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The Easy Thing (ET) observational study: evaluation of adherence to Mediterranean diet and role of a program of nutritional intervention performed by North Naples 2 Local Health Unit

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Abstract. – OBJECTIVE: The present observational study has the aim to describe the nutritional habits and adherence to Mediterranean diet within a dietary intervention performed by North Naples 2 Local Health Unit in some areas of Campania region.

PATIENTS AND METHODS: A semi-quantitative food frequency questionnaire which takes in consideration several kinds of food and the related daily or weekly portions has been administered to people evaluated in the study. An increased score reflects an increased adherence to Mediterranean diet. Patients have been grouped by age, body mass index, education, socio-economic level, income, and score reported to the administered survey. Nutritional intervention has also been evaluated as concerns weight reduction during time.

RESULTS: Surveys were administered to 200 patients aged from 12 to 79 years from 21 November 2018 to 27 November 2019. Obese patients were 61.5% in this population. 67.7% of obese people participating to this study had primary/lower secondary school education. 61.5% of study population have been categorized as having a low or low-medium socio-economic level and 68% of them were obese. An intermediate adherence to Mediterranean Diet has been the most represented (76.5%), a significant difference has been found among the groups normal weight, overweight and obese for the variables age, education and income. Obese patients in the present study had metabolic diseases more frequently than normal-weight patients.

CONCLUSIONS: A high rate of obese people requesting nutritional counseling showed intermediate/bad adherence to Mediterranean Diet, reflecting the diffuse change from Mediterranean Diet to Western habits in nutrition. The nutritional intervention was found to be effective, especially for overweight patients. These data underline the need for further larger epidemiological analysis and public health interventions.

Key Words:
Diet, Mediterranean diet, Cancer, Obesity, Campania, Adherence.

Introduction

Obesity is a condition characterized by excessive storage of body fat and is related to severe diseases[1]. In most cases, an increased amount of calorie intake and reduced physical activity are the main determinants of this status. Prevention is feasible with appropriate interventions on these predisposing factors.

WHO defines overweight and obese adults people having respectively a Body Mass Index (BMI) greater than or equal to 25 and 30[2]. According to a study[3] by the London Imperial College and World Health Organization (WHO), the rate of obese people is doubled in the world from 1980 until today. In 2008 about 35% of the population in the

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world was obese. In 2017-2018, the prevalence of obesity reached 42.4%[4]. The prevalence of obesity was around 40%, being highest in middle-aged adults (44.8%)[4]. Meanwhile, the increasing rate of the younger population considered obese. In 2011, over 40 million children aged less than 5 years were categorized as overweight. In April 2019, WHO published new guidelines on physical activity, sedentary habits and sleep in less than 5-year children and underlined that wealthy habits and education learned from infantile age were maintained during juvenile and adult age[5].

Obesity represents one of the main world health problems because of stable and increasing incidence in Western countries in medium-low level classes and resulting in increased risk for chronic diseases, such as type 2 diabetes mellitus, heart diseases and tumors. In about 44% of cases of type 2 diabetes mellitus, 23% of ischemic heart disease, and 41% of tumors the main pathogenetic factor is the obese/overweight status. Overall, overweight/obese status represents the fifth most important risk factor for mortality in the world and deaths related to obesity are at least 2,8 million/year in the world. However, some controversies still fuel the discussion. One of these is the so-called "obesity paradox" which is represented by a presumptive survival advantage in obese people developing cardiovascular and predominantly chronic diseases[6]. As many studies emphasize, this topic required finalized research to reduce risks of bias.

