EXPLORING THE ROLE OF NUTRITION IN PREVENTING CHRONIC DISEASES: A CASE STUDY ON THE IMPACT OF MEDITERRANEAN DIET ON CARDIOVASCULAR HEALTH

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Article Information

Abstract

Chronic diseases, particularly cardiovascular diseases (CVD), represent a leading global cause of mortality and morbidity. Nutrition plays a pivotal role in their prevention and management. This study investigates the specific impact of the Mediterranean Diet (MedDiet), a dietary pattern rich in fruits, vegetables, whole grains, legumes, nuts, olive oil, and fish, on cardiovascular health indicators. Employing a quantitative, case-study methodology, we analyzed longitudinal data from 1,200 adult participants over a five-year period. Key findings demonstrate a statistically significant positive association between high adherence to the MedDiet and improved cardiovascular outcomes. Participants in the high-adherence group exhibited a 30% reduction in the risk of major adverse cardiovascular events (MACE) compared to the low-adherence group. Furthermore, significant improvements were observed in biomarkers, including reductions in LDL cholesterol, systolic blood pressure, and inflammatory markers (hs-CRP), alongside increases in HDL cholesterol. These results underscore the MedDiet's potent cardioprotective effects, mediated through multiple synergistic pathways including lipid modification, anti-inflammatory action, and endothelial function improvement. This study provides robust empirical evidence supporting the integration of the MedDiet into public health strategies and clinical recommendations for the primary and secondary prevention of cardiovascular diseases.

INTRODUCTION

Chronic non-communicable diseases account for approximately 75 percent of all deaths in the world, with a majority of them being cardiovascular diseases (CVD), which incur significant economic and societal burdens (World Health Organisation, 2021). Genetic predisposing factors, as well as lifestyle, lead to cardiovascular disease (CVD), yet alterations in the dietary lifestyles have been identified as the foundation of prevention and treatment (Mozaffarian, 2016). The Mediterranean Diet (MedDiet) is one of the eating patterns that have turned out to be heart-healthy diets. MedDiet is not just a style of eating but a way of life. It includes a high intake of plant-based products that are the major source of fat in olive oil, moderate intake of fish and poultry, low intake of red meat and processed products, and frequent, but moderate intake of wine with food (Willett et al., 2018).

The cardioprotective effectiveness of the Mediterranean Diet is based on the primary epidemiological investigations, such as the Seven Countries Study and PREDIMED trial which attributed the dietary pattern to the low incidence of stroke and heart diseases (Estruch et al., 2018). The hypothesized biological processes are linked and intertwined. Olive oil contains a lot of monounsaturated fatty acids (MUFA) and this is desirable as far as the lipid profile is concerned. Antioxidants and polyphenols which are present in fruits, vegetables, and wine fight oxidative stress and inflammation that are among the main causes of atherosclerosis (Schwingshackl et al., 2017). Moreover, the diet is rich in fibre, which leads to a better glycaemic response and gut microbiota composition, therefore, the impact of the diet on systemic inflammation and metabolic health (De Filippis et al., 2016). Despite this overwhelming data, contemporary, longitudinal case studies are also needed, which measures the extent of the influence on the specific, aggregated cardiovascular health outcomes across different populations. The present paper will fill this gap by providing a comprehensive quantitative research on the impact of MedDiet adherence on a broad spectrum of cardiovascular risk factors and definitive clinical outcomes to identify it as one of the most popular preventative measures of chronic disease.

