

**SOCIO-DEMOGRAPHIC AND LIFESTYLE DETERMINANTS OF  
ADHERENCE TO THE MEDITERRANEAN DIET IN LEBANESE  
ADULTS: A CROSS-SECTIONAL STUDY**

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A Thesis

presented to

the Faculty of Nursing and Health  
Sciences

at Notre Dame University-Louaize

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In Partial Fulfillment

of the Requirements for the Degree

Master of Science in Human  
Nutrition

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by

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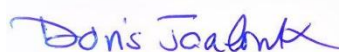
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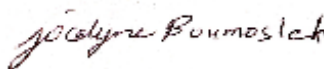
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## ABSTRACT

**Background:** Mediterranean diet (MD) is a traditional dietary pattern mainly followed in the Mediterranean regions and is shown to have positive health impacts, decreasing morbidity and mortality of major chronic diseases. A global shifting from the MD was documented especially in the Mediterranean regions, including Lebanon. Multiple individual and environmental factors were found to impact adherence to MD. In Lebanon, there is a shortage of recent information about adherence to the MD and its associated factors.

**Objective:** The objectives of this study are to 1) evaluate the level of adherence to the MD among Lebanese adults and 2) examine the associations between individual factors (socio-demographic and lifestyle) and MD adherence before and after adjustment for food environment at home and in stores factors.

**Methods:** A cross-sectional study design was carried out during the month of July 2021 among a convenient sample of 326 Lebanese adults. The participants completed an online questionnaire composed of a) questions about socio-demographics, anthropometrics, and lifestyle behaviors; b) the 14-item Mediterranean Diet Adherence Screener (14-MEDAS); and c) the Perceived Nutrition Environment Measures Survey in the Mediterranean Context (NEMS-P-MED-AR).

**Results:** The mean of the 14-MEDAS was  $7.59 \pm 2.22$ , thus the surveyed sample has a moderate adherence to the Mediterranean dietary pattern. Consumption of fruits, vegetables, legumes, and olive oil met the recommended Mediterranean diet intake among the majority of participants. Older age, having children, specializing in a health -related field and having regular physical exercise showed statistically significant associations with higher adherence to the Mediterranean diet. Results from multiple linear regression analyses showed that only older age and having a regular routine of physical activity were significantly associated with increased MD adherence.

**Conclusion:** Public health interventions aiming to promote adherence to the Mediterranean diet shall target predominantly younger age groups of the Lebanese population and incorporate strategies to boost physical activity among target groups.

**Keywords:** Mediterranean diet, Adherence, Determinants, Adults, Lebanon

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## I. BACKGROUND

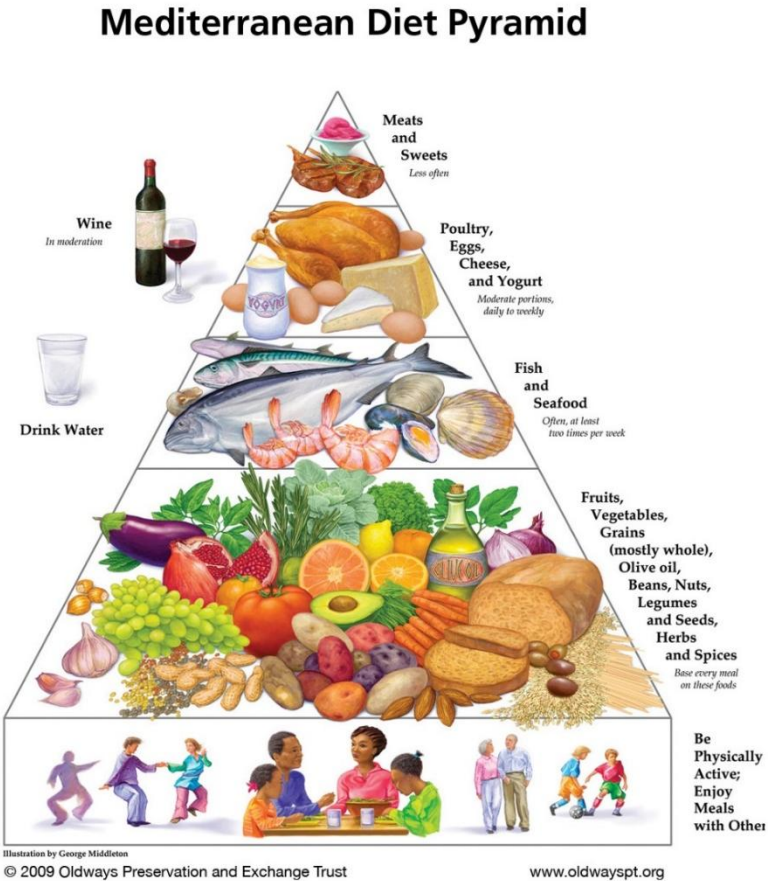
### A. Mediterranean Diet (MD) composition and health benefits

The Mediterranean diet (MD) is the traditional dietary pattern usually embraced by the populations bordering the Mediterranean Sea (Radd-Vagenas et al, 2017). Since the Mediterranean region is culturally, religiously, and economically very diverse and is an area with numerous agricultural patterns, therefore, it is important to set a common definition of the Mediterranean diet. In 1993, the international experts Oldways and the World Health Organization (WHO) / Food and Agriculture Organization (FAO) in collaboration with the Harvard School of Public Health created the Mediterranean Diet Pyramid (figure 1). Their source of information was based on diets of the Mediterranean regions producing olives and where olive oil is the main source of fat (Willet et al., 1995). The MD is characterized by high consumption of carbohydrates (plant foods, cereals and legumes) with low glycemic index, olive oil (main source of fat), a moderate intake of fish, poultry and red wine, and a low intake of red and processed meats. It contains high amounts of antioxidants, polyunsaturated (PUFA) and monounsaturated (MUFA) fats. In addition, it includes polyphenols (red wine, grapes, and apple) (Bonaccio et al, 2013), nutrients, amino acids, minerals (zinc, copper, iron, magnesium) and B-complex vitamins (B6, B12, folic acid).

The MD is not a novel concept: it has been of interest and received much recognition since the 1950s. The American scientist Ancel Keys conducted a study among six Mediterranean countries and found that individuals living in the Mediterranean region had lower rates of coronary heart disease (CHD). He attributed these observations to the lower intake of saturated fatty acids (SFA) and the higher reliance on plant-based foods in these populations (Altomare et al., 2013; Keys & Grande, 1957). Furthermore, adherence to the Mediterranean diet has been linked with a lower risk of obesity (Pereira-da-Silva et al., 2016), cardiovascular diseases (Liyanage et al., 2016), and