Mediterranean diet (MediD) plays an important role as preventive measure to contrast obesity and related diseases. The term MediD describes the traditional dietary habits of countries neighboring the Mediterranean Sea, mostly Greece and Southern Italy[7]. It summarizes not only nutritional habits like predominant use of olive oil, cereals, fruits, vegetables, legumes, tree nuts, the moderate consumption of fish, seafood, and dairy, and low-to-moderate alcohol (mostly red wine) intake, balanced by a limited use of red meat and other meat products, but also includes the idea of a certain lifestyle[5,7]. The pivotal studies[8-10] which coined the term MediD in the 1950s, showed that saturated fat intake was strongly related to ischemic heart disease, while an inverse relationship between polyunsaturated/saturated fats and monounsaturated/saturated fats ratios and incidence and mortality for ischemic heart disease were shown. High monounsaturated fat intake is related to olive oil use typical of Mediterranean countries. In general, based on the results of this study, two classes of food can be identified: on one hand food with animal origin and sugar and, on the other hand, vegetables, fish and alcohol intake respectively having a direct and inverse relationship with ischemic heart disease.

The various components of MediD are cereals 50-59%, extra virgin olive oil 13-17%, vegetables 2.2-3.6%, potatoes 2.3-3.6%, legumes 3-6%, fruits 2.6-3.6%, fish 1.6-2%, red wine 1-6%, meat 2.6-5%, dairy products 2-4%, eggs and fatty animals in low rates. This diet has a very low amount of saturated fats (less than 7-8%) and a low amount of fats overall (from <25% to <35%). Briefly, MediD is primarily characterized by the high ratio of monounsaturated to saturated fats, which exceeds by far the similar ratios in Northern Europe or Northern America[5].

The reduced incidence of cardiovascular disease, as well as of cancer, has reinforced the role of MediD as an effective tool so as to represent almost a medical prescription. The MediD produced a reduction in overall cancer rates, as well as significantly lower rates of digestive tract cancers[11,12]. However, when MediD is recognized as a powerful and even inexpensive preventive measure, the countries cradle of MediD live, perhaps the most difficult phase of their history because of the growing attempts of contamination with Western habits.

In Italy, according to a report dated 2015, more than one third of the adult population is overweight and one out of ten people is obese; overall, about 45.1% of people aged > 18 years is considered in "excessive weight" (overweight plus obese) (https://www.osservatoriosullasalute.it/wp-content/uploads/2016/09/synthesis_2015.pdf). Southern Italian regions registered the higher rate of obese people and overweight as compares to Northern regions. Campania region registered one of the highest rates of overweight people (39.3%). The age range between 65-74 years registered the higher rate of excessive weight in both sexes (men 52.6% and 16.0%, women 40.3% and 14.8%, respectively overweight and obese). Campania region has the highest percentage of smokers and is one of the worst for fruits and vegetables intake[13], which are considered as protective factors against various diseases. Moreover, it is the second region for sedentary lifestyle and, as results, 50% of population is overweight[13]. The increasing percentage of immigrants has also to be considered into this complex landscape. In Campania, stranger citizens are 4.4% at the date of 1st January 2018[14]. As icing on the cake, in Campania there is a land

between Naples and Caserta sadly defined "of fires" because of widespread practice of dumping toxic wastes and setting fire. A possible relationship among land contaminants and dioxin intake, environmental pollution, lack of sidewalks and reduced physical activity suggests that complex interferences should be analyzed. Some studies[15,16] highlighted a possible effect on public health and most of the authors[15,16] suggest, in view of this "mindfulness", the need for prospective studies.

Therefore, we have started an observational study to evaluate the changes, if any, in the diet and the role of a nutritional intervention in a population resident in "land of fires" under the jurisdiction of North Naples 2 Local Health Unit.

Patients and Methods

We use a semi-quantitative food frequency questionnaire (FFQ) survey like that proposed by Monteagudo et al[17] which takes in consideration several kinds of food and the related daily or weekly portions. Every food and the recommended portion are associated with a score, finally producing a total number that can be within or outside the recommendation. The score for every food/portion can be 1, 2 or 3. Zero is assigned if the number of portions if lower or higher than recommended. Fruits, vegetables, cereals and olive oil has a score 3; dairy products and dried fruit have a score 2; potatoes, legumes, eggs, fish, white meat, red meat, sugar and sweets and fermented drinks are scored 1. For adults, one point is assigned for wine or beer intake (one glass for women and two glasses for men). Principal meals are considered breakfast, lunch and dinner. The score ranges from 0 to 24 for an adult and from 0 to 23 for an adolescent (alcohol intake is discouraged in this age range). An increased score reflects an increased adherence to the Mediterranean diet. According to score reported to the survey, patients were grouped into three classes: group I with a score 0-8 (bad adherence to MediD); group II with a score 9-17 (discrete adherence to MediD); group III with a score of 18-24 (good adherence to MediD).