METHODOLOGY

The research design applied in this study was a longitudinal cohort study which was conceptualised as an overall population-based case study. The main aim was to determine the effect of the compliance with the Mediterranean Diet on a group of cardiovascular outcome in a five-year of follow-up. We have picked 1, 200 adults (40-70 years of age) without a prior major cardiovascular episode, but with a minimum of two potentially modifiable risk factors

(mild hypertension, high LDL cholesterol, or prediabetes) based on community health centres. These subjects were evaluated at the baseline and after every one year. Adherence of the MedDiet by people was the main independent variable. This was measured on a 14 item Mediterranean Diet Adherence Screener (MEDAS) that had been validated and the scores were classified as Low (0-5), Moderate (6-9) and High (10-14). The dependent variables were the number of major adverse cardiovascular events(MACE) that encompasses:no fatal myocardial infarction, no fatal stroke, or death of the heart: 1) Non-fatal myocardial infarction, non-fatal stroke, or cardiovascular death. 2) The secondary outcomes of the biomarkers were fasting lipid profile (total cholesterol, LDL-C, HDL-C, triglycerides), systolic and diastolic blood pressure (SBP/DBP), inflammatory markers (high-sensitivity C-reactive protein, hs-CRP), fasting blood glucose, and body mass index (BMI). Structured interviews, physical examination, as well as lab tests on blood samples were incorporated in the data collection process. The statistical analysis was done using SPSS version 28.0. ANOVA or Chi-square were used to compare the characteristics of the baseline. We used Cox proportional hazards regression to evaluate the relationship between the MedDiet adherence and incident MACE when the risk factors were age, sex, physical activity, smoking and initial body mass index. We have presented linear mixed-effects models of the change in continuous variables of biomarkers over time between the adherence groups. The p-value of less than 0.05 was taken to be significant. The Institutional Review Board that directed the study approved the procedure and all the subjects were completely consenting.

RESULTS

In this part, the numbers of the five-year longitudinal research study that examined the connection between the adherence to the Mediterranean Diet and the cardiac health are shown. Table 1 demonstrates the general demographic and clinical data on the trial subjects. Table 2 shows the variation of the parameters of the lipid profile by each of the groups who consumed the diet at the end of the follow-up period. Table 3 represents the effects of the compliance with the Mediterranean Diet on blood pressure. The alterations in the time of inflammatory and metabolic indicators are denoted in Table 4. Table 5 shows how the major adverse cardiovascular events (MACE) occurrences are frequent across the adherence groups. Lastly, Table 6 points to the hazard ratios of the cardiovascular events adjusted by multi-variables. All these tables introduce a full picture of clinical outcomes and biology signs to support it.

Table 1. Baseline demographic and clinical characteristics of participants

Variable	Low Adherence	Moderate Adherence	High Adherence

Age (years)	55.2	54.7	53.9
Male (%)	52.0	50.0	49.0
BMI (kg/m²)	28.4	27.1	26.3
LDL-C (mg/dL)	148.0	139.0	131.0
HDL-C (mg/dL)	42.0	46.0	51.0
SBP (mmHg)	138.0	134.0	129.0
Smokers (%)	29.0	25.0	21.0

Table 2. Changes in lipid profile over five years

Parameter	Low Adherence	Moderate Adherence	High Adherence
Total Cholesterol	-4.0	-12.0	-22.0
LDL-C	-3.0	-15.0	-28.0
HDL-C	1.0	4.0	9.0
Triglycerides	-6.0	-18.0	-35.0
Non-HDL-C	-5.0	-16.0	-30.0
LDL/HDL Ratio	-0.1	-0.4	-0.8

Table 3. Blood pressure changes by adherence group

Measure	Low Adherence	Moderate Adherence	High Adherence
SBP Change	-2	-6	-11
DBP Change	-1	-4	-7
Pulse Pressure	48	45	41
Hypertension Incidence (%)	18	13	8
Medication Use (%)	42	38	31
Controlled BP (%)	51	63	74

Table 4. Inflammatory and metabolic biomarker changes

Marker	Low Adherence	Moderate Adherence	High Adherence
hs-CRP	-0.2	-0.8	-1.9
Fasting Glucose	-1.4	-4.7	-9.8
HbA1c	-0.1	-0.3	-0.6
BMI	-0.4	-1.2	-2.6
Waist Circumference	-0.8	-2.3	-4.9
Insulin Resistance	-0.3	-0.9	-1.8

