Original article

Evaluation of lifestyle and nutritional status in off-site University Italian Students (ADISU-Foggia): A pilot study

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Abstract. *Background and aim:* Unhealthy lifestyle represent one of the main public problems. The World Health Organization (WHO) coined the term "globesity" in 2001 to emphasize the serious threat caused by the excessive weight gain of human beings around the world. The aim of this investigation is to carry out pilot study to detect the nutritional status, eating habits, lifestyle and psychological state related to eating disorders of the Apulian university population. *Methods:* In this study were recruited 80 students (54 female and 26 males; 21.2±2.16 years). Body composition, eating behaviors and physical activity levels were assessed. All participants completed questionnaires and then the nutritional visits. *Results:* Males have an average stature of 176.3 ± 8.2 cm and a weight of 73.6 kg ± 13.5.While the females have an average height of 162.2 cm ± 6.3 with a weight of 61.9 kg ± 15.2. The BMI on average is in the normal weight range for both males and females, respectively 23.7 ± 3.8 for males and 23.5 ± 4.6 for females. Males are more active than females. Eating habits shows that the participant consumed approximatively 50% of carbohydrates, 20 % of protein and 30% of lipids. *Conclusions*: These data shows that the diet of the sample analyzed is in line with national trends and with the departure from food models that have long been recognized as a fundamental for a correct lifestyle, also due to a choice of packaged foods that off-site students use a lot, confirming that nutrition educational program is fundamental, against obesity.

Key words: obesity, university students, eating behaviors, physical activity, nutrition

Introduction

An emerging field called "healthy lifestyle" (HL) refers to a methodical approach to management across various domains (1). Although there have been significant advancements in the prevention and management of chronic diseases, it is widely acknowledged that HL, or healthy behaviors, such as smoking, eating habits, stress management, and inactivity, play a significant role in the onset and progression of many chronic diseases (2). A phenomenon in strong growth after the COVID-19 pandemic, as the introduction of blockades and other containment measures has significantly changed the lifestyle and eating behavior of citizens (3-4). Staying at home and stocking up on food due to shopping restrictions and reduced physical

activity were seen as the major impact that worsened this condition with a lifestyle change of about 53% of Italians (5,6). It is not simple to follow a correct diet (7,8), in addition, the increased consumption of "comfort food" able to reduce stress by increasing the production of serotonin which has a positive effect on mood and reducing physical activity with a consequent increase in sedentary behavior (58%) (6, 9-11), led to an average weight gain of 4 kilograms per citizen, mostly in women (about 24% compared to 22% of men) and with a prevalence in the under 30s (about 21% of total population) (6). Numbers that differ for the southern regions; in fact, if the latest studies on the prevalence of overweight/obese people in Italy are taken into consideration, in the southern regions the numbers present are increasing, consequently they are placed in the first places, for example Apulia has values equal to 39, 5% of overweight people, while as regards obesity it is 12.8% of the total population (12). As for sedentary lifestyle, according to the levels of physical activity (PA) recommended by the WHO today 47% of the adult population in Italy can be classified as "physically active", 23% "partially active", but the 30% are "sedentary" (13).Since 2008, a sedentary lifestyle has been increasing everywhere in the country (but in particular in the South, where it has gone from values that touched 35% in 2008 to values that reached almost 45% in 2019), both in women and men and in all the ages; the geographical gradient is widening to the detriment of the South, while gender differences are maintained over time (to the detriment of women) (14). Currently, the level of sedentarily in Italy is 35.6%, while as regards Apulian region the number is much higher, it is estimated that about 43.7% of the population does not practice any kind of sport (12). An important aspect in assessing the obesity problem is linked to the quality of the food. Generally, the lack of time to cook healthy dishes is one of the factors that most influences the diet (9). Furthermore, in the case of "off-site" university students, this problem is accentuated because in addition to the reduced time for the preparation of healthy foods, in most cases the lack of "knowing how to cook" is combined. The 55% of Italian university students live with their families during their university career (3). Generally during the academic year, an off-site student will find himself having a diet that is profoundly different from what he had in the family, going from a healthy diet trying to favor healthy meals and not to skip meals at the beginning of the academic year up to skipping meals and preferring products from "vending machines" during class hours or take away and aperitifs after the courses. For example, at lunchtime, 73% of non-residents prefer a packed lunch or the University canteen when it is not too crowded, otherwise they go to the shops near the University to buy food, but almost half do not give up receiving, on average once a month, food from home (4). As far as dinner is concerned, over 60% of non-residents use take away at least once a week and pizza and kebabs are the foods most ordered. The 74% do not give up happy hour with friends, at least once a week (51%). Furthermore, more than 70% drink alcohol on weekends and almost 35% do so during the week, both during and after meals (2). A further factor that affects and influences the diet of an off-site student is the fact that many students find the food offered inside the University, as well as in the adjacent areas, too expensive compared to their daily availability, above all if forced to have to eat for several days a week near the University. Some of these therefore opt to bring food from home, the so-called "lunch box" to save time and money but given the lack of will and time, even the "lunch box" does not appear to be so healthy. In addition, junk food and eating habits outside the home also play a fundamental role in obesity (15). Over the years, the habit of eating outside the home with the choice of more palatable foods has increased, in fact more than a third of adults consume junk food several times a week (16), also noting that among food choices with a high fat content over fat-free food (17,18). Recent investigation has shown that the consumption of junk food tends to cause obesity (especially central adiposity) with an ever-increasing number of heart disease and other non-communicable diseases (19). In fact, junk foods are associated with obesity due to their high energy content and the quantity, as mentioned above, of fats present or greater quantities of sugar, chemical additives, and sodium, associated with the presence of a low quantity of micronutrients and fibers. All this determines a bad diet, which could lead, especially in the long term, to a reduced immunity, susceptibility to various systemic diseases, and finally