diabetes mellitus (Nowlin et al., 2012), being partly due to the beneficial impact of the MD on abdominal adiposity (Mistretta et al., 2017) and on inflammatory markers (Nowlin et al., 2012). In accordance with these findings, a randomized clinical trial (RCT) called PREDIMED found the Mediterranean diet to have a protective role on CVD. After 1-year follow-up, participants, who were at high risk of CVD, in the MD + nuts group showed a 13.7% reduction in the prevalence of metabolic syndrome (MetS), a risk factor for CVD, compared with reductions of 6.7% ( $p < 0.05$ ) and 2.0% ( $p < 0.05$ ) in the MD + EVOO (Extra virgin olive oil) and control groups (advice on a low-fat diet), respectively (Ros et al., 2014). Moreover, a cross-sectional study among 500 Lebanese adults aged  $\geq 18$  years (64% females) showed that participants with moderate and high adherence to MD had 57% (OR = 0.430, 95% CI = 0.234-0.788) and 55% (OR = 0.453, 95% CI = 0.214-0.961) lower MetS prevalence, respectively compared to participants with low MD adherence (Cordahi et al., 2015). The Mediterranean dietary pattern has a good level of evidence (B-level) supporting its ability to improve glucose levels and cardiovascular risk factors. Therefore it was included in the American Diabetes Association (ADA) recent nutrition position statement (Evert et al., 2013) as well as the joint scientific statement from the ADA and the American Heart Association (AHA) which focus on CVD prevention in diabetes mellitus (Fox et al., 2015). In addition to the positive effect of the MD on body weight and cardio-metabolic diseases, studies have shown its beneficial effect on cognitive performance (Hardman et al., 2016; Wu & Sun, 2017). Few studies explained the reason behind it, but when measuring the impact of the MD on the brain function of adults and elderly, results showed that this protective impact is primarily due to the antioxidants properties and the B vitamin content (Hardman et al., 2016; Wu & Sun, 2017). Despite this scientific evidence in support of the favorable health outcomes of the MD, Lebanon, among other Mediterranean countries, has been witnessing a gradual change in dietary pattern

referred to as “nutritional transitioning” (Naja et al., 2018). Due to the westernization of foods, the traditional MD has been fading, promoting a novel dietary pattern characterized by increased intake of animal-based foods and causing a higher prevalence of diet-related cardio-metabolic diseases. Previous findings reported a decline in MD adherence in both Lebanese and non-Lebanese populations (Bonaccio et al, 2016; Farhat et al., 2016; Maugeri et al, 2019; Naja et al., 2018). However, the available data from Lebanese studies dates back more than a decade.



*Figure 1. The Mediterranean Diet Pyramid*

## B. Assessing MD adherence among adults

Throughout the years, multiple scores have been used to assess the adherence to the MD with the majority of these indices originating from countries in Europe (Bach et al., 2006), namely Italy, Spain, Greece and France (Agnoli, 2011; Buckland, 2009; Gerber, 2006; Martínez-González, 2012; Panagiotakos, 2006; Trichopolou, 2005). The Mediterranean diet scale (MDS), the first and most widely used MD adherence assessment index, was created in Greece in 1995 and revised in 2003 to assess the effect of the MD on total mortality (Trichopoulou et al, 1995; Trichopoulou et al., 2003). This index is the only one that uses a sex-specific median calculation as a cut-off for each of the 9 food groups. In 2005, the MedDiet index, which is another internationally used score was created in Greece, included predefined cut-off portions and was proposed to be a good alternative for the sex-specific median MDS. It has been used in many studies, including the ATTICA study and the CARDIO 2000 case-control study in Greece (Panagiotakos et al., 2006). On the other hand, the Middle East, and particularly Lebanon, lacked a standardized MD adherence assessment tool which is crucial for comparing compliance with the MD, between European and Middle Eastern countries of the Mediterranean Sea (Naja et al., 2015). Therefore, in 2015, Naja and her colleagues developed a Lebanese index to assess adherence to the MD. The Lebanese Mediterranean diet index (LMD) was based on nine characteristic foods of the traditional Lebanese dietary pattern (Naja et al., 2015). In 2012, Martínez-González and colleagues developed the “Mediterranean Diet Adherence Screener” (MEDAS) which is a rapid estimation tool to screen the adherence to the Mediterranean diet (Schröder et al, 2011). The 14-item MEDAS questionnaire showed to be reasonably valid tool for the rapid estimation of MD adherence, without the need for a food frequency questionnaire, food diary or 24-hour recall as opposed to the earlier mentioned scores.

### C. Adherence to the MD in the Mediterranean regions

Using different indices and scores to assess MD adherence, previous studies reported low to moderate adherence to the traditional MD in the Mediterranean regions including Lebanon (Farhat et al, 2016; Naja et al, 2021; Vilarnau et al, 2019). In a cross-sectional study of 2,610 Lebanese adults (20-55 years, 53.8% females ), only 12.7% of participants had high adherence to the MD as per the Lebanese Mediterranean Diet (LMD) score, while 57.5% and 29.8 % had moderate and low adherence, respectively (Naja et al., 2019). In another study done in Lebanon among 615 adults, total sample had a 4.2 mean Mediterranean diet score (as proposed by Trichopolou et al., 2003) indicative of low adherence to the Mediterranean dietary pattern (Farhat et al., 2016). Likewise, in an Italian cross-sectional study, by Ruggiero et al. (2018), the mean MD score (as proposed by Panagiotakos et al., 2006) of 7,430 adults (aged 20 and above, 46% men) was found to be  $29.6 \pm 5.4$  (reflecting moderate adherence). In 2012, the “Mediterranean Diet Adherence Screener” (MEDAS) was developed by Martínez-González and colleagues, which is a rapid estimation tool to screen the adherence to the Mediterranean diet (Schröder et al, 2011).The adherence to the MD assessed by 14-MEDAS among different countries. For instance, in Spain, the PREDIMED study (Martinez-Gonzalez et al., 2012), reported a MEDAS score of  $8.6 \pm 2.0$  (reflecting moderate adherence), and in a sample of 310 Spanish university students (aged 18–30 years, 64.5% women) the mean 14-MEDAS score was  $7.0 \pm 2.0$  suggestive of moderate adherence level (Cobo-Cuenca et al, 2019). On the other hand, a study among 490 Portuguese adults showed that only 17% of the study population have high adherence to the MD (assessed using 14 item-MEDAS) (Andrade et al., 2020). Lately, the mean MD adherence score in a cross sectional study of 525 Lebanese students was reported at  $8.0 \pm 2.2$  (reflecting moderate adherence) (Karam et al., 2021)

#### D. Determinants of MD adherence

Several studies demonstrated the associations of socio-demographic, lifestyle, and environmental factors with the level of adherence to the MD using different MD scores (Naja et al., 2015; Peng et al., 2017; Ruggiero et al., 2019).

##### Socio-demographic determinants

Socio-demographic determinants including sex, age, marital status, educational and employment status showed association with MD adherence. A cross-sectional study of 7430 Italian adults (aged 20 and above, 46% men), using the MD Score (as proposed by Panagiotakos), showed significantly higher adherence to MD among men (OR= 1.32, 95% CI=1.21–1.43), middle-aged subjects (50–64 years) (OR=1.97, 95% CI=1.52–2.55), and those with higher education levels (OR=1.95, 95%CI=1.57–2.42) while no significant association found with marital status (OR=0.98, 95% CI= 0.82–1.18) and occupation (OR= 0.85, 95%CI = 0.55–1.31) (Ruggiero et al., 2018). However, a cross-sectional study of 411 Italian adults aged 18-85 years showed no association between gender and MD adherence level (OR= 0.890, 95% CI= 0.601–1.320) while a higher adherence was observed in people with older age (OR = 1.030, 95% CI= 1.016–1.044) and more qualified employment (OR=1.136, 95% CI=1.043–1.237) (Vitale et al, 2019). Moreover, a cross-sectional study among 42000 Italian adults (18-75 years) found that people with higher income (0.26, CR = 9.28) and educational levels (2.86, CR = 16.87) are more likely to have a higher adherence to MD (Cavaliere et al., 2018). In Lebanon, a cross sectional study of 2048 Lebanese adults (20-55 years, 45% males) , using four MD scores including LMD and MDS, found that higher adherence to MD/Lebanese dietary pattern was significantly associated with female gender (OR= 1.67; 95% CI = 1.33-2.09), older age (OR= 1.04, 95% CI = 1.03-1.06) and higher educational level (OR=1.85, 95% CI= 1.29–2.64) while no significant association was observed between the level of adherence