The administered survey collected the following data: age, sex, work, education, smoking habits, family and personal illness, information about purchased food, number of meals. In detail, information about a series of food, including fruit, vegetables (fruits and vegetables were grouped according to colors as suggested by the World Health Organization into blue, green, purple, white, yellow, orange red), cereals, potatoes, nuts, olive oil, dairy products, eggs, legumes, fish, red meats, sweets and fermented drinks were collected.

The survey was administered to healthy patients who requested dietary counseling in areas under the jurisdiction of North Naples 2 Local Health Unit. Local Ethical Committee gave the approval to the study, and all patients gave informed consent to participation and personal data treatment.

Patients were grouped by age, BMI, education, socio-economic level, income, and score reported to the administered survey.

Patients were grouped by Body Mass Index (BMI) into 6 classes: low weight BMI<18.4, normal-weight 18.5<BMI<24.9, overweight 25<BMI<29.9, obese I 30<BMI<34.5, obese II 34.1<BMI<34.9, obese III BMI>35). By socio-economic level, patients were distributed into group I (low income: year medium income 0-10.000 euro), group II (low-medium-income: year medium-income: 10000-25000), group III (medium-high income: year medium income: 25.000-50000), group IV (high income: year medium-income above 50000).

The nutritional intervention was also evaluated as concerns of weight reduction during the time. Information concerning associated disease, especially metabolic, drugs assumptions and triglycerides as well as cholesterol levels were recorded.

Statistical Analysis

Data are presented as frequency (percentages) for the categorical variables, while they are presented as mean ± standard deviation for continuous variables. χ^2 test and Fisher's test were used to test the difference among the weight groups (Normal weight, Overweight and Obese) for the categorical variables. ANOVA was used to test the differences among the groups Normal weight, Overweight and Obese for the continuous variables. Since the variable BMI distributes normally, Student's *t*-test for independent samples and ANOVA as appropriate were used to analyze the differences in BMI among the categories of all the qualitative variables. Pearson's correlation was used to analyze the correlation between BMI and Age and BMI and Score. The significance level for all analyses was set to α=.05. All analyses were performed using the statistical software R, version 3.6.1[18].

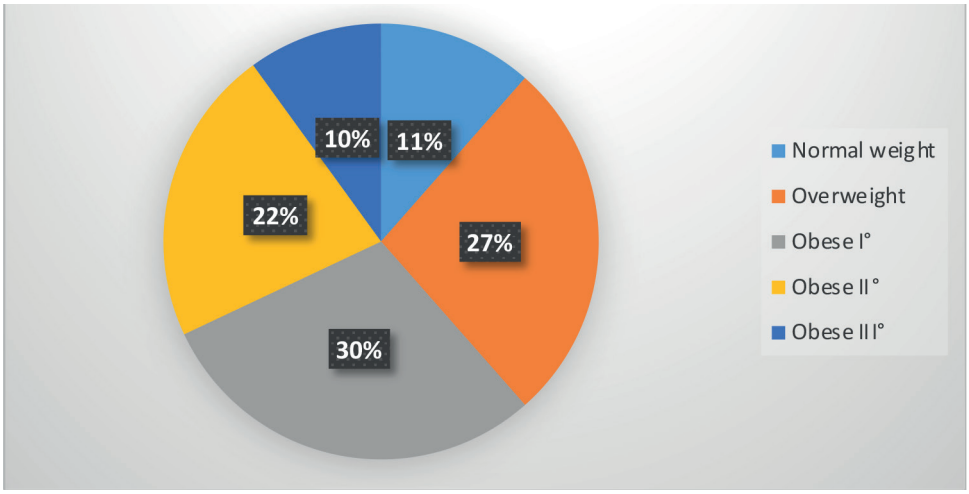

Figure 1. Patient distribution by weight and level of obesity.