are deuced physical and mental well-being and efficiency (20). It is well known that the diet is of human well-being and health, in particular, a dietary model such as the Mediterranean diet that apport macronutrients and micronutrients important to reduce the incidence of cardiovascular and neoplastic diseases, leading to health and longevity (21-22). The principles of the Mediterranean diet have been enclosed, after conspicuous and careful research, within the food pyramid, which has now become an undisputed food model (23). The food pyramid and consequently the weekly or daily food consumption of the portions (s) can be divided as follows: at the base there are fruit with consumption of 1-2 s per main meal, vegetables with consumption ≥ 2 s per main meal, cereals 1-2 s for main meal,

olive oil 1 s for main meal, dairy products consumed 2 s per day, legumes ≥ 2 s per week, eggs 2-4 per week, fish ≥ 2 s per week, white meat 2 s a week, processed meat≤ 1 s a week, red meat; 2 s a week, potatoes ≤ 3 s a week, sweets ≤ 2 s a week (24). Likewise, exercise, or physical activity, which is present at the base of the food pyramid (24), is a fundamental component to ensure numerous physiological and psychosocial benefits in humans, preventing cardiovascular and metabolic diseases (25-26). In this context, the aim of this study is to carry out a cognitive investigation for the development and implementation of a food education project for university students at ADISU Puglia, in order to develop effective tools and methodologies that allow an early intervention to prevent deficiency states or risk factors linked to an unhealthy lifestyle which translates into malnutrition and obesity. Therefore, the aim of this study was to carry out pilot research to instantly detect and photograph the nutritional status, eating habits, lifestyle and psychological state linked to eating disorders of the university population, in younger students. of the southern Italy.

Materials and methods

Participants

For this study, 80 students with the anthropometric characteristics showed in Table 1, were enrolled at ADISU Puglia in collaboration with the Department of Experimental and Clinical Medicine of the University of Foggia, who joined the "Lifestyle &Planet life: improving your life while saving the planet" project. Each participant signed a paper informed consent and authorized team researchers to contact them for subsequent follow-up information.

Table 1. Anthropometric characteristics.

Parameters	**Female**	**Male**
Number *(n)*	54	26
Age *(year)*	21,2 ± 2,4	21,2 ± 1,6
BMI *(Body Mass Index-kg/m²)*	23.5 ± 4.6	23.7 ± 3.8
Height *(cm)*	162.2 ± 6.3	176.3 ± 8.2
Weight *(kg)*	61.9 ± 15.2	73.6 ± 13.5

Eligibility criteria

Young adults of both genders, residing at the ADISU Foggia residences, students, aged between 18 and 30, with or without the presence of single pathologies or comorbidities.

Study protocol and data collection

From November to December 2021, questionnaires were delivered to each participant to evaluate, the general information, the presence or absence of any pathologies, information regarding COVID-19 pandemic's impact, their eating habits to evaluate their adherence to the Mediterranean Diet and their physical activity levels. The questionnaires were formulated to evaluate the adherence to the Mediterranean Diet and were formulated in a simple way to make it readable and understandable by everyone. The questionnaires are mix and based on validated Italian version of questionnaires such as MEDLIFE, PREDIMED for adults, EAT-26, EDE-17.0D and IPAQ as reported in literature (27-30). These have been translated to submit them to the participants. In addition, the questionnaire is shown in Table 2. Subsequently, each participant was evaluated with an anthropometric assessment of body composition and was given questionnaire created on Google Forms, on food diary (Recall 24h) consisted of five open questions on daily

Table 2. Female and Male evaluation questionnaire for general information, eating habits and physical activity. The results are expressed as a percentage (%) compared to the number of total responses.