and marital status (OR=1.18, 95% CI=0.92–1.51) (Naja et al., 2015). In contrast, Farhat et al. (2016), using the MDS to assess the level of adherence among 615 Lebanese adults (aged 19 to 70 years, 35.1% males), found no significant difference in the level of adherence between men and women participants below the age of 30 years, while women over 30 years had lower MD score than men within this age group. Similarly, A Lebanese cross sectional study of 525 university students, using MEDAS to determine level of MD adherence showed older age students to have higher MD adherence level while no difference was found among genders (Karam et al., 2021). In contrast, a cross sectional study among 490 Portuguese adults showed higher MD adherence among women and employed individuals (Andrade et al., 2020). Other determinants associated with poor MD adherence were urban residence, low educational level, unemployment and low income among Italian adults aged 18 and above (Ruggiero et al., 2018; Vitale et al, 2018). In summary, previous studies showed consistent associations between older age, high educational level, high income/ and being employed with better/ higher MD adherence, while the association between gender and MD adherence was not consistent.

#### *Lifestyle and Anthropometric determinants*

Lifestyle determinants such as physical activity, smoking, meal and sleeping patterns have also been studied to test their association with MD adherence. Maugeri et al. (2019) conducted a cross-sectional study among 841 Italian women (aged 25–64 years, with no history of severe diseases) and found that increased physical activity, likelihood of overweight or obesity, and non-smoking status were significantly associated with higher adherence to MD. Findings from a Lebanese study of 2,048 adults (aged > 20 years, 55% females) showed that healthier lifestyle, consisting of high levels of physical activity( OR= 1.08, 95% CI=1.05–1.12), no smoking (OR= 0.78, 95% CI= 0.62–0.97), higher frequency of breakfast consumption (OR=1.08, 95% CI=1.05–1.12), and lower

frequency of eating out (OR= 0.93, 95%CI=0.89–0.98) to be associated with higher adherence to the LMD (Naja et al., 2015). On the contrary, being overweight/ obese, having low physical activity level, and being a smoker were factors significantly associated with poor adherence to MD (Baalbaki et al., 2015). Several studies were conducted to test the association between adiposity markers (“Body Mass Index (BMI) and Waist Circumference (WC)”) and the level of MD adherence, Findings were mixed and differed according to the MD score used. A cross-sectional study of 3384 students (59% females) found no association between MDS and BMI in both genders; yet significant negative association with WC was found in both genders, after adjustments for confounding variables (age, education level, income, sedentary occupation, smoking, and physical activity) (Issa et al., 2011). In addition, the MD was found not to be associated with BMI (Ruggiero et al., 2018), obesity (BMI and waist circumference) or metabolic syndrome (Baalbaki, 2015). In a more recent study of 303 Lebanese students (aged between 21 and 25 years, 57% females), lower BMI was associated with higher MD adherence (El Hajj et al., 2021).

### Food Environment

Environmental factors related to the home, community and consumer food environments such as food availability, accessibility, cost, nutritional quality of foods, and promotions, were also looked at as determinants of MD adherence. A cross-sectional study of 4,942 US adults found that food accessibility, frequency of shopping for fruit, and a greater variety of fruits and vegetables available at home to be significantly associated with meeting the recommended fruit and vegetable intake guidelines (OR=1.49, 95%CI= 1.28- 1.74; OR=1.52, 95%CI= 1.14-2.01 and OR=1.09, 95% CI= 1.08- 1.11, respectively) (Kegler et al., 2021). Another cross-sectional study by Alber et al. (2018) found that perceived availability and quality of fruits and vegetables in the neighborhood to be significantly related to daily fruit and vegetable intake among American adults. A study was



conducted to evaluate the level of household food insecurity (HFI; the inability of the household to secure, nutritious, adequate and safe food for meeting the dietary needs) and its association with adherence to Lebanese Mediterranean dietary patterns (MDP). Results showed that higher HFI scores were associated with lower adherence to Lebanese MDP among adolescents (Naja et al., 2020).

Food label use is another factor which may influence consumer choice of foods. It provides consumers with information about the nutritional quality of packaged goods at the time of purchase, date of production and expiration, cooking instructions and storage conditions. Use of food labels presumably help promote healthier food choices and make people more aware of their dietary choices (Miller & Cassady, 2015). A retrospective cohort study of 1,026 Spanish university students found that students who used food labels had higher MD adherence (OR=1.30; 95% CI= 1.18-1.43) and were more likely to consume high intake of fruits (OR:1.22; 95% CI=1.11-1.34), vegetables (OR=1.15; 95% CI= 1.08-1.12), and fish (OR=1.94; 95 CI 1.38,2.7), and a lower intake of meat (OR=0.76; 95% CI 0.58,0.9) when compared to non-food label users (Navarrete-Munoz et al., 2018). In another study among 411 Italian adults aged 18-85 years, higher MD adherence was observed among those interested in reading food labels (OR = 2.057,  $p < 0.0001$ ) (Vitale et al., 2019).

#### *Knowledge gap in Lebanon and rationale for carrying out the study*

Lebanon, as part of the Eastern Mediterranean region, has been facing a nutritional transition during the past years (Hadjimbei et al., 2016). The traditional MD has progressively been fading due to the westernization of food products and technology-driven culture (Naja et al., 2015), encouraging a new dietary pattern high in fat, refined sugar, and processed foods and causing a

higher prevalence of metabolic diseases (Myles, 2014; Mounayar et al., 2019). Other contextual factors may have also influenced adherence to the traditional MD including political, financial and economic instabilities (Farhoud & Dimassi, 2012; Karam et al., 2006). Deterioration of the economy resulting in increase in food prices may have an influence on food choices and therefore may lead to lower adherence to the MD (Bonaccio et al, 2016).

Knowledge about the relationship between individual factors and MD adherence among adults in Lebanon is not current and dates back more than a decade. We presume that individuals' adherence to the MD may have differed over time owing to changing associations, food environments, and interactions between individual and environmental factors. This study aims to 1) assess the level of adherence to MD among Lebanese adults (aged 18- 65 years); 2) examine the associations between individual factors (socio-demographic and lifestyle) and MD adherence before and after adjustment for food environment at home and in stores factors.

## II. METHODS

### A. Sampling

A cross-sectional study was carried out during the month of July 2021 among a convenient sample of 326 subjects of both genders recruited from urban Lebanese governorates (Beirut, Mount Lebanon, North, South and Bekaa). Prior to the initiation of the study, the study protocol was approved by the Institutional Review Board of Notre Dame University. Participants were selected via an e-flyer (Appendix A') where researchers briefed them about the study's objectives, procedures, inclusion and exclusion criteria for participation. The inclusion criteria included: being a healthy Lebanese adult aged 18-65 years, responsible for most or all of the food and grocery shopping and the exclusion criteria included pregnant and lactating women and those reporting following dietary modifications due to chronic diseases (diabetes, kidney disease, cancer). Eligible participants were then invited to sign electronically a consent form (Appendix A) and complete an online self-administered survey. Subjects had the right to withdraw from the study at any time. Furthermore, participants were assured that their data will be solely accessed by study researchers and that the information they provide will be kept anonymous.

