RISKDESDAS in 2018. North Sulawesi province has the most obesity prevalence rate in Indonesia at 30.2%, followed by DKI Jakarta province and other regions. The prevalence of obesity in West Java Province in 2018 was ranked 14th out of 34 provinces in Indonesia with a rate of 23% and one of the cities with the greatest prevalence of obesity in Indonesia was Cimahi City with a rate of 24.87% followed by Bandung with a rate of 23.84% incidence of obesity [2].

Non-pharmacological management that can be done in obese people is lifestyle adjustments such as altering diet, and increasing physical activity. The Mediterranean diet is considered to be shown to reduce weight because the Mediterranean diet is a diet that stresses intake of monounsaturated fatty acids (MUFA) and consumption of polyunsaturated fatty acids (PUFA). This diet has been approved by The European Association for the Study of Obesity (EASO), and the Indonesian Endocrinology Association (PERKENI). In 2022, the Mediterranean diet is ranked top according to U.S News and World Report for the best plant-based diet, the best heart healthy diet, the best diabetic diet, the best diet for nutritious food, and the easiest diet [3-7]. This study intends to assess the influence of the composition of the Mediterranean diet on BMI, waist circumference, fat content, and visceral fat in obese patients. The hypothesis of this study is that there is an effect of Mediterranean diet components on body mass index, waist circumference, fat content, and visceral fat in obese people.

2. Material and Method

The study design used an observational analysis approach and prospective cohort principles to find out the influence of Mediterranean diet composition on body mass index, waist circumference and levels of fat and visceral fat in obese individuals for 3 months. This investigation was conducted at a clinic in the city of Bandung which contained prolans volunteers. The study was done from September to December 2022. The subjects of this study were obese patients who met the inclusion criteria. The

inclusion criteria in this study comprised patients with a body mass index (BMI) ≥ 25 kg/m², subjects with low physical activity, and subjects with a MEDAS score > 9 .

The sample size of this study is a minimum of 30 samples with data collection using systematic random sampling technique. The instruments and materials utilized for this investigation included a beam balance to measure body weight, a microtoise to measure height, a measuring tape to assess waist circumference, and Bioelectrical Impedance Analysis to test fat and visceral fat levels. This study used the Food Frequency Questionnaire (FFQ) as an extra tool to describe the frequency of food consumption in research respondents.

The analysis employed in this study was ANOVA or Kruska Wallis tests to find out comparisons in all adherence groups and then Tuckey or Mann Whitney post-hoc tests to find out which groups had differences in the degree of consumption of Mediterranean diet components. This study also employed a linear regression test to assess the effect of the total rMED score and the composition of the Mediterranean diet on BMI, waist circumference, fat content and visceral fat.

3. Result and Discussion

The study took place from September to December 2022 in a Bandung clinic. The study's findings informed the selection of a sample of 34 participants who fulfilled the study's inclusion criteria. The average age of the obese patients who followed the Mediterranean diet in this research was 57.59 years old, according to the statistics. Participants' ages ranged from 41 (the youngest) to 73 (the oldest) years old. Evidence suggests that white fat tissue accumulates with age. Triglycerides, which make up 90–95% of white fat tissue, are stored in white fat, and the larger size and quantity of fat in white fat contribute to the effect of increasing fat, which is a rise in body weight [8-10].

The results showed that out of the obese patients who followed the Mediterranean diet, 27 were female (or 79.41%), compared to 7 males (20.59%). Obesity is more common in women after menopause, suggesting that gender plays a role in its development. Reduced estrogen levels have an effect on lipoprotein production via lipoprotein lipase, which in turn causes triglyceride buildup. With a range of 23.98 to 34.25 kg/m², the average body mass index (BMI) among obese patients following a Mediterranean diet was 27.99 kg/m. Among overweight people following a Mediterranean diet, the average

waist measurement was 87.82 centimeters. Obese people often have a waist size ranging from 71 cm at the bottom to 101 cm at the top [11].

TABLE 1: Effects of mediterranean diet food components on body mass index, waist circumference, fat content, and visceral fat.

	p-value			
	BMI (kg/m ²)	Waist Circumference (cm)	Fat Level (%)	Visceral Fat (%)
Vegetables	0,011	0,206	0,320	0,635
Fruit and Nuts	0,012	0,846	0,172	0,545
Legumes and Seeds	0,156	0,773	0,767	0,788
Whole Grain	0,999	0,345	0,968	0,478
Meat	0,237	0,876	0,660	0,158
Fish	0,025	0,628	0,619	0,566
Olive Oil	0,151	0,813	0,192	0,469
Dairy Milk	0,030	0,274	0,734	0,771