	Female (n%)	**Male (n%)**
Question 1: Sex	67,5%	35,2%
Question 2: Age		
• *18-30 years*	100%	100%
• *31-35 years*	0%	0%
• *> 36 years*	0%	0%
Question 3: Smoke		
• *Yes*	44,3%	34,6%
• *No*	55,7%	65,4%
Question 4: Covid Vaccination		
• *Yes*	100%	100%
• *No*	0%	0%
Question 5: Covid Positivity		
• *Yes*	14,3%	19,2%
• *No*	85,7%	80,8%
Question 6: Gastrointestinal disorders/Other disease		
• *Yes*	14,3%	23,1%
• *No*	85,7%	76,9%
Question 7: Do you practice physical activity?		
• *Yes*	35,2%	69,2%
• *No*	64,8%	30,8%
Question 8: If yes, how many times a week?		
• *<1 time per week*	0%	16,6%
• *1-2 times per week*	15,8%	5,5%
• *2-3 times per week*	73,6%	33,5%
• *>3 times per week*	10,6%	44,4%
Question 9: If you practice physical activity, with what intensity?		
• *Low Intensity Training*	10,5%	5,3%
• *Medium intensity Training*	73,7%	78,9%
• *High Intensity Training*	15,8%	15,8%
Question 10: Have you been trying to lose weight in the past three months? If not: Have you tried to avoid gaining weight?		
• *No attempt to either lose or avoid gaining weight in the past three months*	42,6%	57,6%
• *Attempts to both lose weight and avoid gaining weight in the past three months for reasons related to body shape or weight*	57,4%	42,4%
Question 11: Do you pay close attention to the calorific value of food?		
• *Yes*	38,9%	34,6%
• *No*	61,1%	65,4%
Question 12: How many portions of sweets do you consume per week? (Chocolates (1 portion = 3 g) biscuits and similar)		
• *<1 serving per week*	33,3%	30,7%
• *1-2 servings per week*	42,6%	15,4%
• *>2 servings per week*	24,1%	53,9%
Question 13: How many servings of red meat do you eat per week? (Beef, pork, lamb (1 portion 100-150 g)		
• *<1 serving per week*	24,6%	24%
• *1-2 servings per week*	54,7%	40%
• *>2 servings per week*	20,7%	36%
Question 14: How many servings of processed meat do you consume per week? (sausages and similar, 1 portion = 50 g)		
• *<1 serving per week*	39,6%	56%
• *1-2 servings per week*	37,7%	16%
• *>2 servings per week*	22,7%	28%
Question 15: How many eggs do you eat per week? (1 serving = 1 egg)		
• *<1 serving per week*	70,4%	65,4%
• *1-2 servings per week*	22,2%	26,9%
• *>2 servings per week*	7,4%	7,7%
Question 16: How many servings of legumes do you consume per week? (Lentils, beans, peas, chickpeas (1 serving = 1 plate or 50 g dry weight- 150 g cooked weight)		
• *<1 serving per week*	20,4%	23,1%
• *1 serving per week*	22,2%	19,2%
• *2 servings per week*	37%	30,8%
• *>2 servings per week'*	20,4%	26,9%
Question 17: How many portions of white meat do you eat per week? (Poultry, rabbit - 1 serving = 150 g)		
• *<1 serving per week*	42,5%	30,8%
• *1-2 servings per week*	31,5%	46,2%
• *>2 servings per week*	26%	23%
Question 18: How many servings of fish or seafood do you eat per week? (White / fatty fish (1 serving = 100-150 g), canned fish (1 serving = 1 can or 50 g), seafood (1 serving = 200 g)		
• *<1 serving per week*	73,6%	72%
• *1-2 servings per week*	20,8%	16%
• *>2 servings per week*	5,6%	12%
Question 19: How many dairy products do you consume per day? (Milk - 1 portion = 200 ml milk, two yogurts, 1 portion of spreadable cheese)		
• *<1 serving per day*	33,3%	48%
• *2 servings per day*	48,2%	28%
• *>2 servings per day*	18,5%	24%
Question 20: How much fruit do you consume per day? (All fruit and "fruit extracts"- 1 serving = 150-200 g)		
• *<1 serving per day*	44,4%	65,4%
• *1-2 servings per day*	53,7%	34,6%
• *3-4 servings per day*	1,9%	0%
• *>4 servings per day*	0%	0%
Question 21: How many servings of vegetables do you consume per day? (1 portion = 150-200 g)		

• *<1 serving per day*	28,9%	28%
• *1-2 servings per day*	48%	48%
• *>2 servings per day*	23,1%	24%
Question 22: How many tablespoons of olive oil do you consume per day (cooking or salad dressing)? (Olive oil, extra virgin olive oil - 1 serving = 1 tablespoon)		
• *<1 serving per day*	24,1%	19,2%
• *1-2 servings per day*	42,6%	61,6%
• *>2 servings per day*	33,3%	19,2%
Question 23: How many servings of cereals do you consume per day? (White and whole meal bread - 1 serving = 40 g, half sandwich, cereals - 1 serving = 1 plate of rice, pasta(80 g) or 40 g of breakfast cereal)		
• *<1 serving per day*	25,9%	15,4%
• *1-2 servings per day*	46,3%	53,8%
• *>2 servings per day*	27,8%	30,8%
Question 24: Do you drink more than 6 glasses of water or at least one cup of tea a day? (Water or tea - 1 glass serving or 200 ml)		
• *Yes*	75,9%	80,8%
• *No*	35,2%	19,2%
Question 25: Do you drink wine every day with meals? (White / red wine (1 serving = 1 glass of wine or 125 ml)		
• *<1 serving per day*	94,4%	100%
• *1-2 servings per day*	0%	0%
• *>2 servings per day*	5,6%	0%
Question 26: Do you limit adding salt to meals?		
• *Yes*	64,8%	57,7%
• *No*	35,2%	42,3%
Question 27: Do you usually use nibbling between meals? Do you consume snacks between meals?		
• *Yes*	72,2%	69,2%
• *No*	27,8%	30,8%
Question 28: Do you limit your sugar intake in drinks? (including sugary drinks)		
• *Yes*	74,1%	65,4%
• *No*	25,9%	34,6%
Question 29: How many hours do you spend watching TV a day?		
• *<1 hour per day*	53,7%	64%
• *1 hour per day*	35,2%	16%
• *2 hours per day*	7,4%	8%
• *>2 hours per day*	3,7%	12%
Question 30: Do you practice physical activity (> 150 min / week or 30 min / day)? (jogging, brisk walking, dancing, aerobics, gardening)		
• *Yes*	46,3%	50%
• *No*	53,7%	50%

meals, in which each student, under the supervision of the team of dieticians and nutritionists, answered by writing for each main meal (breakfast, snacks, lunch, dinner, daily hydration) the foods and the respective quantities consumed the day before the visit.