### B. Data Collection

Data from participants were collected via an online survey developed by study researchers composed of 3 well-structured questionnaires (background including socio-demographic, anthropometrics and lifestyle habits, 14-MEDAS, NEMS-P-MED-AR; Appendices B, C and D respectively). The survey was translated from English to Arabic by a professional translator and was pre-tested on a pilot sample of 10 participants whose feedback was used to make any necessary changes to the questionnaires before use in the actual study. Data collected from the pilot sample did not constitute part of the data that were collected from the study participants in the actual study

and analyzed. All filled-out questionnaires were reviewed for completion immediately after collecting them from the participants. Data were entered and checked to ensure that typographical or other errors in data files were corrected; duplicate entries were removed from the database and all data from all participants were entered into the database.

### 1. Background: Socio-demographic information

Data on socio-demographic status included age (in years), gender (male, female), having children (no, yes), area of residence (Beirut, Mount, South or North Lebanon, Bekaa), marital status (single, married, separated/divorced, widowed), educational status (university level, secondary school, pre-secondary), specialty in a health-related major (yes, no), employment status (full-time employee, part-time employee, unemployed actively seeking employment, unemployed, not seeking employment).

### 2. Background: Lifestyle Information and Anthropometric Measurements

Data on lifestyle factors included eating habits such as frequency of meals/day (four or more, three, two, one), frequency of main meals/week (6-7 days per week, 3-5 days per week and 0-2 days per week), frequency of breakfast intake/week, frequency of eating out/week, smoking status (non-smoker, smoker), and physical activity status (followed a regular routine or no). Anthropometrics included self-reported weight (kg) and height (cm) measurements for determination of body mass index (BMI), a main indicator of obesity. BMI (kg/m<sup>2</sup>) was calculated by dividing the weight (kg) over the height squared (m<sup>2</sup>) and classified according to the Center for Disease Control and Prevention (CDC) where participants with a BMI  $\geq 30$  kg/m<sup>2</sup> were classified as obese and those with a BMI less than 30 kg/m<sup>2</sup> were considered to be non-obese (CDC, 2020). Moreover, perceived overall sleep quality, health status and impact of economic crisis/pandemic on dietary habits were addressed at the end of the background questionnaire (Appendix B). In this section,

the following responses were recoded into different variables: overall sleep (q17, Background questionnaire), collapsed “very good” and “fairly good” as one category, and “very bad” and “fairly bad” as another, and health status (q18), collapsed “very good” and “good” as one category and “fair” and “poor” as another.

### 3. Food Environment

Food environment perception and self-efficacy questions were assessed using the NEMS-P-MED questionnaire by Martínez-García et al. (2020). This tool measured the perception about availability, accessibility and marketing of 3 types of food environment: home, shops and restaurants.

It is composed of five main sections with a total of 32 questions: Home Food Environment (2 questions), Perceived Food Environment in Stores (7 questions), Perceived Food Environment in Restaurants (4 questions), Your Food Habits and Thoughts About Food (4 questions) and General / Background Information Questions (15 questions).

In order to adapt the NEMS-P-MED to the Lebanese context, the questionnaire was translated from Spanish to Arabic (NEMS-P-MED-AR) and some sections were modified. As such, in the first section “Home Environment”, we added two questions (“How often did you share meal times with your household members?” and “How often did your parents/siblings encourage you to have healthy food choices when you tempt to eat junk foods?”). In section two, “The Perceived Food Environment in Stores”, we modified two questions related to type of food stores and transportation means needed to access the food stores. Three questions were also added to this section (“I often read food labels”, “I find it easy to understand the food labels”, “Why did you read nutrition labels?”). Section three (4 questions) on the “Perceived Food Environment in

Restaurants” was removed; our study aim was narrowed down to the food environment in stores. In addition, section five “General/Background Information Questions” (15 questions) in the original NEMS-P-MED questionnaire was removed; same questions were integrated in our background questionnaire. Lastly, two questions were removed from section four “Your Food Habits and Thoughts About Food”; one was unnecessary as per our study objectives and the other was one of the questions incorporated in the 14-MEDAS tool (“When you eat out at a restaurant or get take-out food, how important to you is taste? nutrition? price? convenience? weight control? and “How often do you eat fruits and vegetables?”). The final questionnaire (NEMS-P-MED-AR), therefore, was composed of 13 questions that were grouped into 3 dimensions (Home Food Environment, Perceived Food Environment in Stores, and Your Food Habits and Thoughts About Food). The questions had different types of responses: dichotomous (yes/no), ordinal with a Likert-type scale from 3 to 5 options depending on the dimension (degree of agreement, importance or frequency). The complete NEMS-P-MED-AR questionnaire is available in Appendix D. In this section, the following responses were recoded into different variables: motivation to select place of food shopping (q6, NEMS-P-MED-AR) were collapsed into “not important” and “a little important” as one category, and “somewhat important” and “very important” as another. With respect to price of fruits and vegetables compared to other stores, we collapsed “expensive” and “very expensive” as one category and “cheap” and “inexpensive” as another (q7, NEMS-P-MED-AR). Likert scales responses in questions related to ease of buying foods in stores (q8), reading and understanding food labels (q10.g-i), and marketing perceptions (food placement and promotions) (q10.a-f) were recoded as follows: “disagree” and “strongly disagree” as one category, and “agree” and “strongly agree” as another. Lastly, for questions related to food

habits/thoughts about food (q12), we collapsed “somewhat important” and “very important” as one category.

#### 4. Dietary Intake and Calculation of the MD score

The measure used in this study to estimate participants' MD adherence was a 14-item Mediterranean Diet Adherence Screener (14-MEDAS) questionnaire, a questionnaire that was developed by researchers who conducted primary prevention nutrition-intervention trial, known as the PREDIMED study (Martínez-González et al., 2012). The 14-MEDAS questionnaire has been adapted to and validated in both Mediterranean (Greece, Cyprus, Italy, Spain and Portugal) (García-Conesa et al., 2020) and non-Mediterranean (i.e., Germany, USA, UK, Korea) populations (Bottcher, 2017; Hebestreit, 2017; Kwon, 2020; Papadaki, 2018).

This tool consisted of 12 questions on food consumption frequency and two questions on food intake habits that are considered specific to the Spanish Mediterranean diet (Schröder et al., 2011). Each question was scored 0 or 1. One point was given for using olive oil as the principal source of fat for cooking, preferring white meat over red meat, or for consuming: 1) 4 or more tablespoons (1 tablespoon = 15 ml) of olive oil/day (d) (including that used in frying, salads, meals eaten away from home, etc.); 2) 2 or more servings of vegetables/d (1 serving= ½ cup cooked or 1 cup raw); 3) 3 or more servings of fruits/d (1 serving= 1 medium piece or ½ cup of juice); 4) <1 serving (<150 g) of red meat or sausages/d; 5) <1 tablespoon (12 g) of animal fat (butter, margarine etc.)/d; 6) <1 can (1 can = 355 ml) of sugar-sweetened beverages/d; 7) 7-14 glasses of wine/week (wk) or 1-2 glasses/d; 8) 3 or more servings of pulses/wk (1 serving=1 cup or 150 g cooked); 9) 3 or more servings of fish (100-150 g cooked), seafood (4-5 pieces), shellfish (200 g)/wk; 10) fewer than three commercial pastries/wk; 11) 3 or more servings of unsalted nuts/wk (1 serving=1/4 cup or

30 g); or 12) 2 or more servings/wk of a dish with a traditional sauce of tomatoes, garlic, onion, sautéed in olive oil. If the condition was not met, 0 points were assigned to that question. The resulting score thus ranged from 0 to 14 with the higher score indicating greater adherence to the MD. For categorization of the adherence to the MD, we applied the following criteria: low adherence,  $\leq 5$ ; moderate to fair adherence, 6–9; good or very good adherence  $\geq 10$  (García-Conesa et al., 2020).

