

# Effectiveness and speed in reducing cardiovascular risk with nutritional intervention in a cohort of Italian women

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# ABSTRACT

**BACKGROUND.** Nutritional intervention based on the Mediterranean Diet effectively significantly reduces cardiovascular risk in a relatively short time in a population of Italian women. Given the absence of contraindications, the Mediterranean diet is an unparalleled preventive and clinical medicine tool.

**OBJECTIVE.** The purpose of the study was to demonstrate the therapeutic efficacy of nutritional intervention based on the Mediterranean Diet in reducing risk factors for cardiovascular diseases over a year.

**SUBJECTS AND METHODS.** The study sample consisted of 97 Italian women (mean age  $46.09 \pm 13.8$  years) who voluntarily underwent dietary evaluation and haematochemical analyses, blood pressure measurement and measurement of anthropometric parameters. Follow-up was carried out with repetition of the same examinations one year later, during which a Mediterranean diet was followed.

**RESULTS.** One year after the start of the diet, blood levels of total cholesterol, triglycerides were significantly reduced; similarly, there was a significant reduction in BMI and a normalization of systolic and diastolic blood pressure levels.

**CONCLUSIONS.** These results are of considerable importance for public health, because this preventive and therapeutic dietary model can be easily adopted by all population groups and various cultures, given the absence of contraindications.

# **KEYWORDS**

MEDITERRANEAN DIET

CARDIOVASCULAR RISK

ITALIAN WOMEN

**HYPERTENSION** 

# **INTRODUCTION**

Current epidemiological predictions show that the world is heading for a storm of cardiovascular disease pandemic proportions. The number of people at high risk of cardiovascular disease is increasing<sup>1</sup>. Cardiovascular diseases are the leading cause of death in all developed countries. In Italy, they are responsible for about 250,000 deaths every year out of about 560,000 total deaths (we are going to about 47%)<sup>2,3</sup>. From an epidemiological point of view, the most important are:

- Ischemic heart disease, whose most serious manifestation is myocardial infarction.
- Circulatory diseases of the brain, whose most serious manifestation is stroke.
- Arterial hypertension which is an important risk factor for heart attack and cerebral stroke.

The morbidity and mortality of cardiovascular disease (CVD) is on the rise, representing a major public health problem worldwide<sup>4</sup>. It is known that the risk of CVD

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is substantially affected by lifestyle, including an unbalanced diet, obesity<sup>5</sup>, tobacco smoking<sup>6</sup>, physical inactivity<sup>7</sup>, salt<sup>8</sup> and sugar abuse<sup>9</sup>. The Mediterranean diet has been associated in recent years with extensive health benefits for human health, including protection against cardiovascular disease<sup>10</sup>. Several epidemiological and clinical studies have evaluated the effect of the Mediterranean Diet (MedDiet) on recognized cardiovascular risk factors, the results of which have been summarized in several meta-analyses<sup>11,12</sup>. Given the absence of contraindications, the Mediterranean diet remains the preventive and therapeutic dietary model par excellence of reference in the dietary field.

# **SUBJECTS AND METHODS**

#### Subjects

This study was conducted on a population consisting of 97 Italian women (average age  $45.6 \pm 14.46$  years) who voluntarily underwent dietary evaluation and hematochemicals analysis (total cholesterol and triglycerides), blood pressure measurement and measurement of anthropometric parameters. Below are the average values for the sample studied in the first half (Table 1).

# **Biochemical analysis**

Blood samples were taken between 08:00 and 09:00 after an overnight fast and analyzed. Plasma lipid concentrations (triglycerides, total cholesterol) were quantified by the automatic colorimetric method (Hitachi; Boehringer Mannheim, Mannheim, Germany).

#### **Blood pressure**

Blood pressure is the pressure exerted by the blood, pumped by the heart, on the wall of the arteries that distribute the blood itself in the body. Blood pressure, systolic (PAS) or diastolic (PAD) parameters have been the subject of numerous studies, some of which establish an association between the increase in these parameters and mortality, particularly in middle ages<sup>13</sup>. According to the World Health Organization (WHO), at least 1 in 5 adults in the world suffer from hypertension, and this factor is the cause of about half of deaths from heart attack and ischemic stroke<sup>14</sup>. Blood pressure was measured by an experienced operator using an aneroid sphygmomanometer (non-invasive method) according to guidelines provided by the World Health Organization (WHO).

#### Anthropometric data

Anthropometric measurements were taken in the morning and on an empty stomach in conjunction with blood collection. Body weight was measured by a scale. Height was measured with the stadiometer. From the ratio of weight to height, the Body Mass Index (BMI), expressed in kg/m<sup>2</sup>, was calculated.