Analysis of body composition and blood pressure

The assessment of body composition was carried out by a team of dieticians and nutritionists, from 8.30 am to 11.00 am, dividing the subjects into two days and into different groups. The measurements were carried out using a stadiometer and scale (SECA 700), which made it possible to calculate body weight, height, and body mass index (BMI). Body composition parameters (body fat mass, body lean mass, and bone mineral content) were calculated by body fat caliper and using Bioelectrical impedance analysis (Quantum V Segmental Bia), respecting fasting for at least 2 hours and with absence of hydration for at least 12 hours and absence of physical exercise for at least 12 hours. Blood pressure was measured by the team of doctors, using a manual sphygmomanometer.

Eating behaviors analysis and evaluation of the adherence to Mediterranean diet

The eating habits of the questionnaires reported in Table 1 were analyzed individually and subsequently reported in a database. Each food diary (Recall 24h) was analyzed using software (Terapia Alimentare Dietosystem® 18.00) for foods bromatological analysis. To analyze eating habits and their proximity to the Mediterranean Diet, the questionnaire in tables 2 was used. A value was assigned for each answer per question, concerning eating habits. Each value made it possible to calculate the distance, statistically expressed as an absolute value, from the respective optimal value. The optimal value is the score assigned to the answer that corresponds to the exact food frequency foreseen by the Mediterranean Diet for each food group. The sum of the distances obtained from the individual answers allowed to obtain a final score. The score was used to classify participants according to their adherence in high, medium and low. The zero value (0) corresponds to total adherence to the Mediterranean diet.

Statistical analysis

Statistical analyses were performed using the IBM® SPSS® Statistics 23.0. The data are presented as mean (M) ± standard deviation (SD), and statistical significance was set at $p < 0.05$. The Shapiro–Wilk test was used to check the normal distribution of variables. The analyses of variance (ANOVA) were performed in order to investigate the differences between parameters. The Linear regression and multivariate regression were performed to investigate the relationship between variables.

Results

General characteristics of the participants, eating behaviors and physical activity levels

A total of 80 participants completed questionnaires to collect their general information, eating behaviors and physical activity levels, after having signed the informed consent. The data, divided for sex, are specifically reported in the Table 2.

The sample is thus divided into 54 females (67.5%) and 26 men (32.5%). Students have an average age of 21.2 ± 2.16 years. 32/80 (40%) participants are smokers, in detail, 23/54 females (42.6%) and 8/26 males (30.7%) are smokers. The whole sample shows a successful COVID-19 vaccination, and only 13/80 children presented past COVID-positivity with a prevalence of 16.5% of the total. Furthermore, 18/80 students (22.5%) have gastrointestinal pathologies and / or disorders. 32% have gastroesophageal reflux, 17% hypothyroidism, 11% polycystic ovary syndrome (PCOS), 11% hepatic steatosis, 11% celiac disease, 6% anemia, 6% diabetes, 6% irritable bowel syndrome (IBS). Responses regarding eating habits are expressed as a percentage of the total number of responses. Most of the questions in the questionnaire were answered by the whole sample except for questions 13, 14, 18,19, 20, 21 and 25. Regarding questions 13 and 14, concerning processed meat and portions of red meat, only 98,1% and 96,15% of the female and male sample answered. It turns out that not everyone consumes portions of red meat and processed meat. Regarding question 18 and 25, concerning fish and wine only 98,1% and 96,15% of the female and male sample answered. Instead for the question 20 and 21, concerning fruit and vegetables only 96,3% for the male sample answered, and 96,2% of female sample. The results emerging from the questionnaire regarding eating habits, physical activity and lifestyle were subsequently used for the remaining statistical analyses.

Body composition evaluation

Body composition assessment was analyzed using BIA and body fat caliper which allowed to analyze in detail the various body compartments, shown in the Table 3 below.

As shown in Table 2 the blood pressure appears to be normal in both male and female, with average systolic pressure values of 129,03 mmHg ± 19,8 and a diastolic pressure of 76,92 mmHg ± 10,6 in male, and average systolic pressure values of 124,25 mmHg ± 20,9 and a diastolic pressure of 74,53 mmHg ± 13,1 in female. The BMI on average is in the normal weight range for both males and females, respectively 23.7 ± 3.8 for males and 23.5 ± 4.6 for females. If we analyze in detail the BMI of the participants and dividing

Table 3. Body composition results. The data show the analysis of data obtained from the assessment of body composition with quantification of the different compartments expressed in kilograms (kg) and percentage (%) compared to body weight. Data are expressed as means ± SD for each group.