### C. Statistical Analyses

Analysis of data was carried out using Statistical Package for the Social Science (SPSS) software version 22 for Windows. Descriptive statistical analyses were performed to determine means and standard deviations (SD) for continuous variables, and frequencies and percentages for categorical ones. Chi square test/ Fisher's Exact test was used to explore relationships between categorical variables. Group differences on continuous variables were tested using one-way ANOVA (or its non-parametric equivalence, Kruskal Wallis test) when there were more than two groups to be compared. Linear regression analyses were used to assess the association between individual factors (socio-demographic and lifestyle) and adherence to the MD after controlling for the effects of confounders. A p-value  $< 0.05$  was considered statistically significant. Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity.



### III. RESULTS

#### 1. Sample characteristics

Socio-demographic, anthropometric, lifestyle factors, and Mediterranean diet score of the study population were shown in **Table 1**. Overall, the sample consisted of 326 healthy Lebanese adults (20.6% men and 79.4% women) with a mean age of  $37.14 \pm 11.84$  years. More than half of the study participants lived in Mount Lebanon (79.4%), were married (54.3%), had children (88.8%), were holders of a university degree (80.1 %), with 29.9 % of them having a degree in health-related disciplines, and full-time employees (58%). In general, the study participants had normal body weight (~58%) and a healthy lifestyle: ~86 % have 3 or more meals per day, 54% have their main meals 6-7 days per week, ~54% consume their breakfast 6-7 days per week, ~81% perceive their sleep quality to be good/very good, ~84% perceive their health status to be good/excellent and ~83 % eat out at a restaurant 0-2 days per week. The majority of the study participants reported to read/understand food labels (~56 %, 61%, respectively) in order to help them make healthy food choices (58.6 %). In the total sample, the mean Mediterranean diet score was  $7.59 \pm 2.22$  with the majority of study participants having good to fair adherence (~83%).

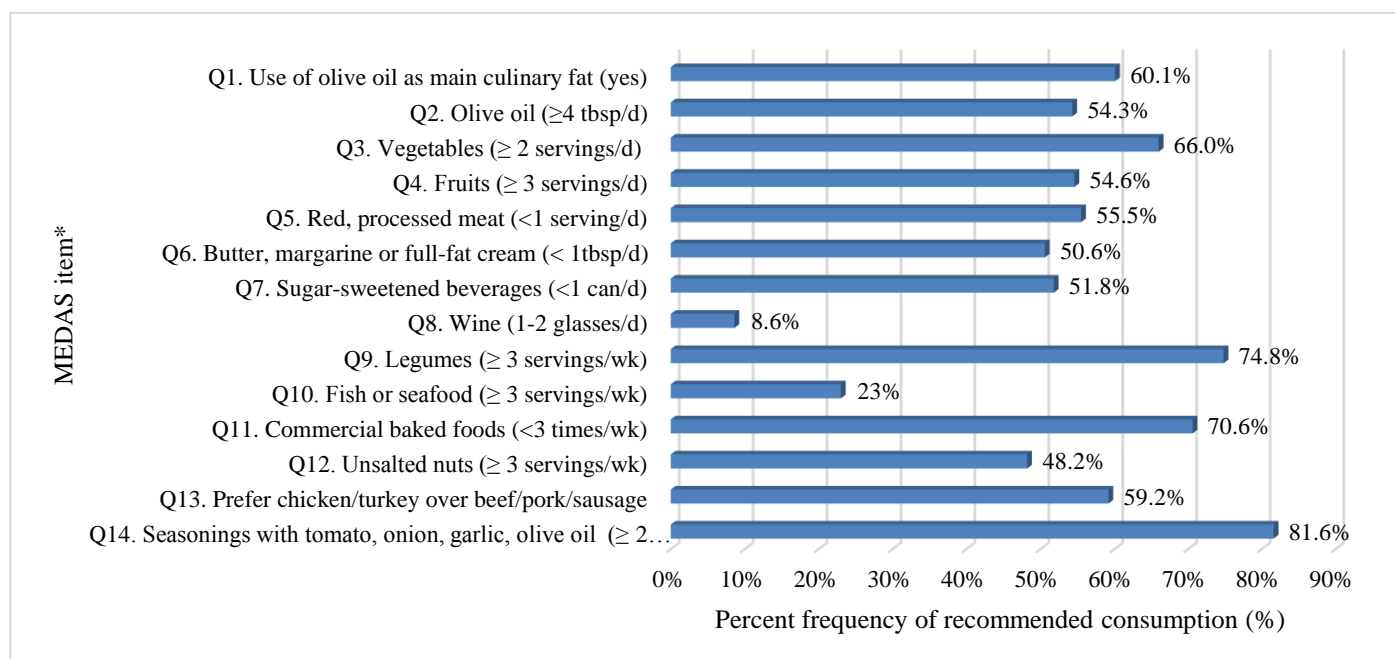
**Table 1.** Sample characteristics (socio-demographic, anthropometric, lifestyle factors), Mediterranean Diet score

	<b>Total (n=326)</b>		<b>Total (n=326)</b>
	<b>Mean <math>\pm</math> SD Or n (%)</b>		<b>Mean <math>\pm</math> SD Or n (%)</b>
<b>Age (years)</b>	37.14 $\pm$ 11.84	<b>Frequency of main meals</b>	
<b>Gender</b>		0-2 days per week	54 (16.6)
Male	67 (20.6)	3-5 days per week	96 (29.4)
Female	259 (79.4)	6-7 days per week	176 (54)
<b>Living area</b>		<b>Frequency of breakfast consumption</b>	
Beirut	38 (11.7)	0-2 days per week	83 (25.5)
Mount Lebanon	259 (79.4)	3-5 days per week	68 (20.9)
South Lebanon	7 (2.1)	6-7 days per week	175 (53.7)