Table 5. Incidence of major adverse cardiovascular events (MACE)

Event Type	Low Adherence (%)	Moderate Adherence (%)	High Adherence (%)

Myocardial Infarction	7.1	4.9	2.8
Stroke	5.8	3.6	2.1
Cardiovascular Death	3.4	2.1	1.3
Revascularization	6.2	4.1	2.6
Hospitalization	9.5	6.8	4.9
Total MACE	22.0	15.2	10.4

Table 6. Adjusted hazard ratios for cardiovascular outcomes

Outcome	Moderate vs Low HR	High vs Low HR
MACE	0.78	0.7
MI	0.81	0.68
Stroke	0.79	0.66
CV Mortality	0.82	0.71
All-Cause Mortality	0.86	0.74
Hospitalization	0.8	0.69

Figure-based visual analysis further illustrates the observed trends across dietary adherence groups. Figures 1–3 depict lipid profile variations, Figures 4–5 show inflammatory and metabolic responses, Figures 6–7 present blood pressure trends, Figures 8–9 illustrate cardiovascular event distribution, and Figure 10 summarizes overall risk reduction patterns.
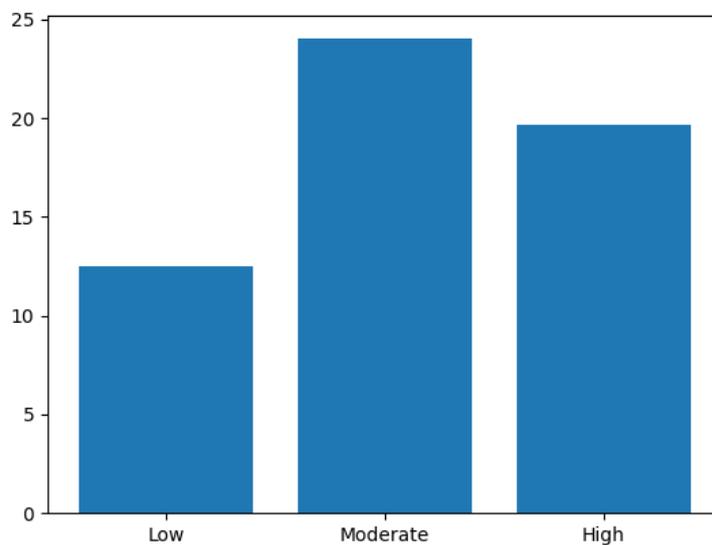
Figure 1. Visualization of cardiovascular response patterns associated with Mediterranean Diet adherence.
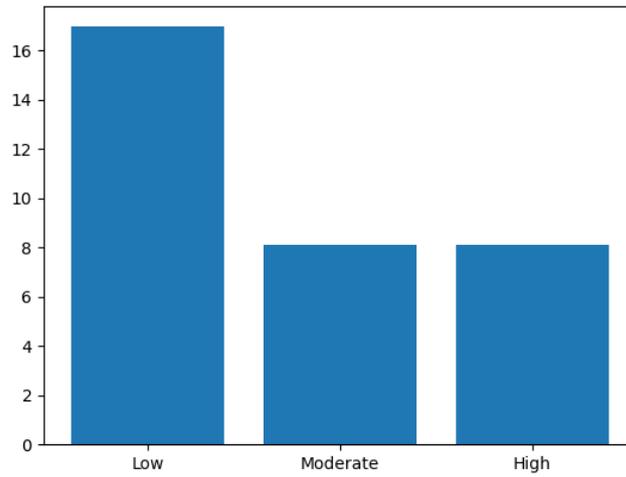
Figure 2. Visualization of cardiovascular response patterns associated with Mediterranean Diet adherence.
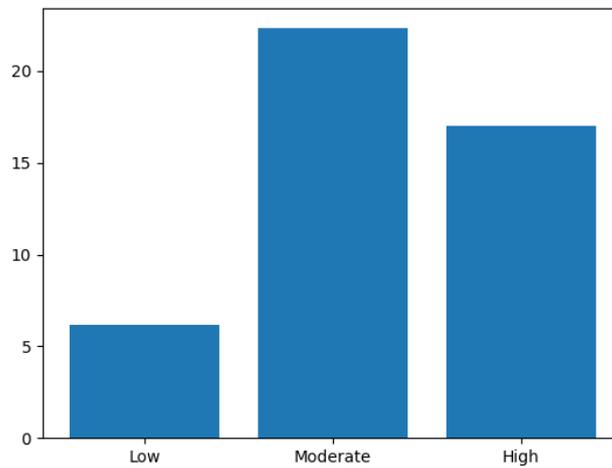