Table 1. Statistical description of the parameters in the population sample.

95% CI												
	No.	Mean	SE	Lower	Upper	Median	Mode	SD	Variance	Range	Minimum	Maximum
Age (years)	97	46.1	1.401	43.3	48.9	47	55.0	13.80	190.4	58	19	77
Tot. Chol (mg/dl)	97	227.2	1.900	223.4	231.0	225	200.0ª	18.71	350.2	120	170	290
TG (mg/dl)	97	161.2	2.030	157.2	165.2	159	155.0ª	20.00	399.9	134	116	250
BMI (kg/m2)	97	29.7	651	28.5	31.0	28	27.0ª	6.41	41.1	24	19	4
SBP (mmHg)	97	128.3	1.318	125.7	130.9	125	120.0	12.98	168.4	70	90	160
DBP (mmHg)	97	75.5	770	74.0	77.0	75	70.0ª	7.59	57.5	35	60	95

Note. The Confidence Interval (CI) of the mean assumes sample means follow a *t*-distribution with No. 1 degrees of freedom; <sup>a</sup>More than one mode exists, only the first is reported.

# NUTRITIONAL INTERVENTION

- The assessment of the nutritional status was carried out in the light of the anamnestic and pathological picture of the individual subjects. Each was prescribed a personalized Mediterranean diet based on these common indications:
- Exclusive use of extra virgin olive oil for cooking and seasoning,
- Increased consumption of fruits, vegetables, legumes and fish
- Reduction of total consumption of processed meat and industrial products
- Limit butter, cream, fast food, sweets, pastries and sugary drinks
- Limiting salt consumption
- Drink about 2 liters of oligomineral water per day

In alcohol drinkers, a moderate consumption of red wine.

From the point of view of nutrients, the prescribed diet is characterized by 60% carbohydrates with a particular indication to prefer the complex carbohydrates contained in products made with whole meal flours (bread and pasta), tubers (potatoes), and especially seasonal vegetables and vegetables with a high-water content (zucchini, pumpkin, cucumbers, lettuce, eggplant, carrots) and seasonal fruit with a low glycemic index. The food day was divided into five meals of which: breakfast, snack, lunch, and snacks. The dietary prescription was adapted according to the clinical and physiological conditions of the individual subject.



Figure 1. Composition in % of nutrients of the prescribed diet.

# **DATA ANALYSIS**

The statistical analysis of the data collected by calculating the Pearson correlation coefficient r was performed. The analysis showed a strong positive correlation between total cholesterol levels and blood triglycerides; in addition, there is a significant positive correlation between BMI and total cholesterol levels and a positive correspondence between systolic and diastolic blood pressure values (Table 2).

		Age (years)	TG (mg/dl)	Tot. Chol (mg/dl)	BMI (kg/m <sup>2</sup> )	SBP (mmHg)	DBP (mmHg)
Age (years)	Pearson's r df <i>p</i> -value						
TG (mg/dl)	Pearson's r df <i>p</i> -value	-0.055 95 0.590					
Tot. Chol (mg/dl)	Pearson's r df <i>p</i> -value	-0-029 95 0.775	0.392*** 95 <.001				
BMI (kg/m2)	Pearson's r df <i>p</i> -value	0.017 95 0.872	0.066 95 0.521	0.224* 95 0.028			
SBP (mmHg)	Pearson's r df <i>p</i> -value	-0.044 95 0.670	-0.128 95 0.212	-0.016 95 0.873	-0.139 95 0.275		
DBP (mmHg)	Pearson's r df <i>p</i> -value	0.042 95 0.684	-0.116 95 0.258	0.049 95 0.632	0.116 95 0.257	0.254* 95 0.012	

 Table 2. Correlation matrix of parameters in the studied population.

Note. \**p* < .05, \*\**p* < .01, \*\*\**p* < .001



The coupled *t*-test was used to evaluate the results obtained with the Mediterranean diet over a year: this test is used when the same group of people is subjected to the same survey twice, which allows you to know if the average has changed between the first and second surveys (Table 3).