North Lebanon	12 (3.7)	<b>Perceived sleep quality</b>	
Bekaa	10 (3.1)	Fairly good/very good	263 (80.7)
<b>Marital status</b>		Fairly bad/very bad	63 (19.3)
Single	138 (42.3)	<b>Perceived health status</b>	
Married	177 (54.3)	Excellent	46 (14.1)
Separated/divorced	7 (2.1)	Very good/good	229 (70.2)
Widowed	4 (1.2)	Fair/poor	51 (15.6)
<b>Have children</b>		<b>Frequency of eating out at a restaurant</b>	
Yes	167 (88.8)	0-2 days per week	271 (83.1)
No	21 (11.2)	3-5 days per week	43 (13.2)
<b>Education level</b>		6-7 days per week	12 (3.7)
Pre-high school or its equivalent	10 (3.1)	<b>Physical activity</b>	
High school or its equivalent	55 (16.9)	Yes	118 (36.2)
University or its equivalent	261 (80.1)	No	208 (63.8)
<b>Health-related major</b>		<b>Read food labels</b>	
Yes	78 (29.9)	Disagree	70 (21.5)
No	183 (70.1)	Neither agree nor disagree	72 (22.1)
<b>Employment status</b>		Agree	184 (56.4)
Full-time employee	189 (58)	<b>Understand food labels</b>	
Part-time employee	39 (12)	Disagree	50 (15.3)
Unemployed, actively seeking employment	34 (10.4)	Neither agree nor disagree	78 (23.9)
Unemployed, not seeking employment (student, housewife, retired, disabled etc.)	64 (19.6)	Agree	198 (60.7)
<b>BMI</b>		<b>Reason for reading food labels</b>	
Underweight (<18.5kg/m <sup>2</sup> )	10 (3.1)	Helps make healthy food choices	150 (58.6)
Normal weight(18.5-24.9 kg/m <sup>2</sup> )	190 (58.3)	Medical doctor/dietitian recommendation	9 (3.5)
Overweight (25-29.9 kg/m <sup>2</sup> )	82 (25.2)	Lose/control weight	46 (18)
Obese (≥30 kg/m <sup>2</sup> )	44 (13.5)	Curiosity (compare different food products)	51 (19.9)
<b>Smoking</b>		<b>MEDAS mean score</b>	7.59 ± 2.22
Yes	117 (35.9)	<b>MD adherence level</b>	
No	209 (64.1)	Good adherence (score ≥ 10)	64 (19.6)
<b>Meals per day</b>		Moderate to fair adherence (score 6-9)	208 (63.8)
One	2 (0.6)	Low adherence (score ≤ 5)	54 (16.6)
Two	44 (13.5)		
Three	146 (44.8)		
Four or more	134 (41.1)		

## 2. Adherence to each category of the Mediterranean diet

**Figure 2** shows the percentage of study participants who met the recommended consumption frequency of 12 food groups/ items as per MEDAS. More than 50 % met the recommended consumption of food seasoned with tomato, onion, garlic and olive oil (81.6%), legumes (74.8%), commercial baked goods (70.6%), vegetables (66%), red/processed meat (55.5%), fruits (54.6%), olive oil (54.3%), sugar-sweetened beverages (51.8%) and butter, margarine or full-fat cream (50.6%). In addition, most of the participants met the recommendation of using olive oil as the main culinary fat (60.1%) and consuming chicken or turkey rather than beef/pork/sausage (59.2%). Less than half of the participants, however, met the recommended consumption of unsalted nuts (48.2%), fish or seafood (23%) and wine (8%).



\*MEDAS: Mediterranean Diet Adherence Screener

**Figure 2.** Level of adherence to each category of the 14-MEDAS score

### 3. Determinants of Adherence to Mediterranean Diet

In the total sample, older age, having children, having a health-related major, and having a regular routine of physical exercise were associated with higher MD adherence levels **Table 2**. Specifically, individuals with good MD adherence levels were older (Good:  $40.55 \pm 11.88$  vs. Low:  $34.52 \pm 11.33$ ,  $p=0.016$ ). In addition, a significantly higher percentage of individuals who reported having children had good MD adherence levels compared to those who did not report having children (Yes: 24% vs. No: 4.8%,  $p = 0.023$ ). A significantly higher percentage of individuals who majored in health-related fields had good MD adherence levels compared to their counterparts (Yes: 29.5 % vs. No: 14.8 %,  $p= 0.020$ ). A significantly higher percentage of the study participants who reported following a regular routine of physical exercise was found to have good/moderate MD adherence levels compared to those who reported not to follow a regular routine of physical exercise (Yes: ~93% vs. No: ~78 %,  $p= 0.001$ ).

**Table 2.** Associations of socio-demographic, anthropometric, and lifestyle characteristics with MD adherence level

	<b>Total (n=326)</b>			
	<b>MD Adherence Mean <math>\pm</math> SD or n (%)</b>			
	<b>Good</b>	<b>Moderate to fair</b>	<b>Low</b>	<b>P value</b>
<b>Age (years)</b>	40.55 $\pm$ 11.88	36.77 $\pm$ 11.77	34.52 $\pm$ 11.33	<b>0.016*</b>
<b>Gender</b>				0.778
Male	13 (19.4)	41 (61.2)	13 (19.4)	
Female	51 (19.7)	167 (64.5)	41 (15.8)	
<b>Living area</b>				0.596
Beirut	6 (15.8)	24 (63.2)	8 (21.1)	
Mount Lebanon	49 (18.9)	169 (65.3)	41 (15.8)	
South Lebanon	1 (14.3)	4 (57.1)	2 (28.6)	
North Lebanon	4 (33.3)	6 (50)	2 (16.7)	
Bekaa	4 (40)	5 (50)	1 (10)	

<b>Marital status</b>				0.252
Single	22 (15.9)	93 (67.4)	23 (16.7)	
Married	39 (22)	109 (61.6)	29 (16.4)	
Separated/divorced	2 (28.6)	5 (71.4)	0 (0)	
Widowed	1 (25)	1 (25)	2 (50)	
<b>Children</b>				0.023*
Yes	41 (24.6)	102 (61.1)	24 (14.4)	
No	1 (4.8)	13 (61.9)	7 (33.3)	
<b>Education level</b>				0.238
Pre-high school or its equivalent	2 (20)	5 (50)	3 (30)	
High school or its equivalent	12 (21.8)	30 (54.5)	13 (23.6)	
University or its equivalent	50 (19.2)	173 (66.3)	38 (14.6)	
<b>Health-related major</b>				0.020*
Yes	23 (29.5)	44 (56.4)	11 (14.1)	
No	27 (14.8)	129 (70.5)	27 (14.8)	
<b>Employment status</b>				0.273
Full-time employee	33 (17.5)	129 (68.3)	27 (14.3)	
Part-time employee	10 (25.6)	21 (53.8)	8 (20.5)	
Unemployed, actively seeking employment	6 (17.6)	24 (70.6)	4 (11.8)	
Unemployed, not seeking employment (student, housewife, retired, disabled etc.)	15 (23.4)	34 (53.1)	15 (23.4)	
<b>BMI</b>				0.686
Underweight (<18.5kg/m <sup>2</sup> )	1 (10)	7 (70)	2 (20)	
Normal weight(18.5-24.9 kg/m <sup>2</sup> )	33 (17.4)	126 (66.3)	31 (16.3)	
Overweight (25-29.9 kg/m <sup>2</sup> )	21 (25.6)	46 (56.1)	15 (18.3)	
Obese	9 (20.5)	29 (65.9)	6 (13.6)	
<b>Meals per day</b>				0.781
One	0 (0)	2 (100)	0 (0)	
Two	10 (22.7)	29 (65.9)	5 (11.4)	
Three	29 (19.9)	88 (60.3)	29 (19.9)	
Four or more	25 (18.7)	89 (66.4)	20 (14.9)	
<b>Frequency of breakfast consumption</b>				0.918
0-2 days per week	16 (19.3)	52 (62.7)	15 (18.1)	
3-5 days per week	12 (17.6)	43 (63.2)	13 (19.1)	
6-7 days per week	36 (20.6)	113 (64.6)	26 (14.9)	
<b>Frequency of main meals</b>				0.967
0-2 days per week	11 (20.4)	35 (64.8)	8 (14.8)	
3-5 days per week	19 (19.8)	59 (61.5)	18 (18.8)	
6-7 days per week	34 (19.3)	114 (64.8)	28 (15.9)	