	Female	**Male**
Number (n)	54	26
Systolic pressure	124,25 mmHg ± 20,9	129,03 mmHg ± 19,8
Diastolic pressure	74,53 mmHg ± 13,1	76,92 mmHg ± 10,6
BMI (Body Mass Index- kg/m²)	23.5 ± 4.6	23.7 ± 3.8
FFM (Free Fat Mass -kg)	41,3 ± 3,1	59,1 ± 7,7
FFM (Free Fat Mass %)	70,1 ± 7,4	81 ± 7
FM (Fat Mass kg)	22,5 ± 17,7	14,6 ± 8
FM (Fat Mass %)	29,9 ± 7,4	19 ± 7
Water (kg)	32 ± 5,4	42,9 ± 6
Water (%)	51,8 ± 5,5	58,8 ± 5,2
ECW (Extracellular water %)	46,6 ± 2,4	41,8 ± 2,7
ICW (Intracellular water %)	53,4 ± 2,4	58,2 ± 2,7

by gender; about 73% of the male sample is in the normal weight range (BMI 18.5 - 24.9), 23% in overweight (BMI 25-29.9) and finally 4% in the moderate obesity range (BMI 35-39,9), as regards the female component this is 67% in the normal weight range, 28% in overweight, 2% in mild obesity, 2% in moderate obesity and finally an equally 2% in the range of severe obesity. The body composition, on the other hand.

Evaluation of food frequencies and bromatological analysis in comparison with Mediterranean Diet

Under the guidance of the team of dieticians and nutritionists, each participant was subjected to a food questionnaire, as previously reported, and Recall 24h to evaluate their eating habits in terms of food and caloric intake, food frequencies and daily division of macronutrients, to evaluate students' adherence to the principles of the Mediterranean diet. The results are shown in Table 4, Table 5 and Table 6 below.

Table 3 and 4 show the results regarding adherence to the Mediterranean diet by the sample under examination. The individual food questionnaires were statistically analyzed for consumption frequencies for each food group. A value was assigned for each answer per question, concerning eating habits. Each value made it possible to calculate the distance, statistically expressed as an absolute value, from the respective optimal value. The optimal value is the score assigned to the answer that corresponds to the exact food frequency foreseen by the Mediterranean Diet for each food group. The sum of the distances obtained from the individual answers allowed to obtain a final score assigned to each student. The score was used to classify participants according to their adherence in high, medium and low. The zero value (0) corresponds to total adherence to the Mediterranean diet. Zero (0) equals total adherence to the Mediterranean Diet (27). On the other hand, Table 4 shows adherence based on the food pyramid divided into food groups. The results are expressed as a percentage (%) of the total number of responses of the sample that adheres to the frequencies established by the Mediterranean diet for each food category (24). Table 5, following the analysis of the 24h recalls, shows the percentages and weights of

Table 4. Adherence Score: the table shows the percentage (n%) of male and female adherents to the Mediterranean Diet. Adherence, divided into three groups (high, medium, low) was evaluated through scores expressed in absolute value. The score is the result of the sum of the distance between the value equivalent to the answers given by the individual student and the value equivalent to the optimal answers for adherence to the Mediterranean Diet. Zero (0) equals total adherence to the Mediterranean Diet.

Adherence Score					
High adherence (0-5 score)		Medium adherence (6-11 score)		Low adherence (12-17 score)	
Male (n%)	Female (n%)	Male (n%)	Female (n%)	Male (n%)	Female (n%)
1,25%	0%	12,5%	33,75%	17,5%	35%

Table 5. Analysis of adherence to the Mediterranean diet: the data show the results obtained from the analysis of the questionnaire for each food group**.**

	Adherent females (n%)	**Adherent males (n%)**
Sweets (2 servings per week)	75,9%	46,2%
Red Meat (<1 serving per week)	25,9%	26,9%
Processed Meat (<1 serving per week)	42,6%	53,8%
Eggs (>2 servings per week)	7,4%	7,7%
Legumes (>2 servings per week)	18,6%	26,9%
White Meat (2 servings per week)	31,5%	46,2%
Fish (>2 servings per week)	5,6%	11,5%
Dairy Products (1-2 servings per day)	18,5%	28%
Fruit (1-2 servings per day)	53,7%	34,6%
Vegetables (> 2 servings per day)	22,2%	23,1%
Olive oil (1-2 servings per day)	42,6%	61,6%
Cereals (1-2 servings per day)	46,3%	53,8%

Table 6. Calorie intake analysis:the data show the results obtained from the analysis of the 24h recall in terms of calories and macronutrients, expressed in grams (g) or percentage (%) of the total calorie intake. Data are expressed as means ± SD for each group.

	Female	**Male**
Caloric intake	**1446,4 ± 453,2**	**1621 ± 566,7**
CHO (g)	**202,7 ± 72,7**	**226 ± 94,2**
CHO (%)	**52,7 ± 9,4**	**50,4 ± 13,4**
Protein (g)	**61,7 ± 21,8**	**75,7 ± 40,4**
Protein (%)	**17,6 ± 6,5**	**19,5 ± 9,3**
Lipid (g)	**48,4 ± 24,1**	**50,9 ±18,1**
Lipid (%)	**29,4 ± 9,9**	**29,4 ± 9**
Fiber (g)	**13 ± 7,1**	**12,3 ± 5,6**

macronutrients relating to the daily intake, divided by male and female sex.