Results

Surveys were administered to 200 patients aged from 12 to 79 years (sex: 48 males/152 females) from 21 November 2018 to 27 November 2019. The most represented class of patients was middle aged 20-65 years (125 patients), followed by over 60 years (56 patients), and 12-19 years (19 patients). Patients were categorized into normal weight (11,5%), overweight (27%), first level obese (29,5%), second level obese (22%), third level obese (10%) (Figure 1). Obese patients were 61.5% in this population. Among men, obesity was predominant (34 patients, 70%), followed by overweight (9 patients, 18%) and normal weight (5 patients, 10%). Similarly, among women, 58% (89 patients) were obese, 30% (45 patients) overweight and 12% (18 patients) were normal weight.

63.5% of patients had primary/lower secondary school education, 16.5% had a high school title, and only two patients were graduated. A significant difference was found among the groups normal weight, overweight and obese for the variables education (p=0.0043) and socio-economic level/income (p=0.0247), as shown in Table I. Focusing on obese people participating to this study, 86 out of 200 overall patients (43%) had primary/lower secondary school education (Figure 2). The obese patients with high school/graduation were only 18% (37/200). Among normal weight patients, primary/lower education rate was similar to high education.

As to socio-economic level, 61.5% of the study population reported a low or low-medium level. Among them, 68% was obese. Patients with low socio-economic level were all overweight (5 patients), patients with medium-low level were respectively obese in 69% (81 patients) and overweight in 23% of cases (27 patients), patients at medium-high level were obese in 52% of cases (38 patients) and overweight in 31.5% of cases (23 patients). The only high-level patient was obese.

Also, age was found to significantly differ (p=0.0035) among the groups normal weight, overweight and obese, with the obese group being on average older than the normal weight and overweight groups (Table II). For the variable BMI, a significant difference was found among the levels of education (p=0.001) and income (p=0.0017), consistently with the results obtained on the weight categories, while the test also showed a significant difference in the BMI for the intake of local products (p=0.0192) as shown in Table III. A significant positive correlation was found between the variable BMI and Age (ρ=0.24, p=0.0006) as shown in Table IV.

Most of the patients were informed about nutrition by mass media (television, internet, radio), 12% read specific books, 3% asked about nutrition to a personal trainer and 1.5% did not reply. At the time of interview, 31.5% of overall patients, had previously requested counseling by a nutritionist. Interestingly, more than half of patients (52%) that had previously requested nutritional intervention was obese.

69.5% of patients preferred local products, but only 19.5% really checked for nutritional labels and 25.5% for the source. Even if daily vegetables

and fruits intake can be considered low as respects to recommended, 61% reported intake of various colors of these foods. In the present sample of people, only 18.5% (8% obese) regularly performed physical activity.

Based on the results to survey, second group with an intermediate adherence to MediD was the most represented (153 patients, 76.5%), followed by the first group having a bad adherence to MediD with 29 patients (14.5%), and third group with good adherence comprising 18 patients (9%) (Figure 3).

Obese patients were showed to belong predominantly to II group (97 out of 123, about 79%), followed by group I and III in an almost equal percentage (9 and 10 out of 123, respectively). Overweight patients had a similar distribution, in fact they belong predominantly to second group: 39 out of 54 (72%), followed by group I (18%) and group III (9%). Normal weight patients were similarly concentrated in group II. Overall, group II comprised most study patients: 153 out of 200 (76%). However, high scores reflected in many cases an adequate intake of cereals (100% of the population regularly takes pasta, bread, and bakery products) and extra virgin oil (in 92% was the preferred oil). About 95% of population do not regularly eat fish. Only 47% of enrolled patients eat legumes 3-4 times in a week and 35% has a daily intake of fruits and vegetables. 37% of study population eats eggs not more than one in a week. The obese population showed an almost similar intake of fruits and vegetables, while seed oil was preferred to extra virgin oil, this latter being used in 81% of cases as compares to 92% in normal-weight population. The obese patients in the present study had metabolic diseases more frequently than normal-weight patients. In fact, 42% of obese versus 6.5% of normal weight showed metabolic diseases: 12% diabetes, 29% hypertension and 4% dyslipidemia.