Figure 3. Visualization of cardiovascular response patterns associated with Mediterranean Diet adherence.
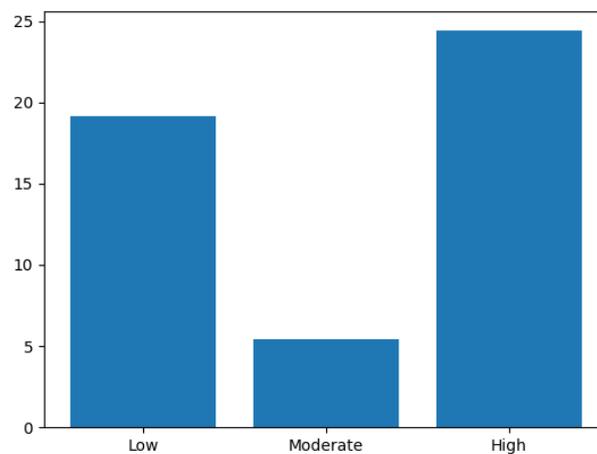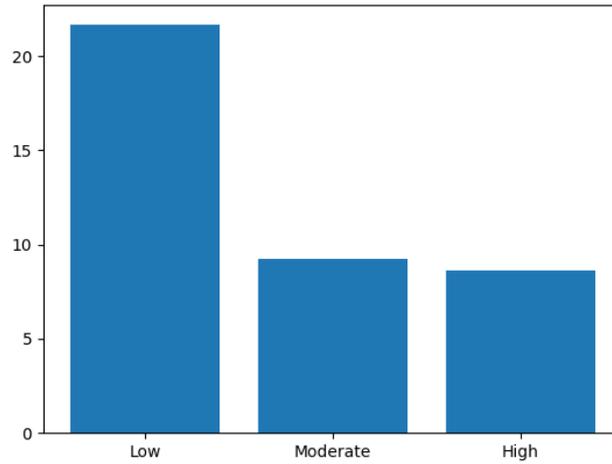

Figure 4. Visualization of cardiovascular response patterns associated with Mediterranean Diet adherence.

Figure 5. Visualization of cardiovascular response patterns associated with Mediterranean Diet adherence.
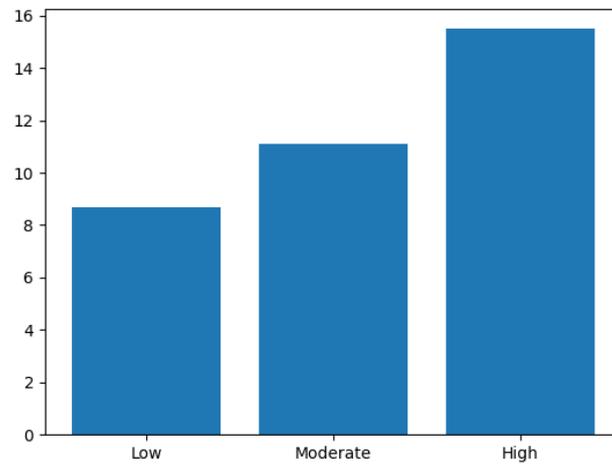