Statistical correlation between lifestyle and body composition

The previous results were statistically examined with the aim of defining possible correlations between the data on lifestyles, eating habits and physical activity, as reported in Table 1, and the body composition results, shown in Table 2. Significant positive correlation emerged between Smoking and BMI ($p < 0.05$; $R = 0.265$). Furthermore, significant positive correlation emerged between smoking and ECW ($p<0.05$; $R = 0.2$). Significant negative correlation emerged between frequency of physical exercise and fat mass ($p<0.01$; $R = 0.19$). Moreover, significant positive correlation emerged between frequency of physical exercise and FFM ($p<0.05$; $R = 0.28$). As shown in figure 5, the dependent variable BMI can be influenced by both lifestyle and eating habits. The consumption of fish once a week, the frequency of physical activity 1-2 times a week, the attempts to lose weight and not gain weight in the last three months (question 10, table 1 and 2) appear to be positively correlated, i.e. they affect the increased BMI. While, the consumption of legumes once a week, the consumption of snacks a day, no consumption of wine during meals and the consumption of processed meat >1 time a week negatively affect BMI, i.e. they affect the decrease in BMI. Furthermore, the results obtained from the previous analyzes such as eating habits, lifestyle were also analyzed using the multivariate linear regression model. This analysis was used to model the value of multiple dependent variables based on their relationships with categorical and scale predictors. Multivariate regression analyzes were evaluated for each independent variable, but only the variables presenting a *p-value <0.05 were reported in the figures. The dependent or target variables analyzed, to which the model gave significant responses, were the BMI (Figure 1) and FM (Figure 2).

As shown in figure 5, the dependent variable BMI can be influenced by both lifestyle and eating habits. The consumption of fish once a week, the frequency of physical activity 1-2 times a week, the attempts to lose weight and gain weight in the last three months (question 10, table 1) appear to be positively correlated, i.e. they affect the increased BMI. While, the consumption of legumes once a week, the consumption of snacks a day, no consumption of wine during meals and the consumption of processed meat >1 time a week negatively affect BMI, i.e. they affect the decrease in BMI. Instead, as shown in Figure 6, the FM of the sample appears to be negatively correlated (ie decreases) with a frequency of physical activity both >3 times a week and 1-2 times a week. Furthermore, a negative correlation occurs with question n.10 (Table 1), ie the sample that answered "no attempt to lose weight in the last three months" statistically has a lower FM. On the other hand, the consumption of fish twice a week appears to be positively correlated with FM (ie there is an increase in FM).

Discussion

The main purpose of this study was to evaluate the nutritional status in off-site University Students from the Apulia Region. Our study providing an overview of the lifestyle of students who live away from home, which implies, in work or study-related life, profound changes in eating and behavioral habits, due to common factors that influence young people's nutritional choices such as lifestyle changes, increases in costs and financial resources and consequently greater choice of ready and "quick" meals (27). Although ours is an observational study, we believe it is very important because it has allowed us to have insight into the lifestyles of a particular population of students. Our study showed that the students who were involved did not participate in enough physical activity and that they had unhealthy eating habits. The results of our study are in line with previously published results by WHO (27). In fact, given that the 2010 Global Recommendations on Lifestyle for Health state that one in four (27.5%) adults and more than three quarters (81%) of adolescents do not meet the recommendations for physical exercise and diet (28), there is an urgent need to increase priority and investment in services to promote healthy lifestyle (3). These statistics also show that gender differences are significant and that participation levels have not increased globally over the past

Figure 1. Multivariate linear regression of lifestyle, eating habits on BMI. The dependent or goal variable is the BMI and the independent variables are respectively: "Fish" or consumption of Fish (1 portion per week mode); "Weight loss" or attempt to lose weight in the last three months (attempt to lose weight gain weight in the last three months mode); "Physical Act FRQ" or frequency of physical activity (1-2 times per week mode); "Legumes" or consumption of legumes (1 portion per week mode); "Wine" or consumption of wine (no consumption of wine mode); "Snacks" or consumption of snacks (yes consumption of snacks mode); "Processed meat" or consumption of processed meat (> 1 time per week mode). The thickness of the line represents the degree of importance of the variable ($p<0.05$).

20 years. Inequalities in involvement by age, gender, socioeconomic level and geography are also frequently seen in national data, which highlights the urgency of increasing financial support for health [4]. For current and future generations to remain healthy throughout their lifespans, proper diet is crucial. A balanced diet lowers the risk of chronic diseases while promoting healthy growth and development. Adults who follow a healthy diet have a lower risk of obesity, heart disease, type 2 diabetes, and several malignancies. They also live longer. People with chronic diseases can control their conditions and prevent complications by eating healthfully (31-34).

Unhealthy eating habits have therefore characterized the last few decades, moving further and further away from the food model of the Mediterranean Diet, especially in the southern regions, increasing more and more after the COVID-19 pandemic. The modernization of the food chain, the change of lifestyles, urbanization and globalization have had important effects on the food lifestyle (35). In Apulian region we have witnessed more and more a real erosion of the Mediterranean diet, it is in fact shown in a study by Bottalico F. et al, how the Apulian food habits have changed negatively compared to the typical Mediterranean traditions, with the increase in the consumption of foods and products with high energy density and consequent increase in the incidence of obesity and diseases gate to the power supply (36). The share of overweight people aged 18 and over is stable in Italy. In fact, even in 2019, it is confirmed that 35.4% of the adult population is overweight, while just over one in ten people is obese (10.9%). The highest prevalence of people over the age of 18, obese, is found in the southern regions, mainly in Apulia with a rate of 12.8%, while as regards overweight it occurs with a