Table I. Data are presented as Frequency (percentages). p-values are computed with Chi square or Fisher test as appropriate. Significant values are marked with asterisk*.

Group	Normal weight	Overweight	Obese	*p*-value*
Local Product				0.056
Yes	11 (47.83%)	39 (72.22%)	89 (72.36%)	
No	12 (52.17%)	15 (27.78%)	34 (27.64%)	
Food Labelling				0.206
Yes	3 (13.04%)	15 (27.78%)	21 (17.07%)	
No	20 (86.96%)	39 (72.22%)	102 (82.93%)	
Food Origin				0.290
Yes	5 (21.74%)	10 (18.52%)	36 (29.27%)	
No	18 (78.26%)	44 (81.48%)	87 (70.73%)	
Smoking				0.808
Yes	4 (17.39%)	13 (24.07%)	28 (22.76%)	
No	19 (82.61%)	41 (75.93%)	95 (77.24%)	
Colour				0.077
Yes	15 (65.22%)	26 (48.15%)	81 (65.86%)	
No	8 (34.78%)	28 (51.85%)	42 (34.15%)	
Alcohol				0.925
Yes	2 (8.79%)	4 (7.41%)	9 (7.32%)	
No	21 (91.30%)	50 (92.59%)	114 (92.68%)	
Sex				0.279
Male	5 (21.74%)	9 (16.67%)	34 (27.64%)	
Female	18 (78.26%)	45 (83.33%)	89 (72.36%)	
Education				0.004*
Primary/Secondary	11 (47.83%)	30 (55.56%)	86 (72.27%)	
High school	9 (39.13%)	17 (31.48%)	31 (26.05%)	
Degree	3 (13.04%)	7 (12.96%)	2 (1.68%)	
Income				0.025*
Medium-low/Low	10 (43.48%)	29 (53.70%)	84 (68.29%)	
Medium-high	11 (47.83%)	23 (42.59%)	38 (30.89%)	
High	2 (8.70%)	2 (3.70%)	1 (0.81%)	

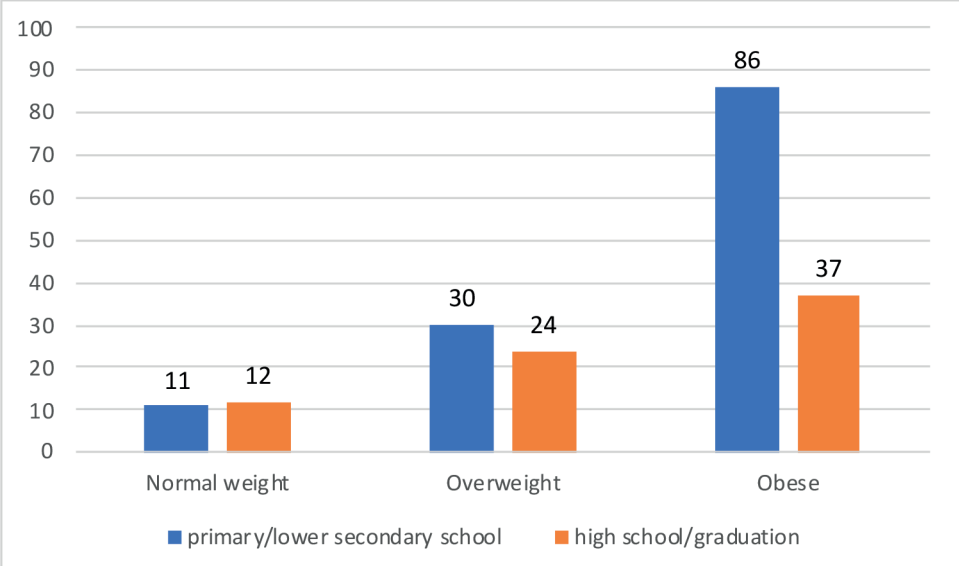

Figure 2. Patients distribution by weight and education.