A statistical analysis reveals a noteworthy correlation ($p=0.000<0.05$) between vegetable components and adherence to the Mediterranean diet. Adherence to the Mediterranean diet is significantly correlated with fruit components and nuts ($p=0.000<0.05$). Adherence to the Mediterranean diet is significantly correlated with legume components ($p=0.000<0.05$). The correlation between whole grain components and following the Mediterranean diet is statistically significant ($p=0.000<0.05$). Adherence to the Mediterranean diet is significantly correlated with red meat components ($p=0.000<0.05$). The fish component is significantly related to following the Mediterranean diet ($p=0.000<0.05$). The components of olive oil and compliance with the Mediterranean diet are significantly related ($p=0.000<0.05$), while the components of dairy products are significantly related to adherence to the Mediterranean diet ($p=0.006<0.05$). A statistically significant relationship between vegetable consumption and body mass index (BMI) is seen in Table 1. This is because eating veggies can help curb hunger pangs because of the fiber they contain, which is known to speed up the process of feeling full by increasing the amount of chewing required to break down food. Eating speed and volume are influenced by the activation of hypothalamic histamine neurons, which in turn suppresses H1 receptors, as can happen when food is chewed. Cholecystokinin is involved in stomach emptying regulation and promoting fullness; eating foods high in fiber can enhance its release [12,13].

A statistically significant relationship between fruit and nuts and body mass index (BMI) is seen in Table 1. It is known that the fruit's polyphenol content works to enhance thermogenesis and calorie expenditure. Additionally, it can hinder the differentiation of adipose tissue creation, boost lipolysis, activate β -oxidation, and thus transform energy intake into energy more rapidly. This state can aid in avoiding the buildup of TAG [14]. Because they contain fiber, which the digestive system has a hard time digesting, nuts are believed to aid weight loss by providing sustained energy throughout hunger pangs [12,15].

Table 1 shows that for all variables, there are no significant conclusions between seeds and legumes. The subject's failure to ingest the prescribed amount increases the likelihood that this will occur. The suggested daily allowance for legumes is 3-6 cups, while the recommended weekly allowance for whole grains is 60 grams, or three servings [16,17].

There are no statistically significant relationships between red meat and any of the other variables, according to Table 1. Red meat's protein and saturated fat content make it a potential trigger for this illness. A varied method of processing meat is another factor that causes weight gain when eating it. Weight gain due to processed beef is a real possibility, according to studies conducted in 2022 by Khodayari et al. This is due to the fact that processed meat is rich in calories and fat but short in protein, and it also contains nitrosamines, a carcinogenic substance with four times the salt level of original meat. Adipose tissue fat will accumulate under these circumstances [18,19].

Table 1 shows that there is a statistically significant relationship between fish and body mass index. This is due to the fact that fish is a good source of omega-3 polyunsaturated fatty acids (PUFA), which have anti-obesity effects by regulating gene expression to boost energy expenditure and decrease body fat storage and improve fat oxidation [20,21].

There are no statistically significant relationships between olive oil and any of the other factors, according to Table 1. Because linolenic acid is naturally more susceptible to oxidation, which causes cellular instability and inflammation and ultimately makes obesity more likely. An example of this mechanism in action is the conversion of linolenic acid to arachidonic acid, which in turn triggers the creation of adipose tissue, activates macrophages, and increases inflammation, ultimately leading to obesity [22,23].

There is a statistically significant relationship between dairy products and body mass index (BMI), as seen in Table 1. Dairy products' high calcium content causes this

condition by preventing the production of fat by lowering the expression of two genes that are involved in adipogenesis: peroxisome proliferator-activated receptor gamma (PPAR) and CCAAT/enhancer-binding protein alpha (C/EBP). By influencing adipocyte intracellular Ca^{2+} levels, calcium consumption can likewise reduce lipogenesis and enhance lipolysis. According to a 2012 study by Sun et al., people whose diets are rich in calcium have lower body fat percentages and lower expression of genes involved in lipogenesis (such as fatty acid synthetase, or FAS), and higher expression of genes involved in lipolysis (such as hormone sensitive lipase, or HSL). A reduction in body fat and subsequent weight loss are symptoms of this illness [24,25].

4. Conclusion

Patients with obesity who followed the Mediterranean diet in this research had an average age of 57.59 years, according to the results. A whopping 79.41% of the obese people who followed the Mediterranean diet plan were women. Vegetables, fruits, nuts, seafood, and dairy all have a role in determining body mass index (BMI) in overweight and obese people. In individuals who were overweight, the impact of various food groups on waist size, total fat, and visceral fat was insignificant. This included fruits and nuts, legumes, seeds, meat, seafood, olive oil, and dairy products.

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