			Statistic	df	р	Mean difference	SE difference
Tot. Chol (mg/dl)	Tot. Chol (mg/dl) after 1 year	Student's t	10.3275	96.0	< .001	19.1753	1.857
TG (mg/dl)	TG (mg/dl) after 1 year	Student's t	5.9295	96.0	< .001	11.1031	1.873
BMI (kg/m2)	BMI (kg/m2) after 1 year	Student's t	0.0460	96.0	0.963	0.0412	0.896
SBP (mmHg)	SBP (mmHg) after 1 year	Student's t	5.6880	96.0	< .001	6.9588	1.223
DBP (mmHg)	DBP (mmHg) after 1 year	Student's t	3.6266	96.0	< .001	2.4227	0.668

**Table 3.** Coupled *t*-test for assessing the difference of the factors analyzed after one year of diet.

Note.  $H_a \mu$  Measure 1 - Measure 2  $\neq 0$ 

Comparing the average levels of risk factors analyzed (Figure 2) in the present study before the diet course and after one year, it emerges that:

- Mean blood cholesterol levels (mg/dl) in the total population decreased by 8.4%
- Mean blood triglyceride levels (mg/dl) in the total population decreased by 6.8%
- Average BMI levels  $(kg/m^2)$  in the total population decreased by 4.0%
- Mean systolic blood pressure (mmHg) levels in the total population decreased by 5.5%
- Mean diastolic blood pressure (mmHg) levels in the total population decreased by 3.3%





#### Reduction of cardiovascular risk with nutritional interventions



Figure 3. Analysis of the parameters in the first half year and after one year of the Mediterranean diet.

BMI (kg/m2)

SBP (mmHg) 

Total Chol. (mg/dl)

tal cholesterol levels  $\leq 200 \text{ mg/dl}$ values  $\leq 150 \text{ mg/dl}$ of systolic blood pressure  $\leq 120 \text{ mmHg}$ • blood pressure values.  $\leq 80 \text{ mmHg}$ Total cholesterol at first time Total cholesterol after 1 year of diet TG (mg/dl) Systolic blood pressure at first time Triglycerides at first time Systolic blood pressure after 1 year of diet Triglycerides after 1 year of diet DBP (mmHg) Diastolic blood pressure at first time BMI at first time BMI after 1 year of diet

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Diastolic blood pressure after 1 year of diet

Analysis of clinical data (Figure 3) shows that patients in the present study before the controlled diet path after one year show that:

- 22% of subjects returned to the optimal values of to-
- 26.8% of subjects returned to optimal triglyceride
- 9.3% of the subjects fell within the BMI values corresponding to normal weight, between 18.5 and 24.9 kg/m<sup>2</sup>
- 21.7% of subjects were within the desirable values
- 6.2% of subjects were within the desirable diastolic



The population was divided into two groups according to the age groups Group 1 (18-40 years) and Group 2 (41-80 years) to compare and analyze any differences in the changes in the parameters analyzed over the period of one year. The percentage analysis of the mean values in the two groups shows that the mean blood cholesterol levels were reduced by 8% in both groups, the mean triglyceride levels were reduced by 8% in group 1 (18-40 years) and by 5% in group 2 (41-80 years); the mean BMI levels were reduced by 3% in group 1 and by 4% in group 2; the mean systolic blood pressure levels were reduced for both groups while diastolic blood pressure levels were reduced by 4% for group 1 and for Group 2 of 2% (Figure 4).

Figure 4. Percentage of reduction in mean levels of risk factors for the two population groups analyzed.



# **DISCUSSION AND CONCLUSIONS**

The data obtained shows a highly significant reduction in risk factors for cardiovascular disease in the population of 97 Italian women (mean age  $46.09 \pm 13.8$ years). Specifically, the average total risk was reduced by 28%, considering that these results were achieved over a relatively short period of one calendar year by nutritional intervention alone, without taking drugs (Figure 5).

Taking into account the two population groups divided by age groups (Group 1: between 18 and 40 years; Group 2: between 41 and 80 years) from the percentage assessment of the reduction of the mean levels of risk factors for the two groups, it is clear that the effectiveness of nutritional intervention is in no way inhibited by advancing age, so it is possible to effectively reduce these pathological risk factors at all ages by obtaining significant clinical results. It is understood that **Figure 5.** Reduction of cardiovascular risk factors with a year of Mediterranean diet.





the Mediterranean Diet acts synergistically on the five risk factors considered (total cholesterol, triglycerides, BMI, systolic blood pressure and diastolic blood pressure) studied extensively in numerous studies. The present study represents a remarkable proof of the clinical efficacy of a nutritional intervention based on the Mediterranean diet with the aim of significantly reducing, in a relatively short time, the cardiovascular risk in a population of Italian women. The results obtained on the one hand lay the foundation for future public health and preventive medicine actions aimed at greater primary prevention that can control, manage and reduce the risk of cardiovascular diseases and increasing public spending, on the other hand, they demonstrate the therapeutic efficacy of a precision internal and nutritional intervention based on the Mediterranean diet in the presence of multiple cardiovascular risk factors.

# **Conflict of Interest**

The author declares that they have no conflicts of interest. The article is not under evaluation anywhere, and it is not submitted elsewhere.

# **Policy on Ethics**

The author declares that for the following observational study, informed consent has been obtained from the subjects who have adhered to it in complete freedom.

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