Following one year, 80% of overweight patients changed into normal weight through not only dietary style change but also with increased mild physical activity. As concerns obese patients, the nutritional intervention was found to be less effective as regards weight: 45% of obese became overweight, 45% became normal-weight and 10% gave up. We registered a significant impact on associated disease, with reduction of dosage and drugs taken in diabetes and normal ranges of triglycerides and cholesterol.

Discussion

MediD is undoubtedly an effective tool for reducing cardiovascular risk and cancer incidence. However, Mediterranean countries have increasingly changed the typical MediD into a Western diet with a high intake of junk foods, saturated fat intake and low physical activity. Several studies document this trend[19]. A cross-sectional study[20] with two evaluations, one made in 1985-86 and another in 2005-06, showed a decreased adherence to MediD with a reduction as high as 8.2%, in the age range of 30-49 years.

In general, diet quality follows a socioeconomic gradient in terms of education, employment and income: specifically, people with higher socio-economic status consume more vegetables, fruit, whole grains, fish, and low-fat products, while those with lower socio-economic status consume more refined grains and added fats[21]. Our study confirms these data. In the present study, most patients (63.5%) had a primary/lower secondary school education, thus reflecting one of the problems of the land where the study was performed. Such percentage is almost superimposable to low income and obese patients in the population evaluated in the present study. We would like to underline that 67.7% of the obese people of this study had the lower level of education. Obese people were also grouped predominantly into

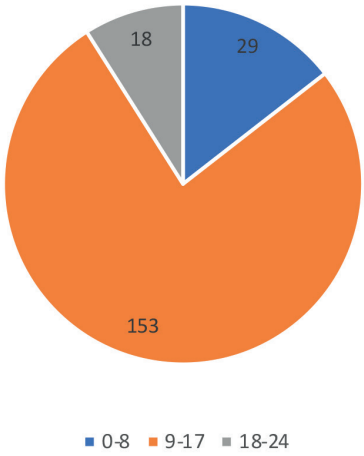

Figure 3. Patients representation according to survey results: group I with a score 0-8 (worst adherence to MediD); group II with a score 9-17 (discrete adherence to MediD); group III with a score 18-24 (good adherence to MediD).

Table II. M ± SD. *p*-values computed with ANOVA. Significant values are marked with asterisk*.

Variable	Normal weight	Overweight	Obese	*p*-value*
Age	42.91±16.52	42.11±17.82	50.77±16.75	0.004*
Score	12.83±4.17	11.89±3.87	12.28±3.82	0.614

Table III. *p*-values are calculated with Student's *t*-test or ANOVA as appropriate. Significant values are marked with asterisk *.*.

	Group	BMI	*p*-value*
Local Products			0.019*
	Yes	33.08±6.17	
	No	30.81±6.24	
Food Labelling			0.811
	Yes	32.63±7.38	
	No	32.33±5.99	
Food Origin			0.366
	Yes	33.09±6.45	
	No	32.15±6.20	
Smoking			0.607
	Yes	32.78±5.66	
	No	32.27±6.44	
Colour			0.132
	Yes	32.90±6.58	
	No	31.58±5.68	
Alcohol			0.211
	Yes	30.90±4.45	
	No	32.51±6.38	
	Sex		0.627
	Male	32.75±5.65	
	Female	32.27±6.46	
Education			<0.001*
	Primary/Secondary	33.39±6.05	
	High school	31.11±6.30	
	Degree	27.28±5.85	
Income			0.002*
	Medium-low /Low	33.62±6.36	
	Medium-high	30.45±5.51	
	High	29.90±7.53	

low socio-economic and medium/low socio-economic level class. These data are in line with the association of obesity and poor classes[22]. Low level of education and income were correlated to high BMI. The different categories of patients had a different age probably reflecting a high level of education, more attention to physical appearance and/or quality of information concerning nutrition. Local product supply also probably reflects increasing attention to nutrition which translates into correlation found to BMI.