<b>Frequency of eating out at a restaurant</b>				0.951
0-2 days per week	54 (19.9)	170 (62.7)	47 (17.3)	
3-5 days per week	8 (18.6)	29 (67.4)	6 (14)	
6-7 days per week	2 (16.7)	9 (75)	1(8.3)	
<b>Smoking</b>				0.124
Yes	16 (13.7)	81 (69.2)	20 (17.1)	
No	48 (23)	127 (60.8)	34 (16.3)	
<b>Physical activity</b>				<b>0.001*</b>
Yes	30 (25.4)	80 (67.8)	8 (6.8)	
No	34 (16.3)	128 (61.5)	46 (22.1)	
<b>Perceived sleep quality</b>				0.466
Fairly good/very good	55 (20.9)	166 (63.1)	42 (16)	
Fairly bad/very bad	9 (14.3)	42 (66.7)	12 (19)	
<b>Perceived health status</b>				0.129
Excellent	14 (30.4)	29 (63)	3 (6.5)	
Good/very good	43 (18.8)	145 (63.3)	41 (17.9)	
Fair/poor	7 (13.7)	34 (66.7)	10 (19.6)	
<b>Read food labels</b>				0.521
Disagree	10 (14.3)	48 (68.6)	12 (17.1)	
Neither agree nor disagree	12 (16.7)	46 (63.9)	14 (19.4)	
Agree	42 (22.8)	114 (62)	28 (15.2)	
<b>Understand food labels</b>				0.627
Disagree	13 (26)	28 (56)	9 (18)	
Neither agree nor disagree	12 (15.4)	52 (66.7)	14 (17.9)	
Agree	39 (19.7)	128 (64.6)	31 (15.7)	
<b>Reason for reading food labels</b>				0.120
Helps make healthy food choices	33 (22)	95 (63.3)	22 (14.7)	
Medical doctor/dietitian recommendation	4 (44.4)	4 (44.4)	1 (11.1)	
Lose/control weight	11 (23.9)	30 (65.2)	5 (10.9)	
Curiosity (compare different food products)	6 (11.8)	31 (60.8)	14 (27.5)	

\* Significant at  $P < 0.05$

Categorical variables are expressed as n (%), continuous variables are expressed as mean  $\pm$  (SDs)

Significance is derived from independent t test for continuous variables and Chi square test ( $\chi^2$ ) for categorical variables

After controlling for gender, having children, educational level, having a degree in health-related disciplines, smoking, and physical exercise, a 1-year increase in age was found to be associated with an increase of 0.042 in the MD score. In addition, lack of a regular routine of physical exercise was found to be associated with a decrease of 0.908 points in the MD score (**Table 3, Model 1**).

After controlling for the effects of home food environment variables (availability of whole wheat pasta, rice or flour, whole grain or brown bread, fresh/frozen fish, low-fat or non-fat dairy, sweets and pastries and regular soft drinks) in Model 2, and the effects of food store environment related variables (e.g., motivation to select place of food shopping (variety, quality and price) and importance of taste, nutrition, price and convenience when shopping for food) in Model 3, age and regular routine of physical exercise remained to be positively associated with the MD score . Specifically, a 1-year increase in age and lack of a regular routine of physical exercise were found to be associated with an increase of 0.028 and a decrease of 0.775 points in the MD score, respectively (**Model 2**). Similarly, in Model 3, a 1-year increase in age and lack of a regular routine of physical exercise were found to be associated with an increase of 0.042 and a decrease of 0.990 points in the MD score, respectively (**Model 3**).

**Table 3.** Associations of socio-demographic and lifestyle factors with Mediterranean diet adherence level in the study population, as assessed by multivariable linear regression

	Unstandardized $\beta$	SE	Standardized $\beta$	95% CI	
<b>Model 1</b>					
Age	<b>0.042*</b>	0.013	0.222	0.016	0.068
Gender	0.328	0.302	0.060	-0.267	0.922
Children	0.000	0.000	0.057	0.000	0.001
Educational level	0.381	0.742	0.084	-1.080	1.841
Health related-major	-0.001	0.001	-0.154	-0.003	0.001
Smoking	-0.448	0.253	-0.097	-0.945	0.049
Physical activity	<b>-0.908*</b>	0.253	-0.197	-1.405	-0.410
<b>Model 2</b>					
Age	<b>0.028*</b>	0.013	0.148	0.002	0.054
Gender	0.460	0.292	0.084	-0.115	1.035
Children	0.000	0.000	0.025	0.000	0.001
Educational level	0.417	0.716	0.092	-0.993	1.827
Health-related major	-0.001	0.001	-0.137	-0.003	0.001
Smoking	-0.263	0.244	-0.057	-0.743	0.216

Physical activity	<b>-0.775*</b>	0.253	-0.168	-1.273	-0.276
<b>Model 3</b>					
Age	<b>0.042*</b>	0.013	0.222	0.016	0.068
Gender	0.419	0.301	0.076	-0.173	1.011
Children	0.000	0.000	0.060	0.000	0.001
Educational level	0.621	0.741	0.137	-0.837	2.080
Health-related major	-0.001	0.001	-0.210	-0.003	0.001
Smoking	-0.381	0.253	-0.082	-0.878	0.117
Physical activity	<b>-0.990*</b>	0.254	-0.214	-1.489	-0.490

\* Significant at  $p < 0.05$

Model 1: adjusted for gender, children, educational level, health related major, smoking and physical activity.

Model 2: adjusted for home food environment variables (e.g., availability of whole wheat pasta, rice or flour, whole grain or brown bread, fresh/frozen fish, low-fat or non-fat dairy, sweets and pastries and regular soft drinks).

Model 3: adjusted for food environment in stores variables (e.g., motivation to select place of food shopping (variety, quality and price) and importance of taste, nutrition, price and convenience when shopping for food).

CI= confidence interval



#### IV. DISCUSSION

Studies examining adherence to the Mediterranean Diet among Lebanese people are few and the data collected date back more than a decade. This study aimed to assess the level of adherence to the MD in a sample of seemingly healthy Lebanese adults (18 to 65 years old; Mean age=  $37.14 \pm 11.84$ ) and to investigate the major socio-demographic, anthropometric, and lifestyle factors that influence it. Our sample consisted mainly of young adult women who were health-conscious, highly educated, and employed. Results showed that 64% of the study participants had fair to moderate MD adherence (14-MEDAS scores between six and nine). This finding is consistent with those reported by Naja et al. (2019) showing moderate adherence to the MD (assessed by LMD score) among 2610 Lebanese adults (aged  $\geq 20$ ). Another Lebanese study including 501 adults (aged  $\geq 18$ ) showed moderate MD adherence (assessed by LMD score) (Cordahi et al., 2015). Similar results were observed in studies done in other Mediterranean countries including Italy (Maugeri et al., 2019; Vitale et al., 2018) and Portugal (Andrade et al., 2020).