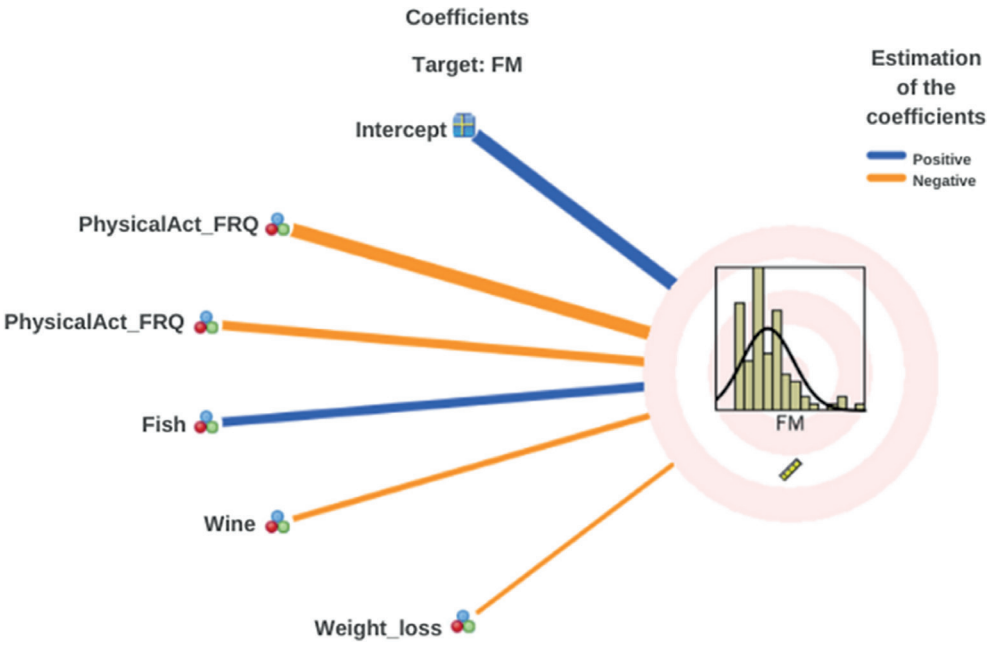

Figure 2. Multivariate linear regression of lifestyle, eating habits on FM. The dependent or goal variable is the FM and the independent variables are respectively: "Physical Activity Frequency" or Frequency of physical activity (>3 times per week mode); "Physical Activity Frequency" or Frequency of physical activity (1-2 times per week mode); "Fish" or consumption of fish (2 portions per week mode); "Wine" or consumption of wine (no consumption mode); "Weight loss" or attempts to lose weight (No attempt to lose weight gain weight in the last three months mode). The thickness of the line represents the degree of importance of the variable ($p<0.05$).

percentage of 39, 5% (12). Phenomenon that increased with the COVID-19 pandemic with an increase in the weight of the population (+ 4kg body weight in Italians) (6), and highlighted that the presence of obesity (especially in young adults) increases the risk of complications and death in people affected by COVID-19, as it increases the likelihood of developing respiratory dysfunction, high levels of inflammation, impaired immune response to viral infections and the presence of other associated diseases (37,38). However, the data of the population examined for this study are slightly different from the general averages, as, when assessing the BMI, these percentages do not seem to be present. In fact, the prevalence of both obesity and overweight among students appears far from the national and Apulian average percentage. However, the population data examined for this study are slightly different from the overall averages, as these percentages do not appear to be present in the BMI assessment. In fact, the prevalence of both obesity and overweight among students appears far from the national and Apulian average percentage. The Italian average of overweight is 35.4% while in Apulian region it is 39.5%, completely different percentages within the sample, which does not respect these proportions. In fact, the average overweight divided by gender is respectively 28% and 23% for the female and male sample. The same situation occurs about obesity, also in this case the average of young obese adults present in the analyzed sample seems to be lower than the national and regional averages. The national average of obese is 10.9%, while Apulian is 12.8%, in the sample it seems to differ by almost half, respectively by 6% for the female gender and 4% for the male gender (39). Although weight and BMI data appear to differ positively from national and regional averages, special attention should be paid to body composition analysis. In fact, although the weight of the sample, on average, falls within a BMI of normal weight, the body compartments do not seem to fall within the ideal