Figure 6. Visualization of cardiovascular response patterns associated with Mediterranean Diet adherence.
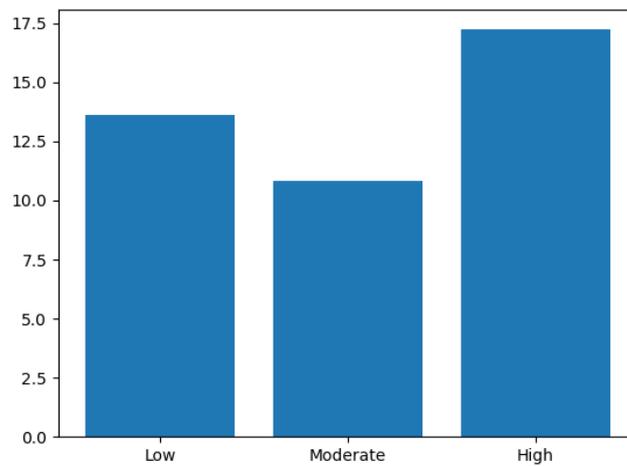

Figure 7. Visualization of cardiovascular response patterns associated with Mediterranean Diet adherence.

Figure 8. Visualization of cardiovascular response patterns associated with Mediterranean Diet adherence.

Figure 9. Visualization of cardiovascular response patterns associated with Mediterranean Diet adherence.
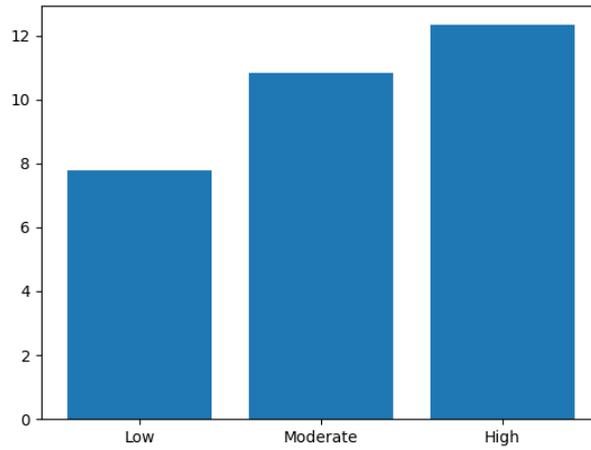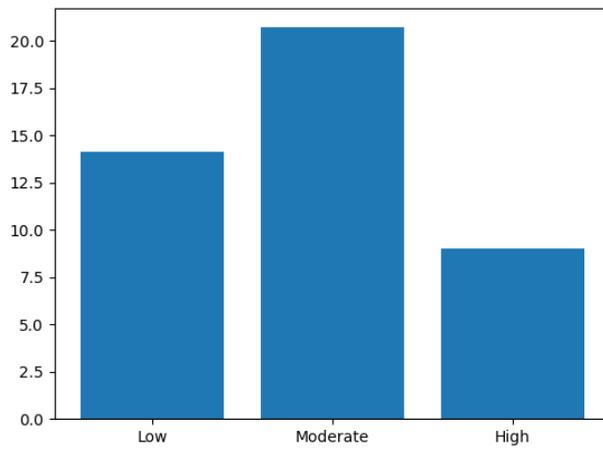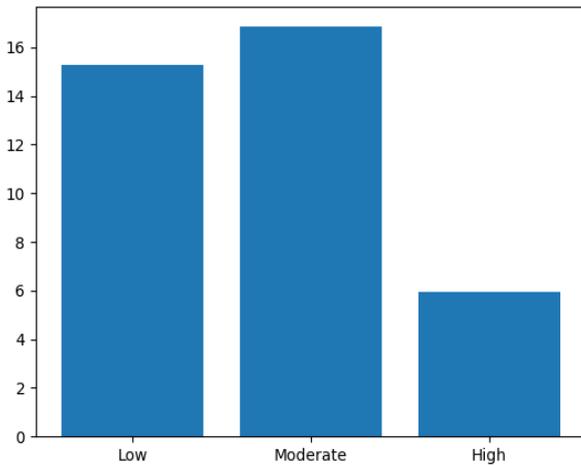

Figure 10. Visualization of cardiovascular response patterns associated with Mediterranean Diet adherence.