Interestingly, most study patients showed intermediate/bad adherence to MediD, reflecting diffuse change from MediD to Western habits in nutrition. Obese and overweight patients also showed predominantly an intermediate adherence to MediD. The discrete adherence to MediD showed in most patients (76%) is far from the optimal required adherence, in fact, for group III patients was made only by 18 out of 200 patients (9%). Low adherence to MediD was found in

Table IV. *p*-values computed with Pearson'sr. Significant values are marked with asterisk*.

Variable	Correlation	*p*-value*
Age	0.2417937	<0.001*
Score	-0.07045554	0.322

other studies. As an example, an evaluation of 1740 Italian 8-9-year-olds revealed that only 5.0% of the children resulted "high" adherers of MediD. Such children had low consumption of fruit, vegetables, legumes, dairy products and a high intake of commercially baked goods for breakfast and sweets[23]. In Northern Italy during the period 2010-2016, Leone et al[24] found that only 14% of the subjects had a dietary pattern consistent with MediD.

Conversely, good adherence to MediD showed recognized positive results on health. An extensive literature attests this correlation. As an example, a significant interaction between Mediterranean diet adherence and weight status on hypertension and a significant reduction of hypertension with MediD was recently showed by Magriplis et al[25]. Good adherence to MediD was associated with lower insulin resistance[26]. A relationship between pathogenesis and clinical severity of congestive heart failure was found in by Tuttolomondo et al[27]. A high adherence to MediD is associated with a reduced incidence of all-cause mortality, fatal and non-fatal major cardiovascular disease (CVD), type 2 diabetes, weight gain, metabolic syndrome, depression, cognitive decline, and nephrolithiasis, as shown in the Seguimiento Universidad de Navarra (SUN) cohort[28]. A high adherence to the Mediterranean diet at midlife was helpful to maintain good overall health during aging[29].

The high rate of obese patients in the present study which is 61.5%, reflects the selection of patients requesting nutritional counseling. However, the relevant number of obese people underlines the need for public measures to reduce this medically relevant problem. In Italy, several surveillance systems have been implemented to assess obesity, such as "Passi", regarding 18-69 aged people, "OKkio alla Salute" for primary school children and "Passi d'Argento" oriented to over 65 years. "Guadagnare salute" is a national program aimed to promote prevention and control of chronic diseases through healthy lifestyles. Local initiatives are in line with these objectives. In this context, the program performed by North Naples 2 Local Health Unit can be included.

The interest showed by the population towards this free nutritional program performed by North Naples 2 Local Health Unit during the first year is remarkable. The nutritional intervention has been found to be effective especially for overweight patients. Obese patients are probably more resistant to nutritional approaches and require prolonged observational time. Low physical activity performed is surely determinant in condition basal obesity and results obtained with nutritional intervention. In the present sample of people, only 18.5% (8% obese) regularly performed physical activity.

Awareness campaigns to MediD and physical activity should help in improving our results in the next future. There is consensus that physical activity interventions in the primary care settings may increase levels of the activity performed by sedentary patients, at least in the short-term[30]. Combination of nutritional interventions and increased physical activity is surely a cost-effective public strategy to reduce chronic metabolic illnesses with relevant costs for our public health system. Moreover, a high/low adherence to the MediD model and educational/social policies could represent a sustainable model to reduce a wide range of chronic disease as some model approach showed[31,32].

Conclusions

Obesity is a diffuse condition with important relationships with chronic health diseases including cancer disease[33-41]. In areas traditionally linked to MediD, Western habits and junk food intake have increasingly contaminated rural and poor diet style. As a result, in Campania there is one of the highest rates of overweight/obese people. In the present study, we registered an intermediate adherence to MediD which is considered suboptimal in terms of impact in reducing obesity and related diseases. Level of education and income were also significantly correlated with obesity, suggesting the role for education and awareness campaigns.

The present study highlights the need of larger epidemiological and public health programs with the aim to assess the relevance of obesity and possibly provide interventional tools.

Conflict of Interest

The Authors declare that they have no conflict of interests.

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