parameters, particularly in the female gender compared to the male gender. The human body is made up of many different elements, both sex and age and size are important determinants of the number of elements present in the body (40). As previously reported, BMI is influenced by both lifestyle and eating habits. The consumption of fish once a week, the frequency of physical activity 1-2 times a week, the attempts to lose weight and not gain weight in the last three months (question 18, table 1) appear to be positively correlated. While the consumption of legumes once a week and the consumption of processed meat >1 time a week negatively affect BMI, because participating students could eat meat to get protein for physical activity (41). Physical activity and healthy eating are good strategies for maintaining body composition and reducing all risk factors (42-48). Lower level of physical activity could be inducing water retention especially in the female. In fact, about 64% of women are sedentary, about double the national and regional average, since it certainly affects body composition, especially in the long term. Another cause that could induce changes in body composition would be the nutritional imbalance in terms of macronutrients and consequently also in micronutrients. In fact, university nutrition is mainly shifted towards a greater protein component, which does not appear to be in line with the principles of the Mediterranean diet, which has long been recognized by UNESCO as a world heritage site above all for its longevity capabilities (49-51). As can also be seen from table 4, the deviation from Mediterranean diet percentages does not only concern the components of the macronutrients but also specifically concerns the various food groups, whose percentages of adherence to the frequencies of the various food categories differ clearly from the guide recommended by the Mediterranean Diet (24). Only 22,1 and 23,1% of the female and male students complies with the frequencies established for vegetables, 46,3% and 53,8% for cereals, 25,9% and 26,9% for red meat. The 18,5% and 28% of the female and male sample complies the percentages of dairy products, 18,6% and 26,9% for legumes, 31,5% and 46,2% for white meat, 5,6% and 11,5% for fish, 7,4% and 7,7% for eggs, 42,6% and 53,8%% for meat processed and only 53,7% and 34,6% for the fruit. Furthermore, as shown in table 3, out of the total number of participants, no female and only 1.25% of the male students show high adherence to the Mediterranean diet, only 12.5% of the male sample and 33. 75% of the females show moderate adherence and against 17.5% and 35% of the male and female sample show a low adherence to the Mediterranean diet, completely distancing themselves from the reference food model. In summary, females have a higher adherence than males, at least partially, by the greater interest the women have in healthy diet and the awareness of the effects of nutrition on health as already reported in the literature (52-53). These data seem to show that it is important to implement food education (concept of the double pyramid), to monitor the body composition of the university population, and to fight food waste. Moreover, it is now known that a sedentary lifestyle has negative impact on human health. In fact, in human history, foods have a functional aspect, they have always been used by populations with a clear increase in resistance to fatigue and with an excellent balancing effect on the nervous system: macronutrients and micronutrients therefore constitute an essential food during pregnancy, breastfeeding, growth and against psychophysical overwork, anemia, constipation, diverticulosis, varicose veins of the lower limbs, atherosclerosis, senile diabetes, hypercholesterolemia, etc. In obese and/or overweight participants who lead a wrong lifestyle, the accumulation of visceral fat causes a state of chronic subclinical inflammation resulting from hypertrophy and hyperplasia of the adipose cells (54-56). An alteration of adipose tissue results in an alteration of the production of pro- and anti-inflammatory adipocytokines, with hyper production of pro-inflammatory cytokines such as TNF-α and IL-1β (57-60). Given the endocrine nature of adipose tissue, chronic subclinical inflammation of adipose tissue then becomes systemic (61-62). From this point of view, the low-carb diet can represent a valid strategy against obesity and related diseases, by reducing visceral fat, the inflammatory state and oxidative stress, rebalancing the production of cytokines and adipocytokines with an anti-inflammatory action to the detriment of those with pro-inflammatory action. When the body undergoes a change in body composition, with weight loss, the adipose cells undergo lipolysis, reducing visceral fat and chronic inflammation

(63-68). In addition, the production of anti-inflammatory adipocytokines such as adiponectin increases, and immune cells are also rearranged. Given that many healthy behaviors are formed and established during this time, the transition from adolescence to young adulthood may be a crucial moment for health promotion measures, including the promotion of good eating. Furthermore, excessive weight gain has been observed among young adults, particularly university students (31–33). The transition from high school to university also coincides with new living conditions, which could cause eating habits to change (34). But few research have examined potential shifts in eating habits post matriculation. Sport was the recreational activity students engaged in the most, despite doing so less frequently than the weekly average recommended for the maintenance of good health (14), which is consistent with other studies describing a lack of regular sporting activities (14) and a decline in all forms of physical activity in correspondence with the start of university (15). According to an important survey conducted in Southern Italy (11), students who live alone spend less time overall dedicating themselves to sports and other recreational activities which promote inclusion and sharing, allowing young people to interact with each other and improve consequently the psychological and nutritional state (35). For this reason, it is important to maintain a physiological "lean state", since a reduced component of adipose cells is also accompanied by a reduced concentration of endocrine disruptors and accumulated dioxins, which could lead to the appearance of related pathologies such as a of low-grade inflammation of adipose tissue resulting in obesity.

Conclusion

The results obtained from this pilot study made it possible to obtain a first statistical report on the university population of Foggia. The data shows that the sample's diet is in line with national trends which have long been distant from dietary models, such as the Mediterranean Diet, recognized as a fundamental pillar for a correct lifestyle. It is important to underline that the limit of this project could be the involvement of a small sample of our society and of the Apulian university reality, requiring further surveys on a larger population. The project's proposal is to offer a research basis to analyze possible incorrect eating and lifestyle behaviors, limiting the early spread of overweight and obesity, especially in the youngest and most sensitive segments of the population in line with the objectives of national primary prevention programs. In fact, this method of investigation at the provincial level could represent the starting point for nutritional and sporting activity re-education programmers, aimed at improving health within university contexts, which could be extended to a regional level and offer ideas for national level.

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Author Contributions: For research articles with several authors, a short paragraph specifying their individual contributions must be provided. The following statements should be used "Conceptualization, R.P. and G.M.; methodology, M.E.L.T. and F.M.; software, P.V.; validation, A.V., G.C. and G.T.; formal analysis, G.M.; investigation, I.V.; resources, P.L.; data curation, G.M.; writing—original draft preparation, A.M.; writing—review and editing, V.M. and R.P.; visualization, M.M.; supervision, R.P.; project administration, G.M.; funding acquisition, G.M. All authors have read and agreed to the published version of the manuscript."

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