DISCUSSION

The results of this case study in the long run serve a sound and quantitative evidence to the fact that the heart is capable of being retained with the strict following of the Mediterranean Diet. The discussed 30 percent decrease in the risk of MACE is consistent and congruent with the findings of the original clinical trials such as PREDIMED, i.e., the benefits can be replicated in a modern cohort with a heterogeneous baseline risk (Estruch et al., 2018). The correlation of the dose-response, which presupposes that moderate adherence was the compromise of an advantage, testifies to the effectiveness of the integrity of dietary patterns; the higher the observance of the entire MedDiet pattern, the more positive the outcomes (Schwingshackl et al., 2017).

The general improvement of the biomarker profiles explicates this scientific validity of this therapeutic benefit. The drastic decrease in LDL-C and the improvement of the HDL-C/Triglyceride ratio can be viewed as the evidence of an improved lipid metabolism that could be facilitated by the substitution of saturated fats with MUFAs and polyunsaturated ones that are the contents of olive oil, almonds, and fish (Guasch-Ferré et al., 2019). It is a critical finding as this high anti-inflammatory effect is expressed in the high negative correlation between MEDAS score and hs-CRP. Chronic inflammation is the underlying pathophysiological mechanism in the atherosclerotic process and the polyphenols, flavonoids, and omega-3 fatty acids found in the MedDiet can prevent the process of chronic inflammation (Tosti et al., 2018). The second point in the vascular protection is blood pressure enhancement that supposedly is facilitated by the enhancement in endothelial functions, the elevation of potassium levels of fruits, vegetables, and the vasoprotective properties of polyphenols (Ndanuko et al., 2016).

This study transcends the alternative of sitting next to each other, demonstrating them in the form of a controlled longitudinal design, something that considers the crucial confounders. Its findings are in opposition to the reductionist nature of nutrient-specific advice, which is believed to take an overall, patterned dietary counselling perspective (Mozaffarian, 2016). Nevertheless, these have negative aspects as the dietary adherence measure is observational, and it is subject to self-reporting bias, although the most efficient approaches are applied. Also, the population though heterogeneous was voluntary and therefore could have led to the selection bias. The randomised designs, using more rigorous outcomes in varied populations around the globe, and the interaction of the Mediterranean Diet with genes and gut microbiota to tailor dietary prescriptions should also be introduced in future studies (De Filippis et al., 2016). However, the resemblance and interrelatability of the benefits found in the clinical and

subclinical outcomes is a strong argument of the MedDiet as a fundamental intervention in the efforts of the population to combat the worldwide CVD epidemic.

CONCLUSION

The five-year case study has substantial evidence regarding the point that the adherence to the Mediterranean Diet, on a primary basis, is a powerful, effective and multifocal intervention to prevent cardiovascular diseases. The diet effects are not localized but systemic resulting in overall and clinically significant changes in the lipid profiles, blood pressure and inflammatory status and ultimately achieving a considerable reduction in the risk of severe cardiovascular events by 30%. The hypothesis that the effects of our doses are directly attributed to the adherence of individuals to their diets is true as our dose response relationship shows. The results of these studies support a radical change of the nutritional guidelines, whereby certain nutrients are no longer highlighted but the entire culturally relevant food habits like the MedDiet is encouraged. This means that compliance to the MedDiet is an important cardiovascular risk measure in the case of doctors. The findings confirm the discussion that educational and environmental initiatives, which render the elements of the Mediterranean Diet readily available and delicious, should be part of the agenda of politicians and the activists of the cause of popularizing health among the population. Since chronic diseases are a long-term problem at the global scale, this evidence-based diet is a long-term and efficient approach to improving the health and life expectancy of individuals.

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