The results of the Mediterranean diet screener revealed that a high percentage of study participants met the recommended intake of tomato, onion, garlic, and olive oil-seasoned foods, legumes, vegetables, red processed meat, fruits, nuts, and sugar-sweetened beverages, consistent with findings of a Lebanese study done among university students (53% men, 18–25 years old) and used the same tool (Karam et al., 2020). However, compared to the latter study, a higher percentage of our study participants met the recommended intake for baked goods and a lower percentage met the recommended intake for olive oil as the main source of fat in cooking, fish, wine, and preferred low-fat/lean meats (e.g., chicken or turkey) over high-fat meats (beef or pork). The above results were also observed in a study among Italian adults (18-85 years old, 54% females), but adherence to the recommended intake was lower for fruits, vegetables, and legumes (Vitale et al., 2018). The

low intake of fish and alcohol is consistent with earlier findings among Lebanese adults (Farhat et al., 2016) and university students (Yahia et al., 2008). It is worth mentioning, however, that the tools utilized to assess MD adherence in the aforementioned studies were different.

Our findings about the relationships of socio-demographic, anthropometric, and lifestyle factors with MD adherence identified older age, having children, having a health-related major, and following a regular routine of physical exercise as characteristics associated with increased adherence to the MD while living area, marital status, eating habits and BMI were not associated with adherence levels. According to multiple linear regression analyses, old age and regular routine of physical activity are the only ones which maintained statistically significant association with adherence levels, after controlling for multiple individual and food environment variables. The observed association between age and MD adherence is in accordance with previous findings. For instance, findings from a Lebanese study done among adults (aged 20-55; mean age=  $34.7 \pm 9.9$ ; 55% females) showed that adherence was higher among older age individuals compared to younger ones (Naja et al. (2015). Noticeably, many studies done among different Mediterranean countries showed a positive association between age and MD adherence level (Farhat et al. 2016; Ruggiero et al., 2018; Vitale et al., 2018). One explanation could be that older adults tend to maintain traditional dietary habits as compared to younger ones who are more exposed to new and “fashionable” food products (high-calorie and nutrient-poor ultra-processed foods). This age gradient in MD adherence could also indicate a state of nutrition transition, from traditional to western dietary patterns, a phenomenon that often presents itself in younger age groups, as many Mediterranean countries have been experiencing (Bonaccio et al, 2016; Farhat et al., 2016; Maugeri et al, 2019; Naja et al., 2018). This phenomenon is accompanied by other issues, such as low availability of local and seasonal foods, as well as limited accessibility due to the elevated

costs of the recommended foods (Lăcătușu et al., 2019). In this study, following a regular routine of physical activity was strongly associated with higher MD adherence levels, a finding that is in agreement with those reported among Spanish (Patino-Alonso et al., 2014; León-Muñoz et al., 2012) and Lebanese adults (Naja et al., 2015). Moreover, it has been shown that combining physical activity and dietary adjustments yields to better MD adherence than either intervention alone (Patino-Alonso et al., 2014). These findings could be useful in developing future programs that combine enhanced Mediterranean diet adherence with increased physical activity.

While adherence to the Mediterranean healthy dietary pattern may be the result of an individual's choice reflecting a health-conscious profile, our study results showed that individuals with specialty in health-related disciplines have higher MD adherence. This finding is in line with the results of a previous study conducted among 744 Italian adults ( $\geq 35$  years, mean =  $52.1 \pm 9.4$ , 50% females) to assess the effect of nutrition knowledge on Mediterranean diet adherence. The findings showed that having a good knowledge of nutrition was linked to better adherence to the MD (Bonaccio et al., 2013). Furthermore, Bottcher et al. (2017) found a link between general nutrition knowledge and Mediterranean diet adherence in 129 Southeast US sample population (aged between 18 and 44; 69% females). However, in our study, the association between majoring in health related fields (nutrition knowledge) and MD adherence did not remain statistically significant after controlling for other socio-demographic, lifestyle and food environment factors. Moreover, no statistically significant association was found in this study between gender and adherence to the MD. The lack of significant association between female gender and MD adherence was not unexpected, in view of the inconsistent findings from the literature, and disproportionate gender distribution in the study sample (~80% females) which can be explained by the fact that women are more likely than men to do most of the food shopping in the majority

of Lebanese households. Furthermore, in this study no statistically significant association was found between educational level and adherence to the MD contrary to the findings from the literature where higher educational levels showed to be associated with higher MD adherence (Cavaliere et al., 2018; Naja et al., 2015; Ruggiero et al., 2018). However, 80% of the participants in our study had university level education which may account for nonappearance of association between educational level and MD adherence. No statistically significant association was found in this study between BMI and MD adherence. Findings from previous studies were mixed: some studies reported no association between BMI and MD adherence (Issa et al., 2011; Ruggiero et al., 2018), while a recent study among 303 Lebanese students (18-25 years; 69% females) showed a negative association (El Hajj et al., 2021).

### **Strengths and Limitations**

In our study, we collected data on a large number of covariates reported to have associations with MD adherence level, hence exploring the link between individual (socio-demographic, anthropometric, and lifestyle) factors and MD adherence, before and after controlling for confounding variables. The findings of this study ought to be considered in light of a several limitations. First, the cross-sectional design of the study allowed us to examine associations, not potential causal links, between MD adherence and individual (socio-demographic, anthropometric, and lifestyle) factors. Second, the study sample was a convenient sample. Colleagues, relatives, and friends were all given a link to the online questionnaire and it is impossible to rule out the possibility of oversampling a specific network. Young adult women with a high degree of education made up the largest segment of our study sample. The uneven gender distribution in our

sample (80% females) can be explained by the fact that women are more likely than men to do most of the food shopping in the majority of Lebanese households. Therefore, the findings are exploratory, specific to the study sample profile and cannot be generalized. Third, common biases associated with collecting data using online surveys (e.g., sampling, self-selection, and response biases) should not be ignored (Wright KB, 2006); nevertheless, prior research by Ekman et al. (2006) found that these biases were comparable to those induced by paper questionnaires. Fourth, the questionnaires were self-administered, which could have resulted in respondents over-reporting socially desirable responses (social desirability response bias). Fifth, the questionnaire used to assess adherence to the Mediterranean Diet adherence was validated for the Spanish population, but not for the Lebanese population; however, it has been adapted to an English version and used in other samples. Furthermore, the utilized questionnaire of 14-MEDAS adherence score represents a valid and easy tool for a rapid screening rather than an exact assessment of adherence to the traditional Mediterranean dietary pattern in different population groups. ). Sixth, we modified some of the sections of the NEMS-P-MED questionnaire; therefore, the validity of the original tool might be affected. Moreover, the latter tool was validated for the Spanish population, but not in Lebanese samples. Seventh, the real occupational/economic status of the participants was not captured, as only data on education and employment status were collected. No data on income were collected even though it is among the factors believed to affect dietary patterns. Based on the above limitations, it is possible that we might have missed the true relationship between MEDAS scores and some of the factors that affect MD adherence.

## V. CONCLUSION

To the best of our knowledge, this study represents the most recent research on Mediterranean Diet adherence and its determinants among healthy Lebanese adults. Our study shows moderate to fair adherence to the Mediterranean diet (64%) among these adults and identifies factors that are associated with improved MD adherence, such as older age and regular physical activity. Particularly, our results suggest that younger individuals and those who do not engage in regular physical exercise are less adherent to the Mediterranean diet, thus highlighting the need for stronger health promotion efforts and future interventions aimed at younger age groups, men and women, with fairly low levels of physical activity to emphasize the advantages of the Mediterranean diet and encourage its adherence. The over-representation of young, highly educated females in our sample and the choice of the instrument to screen for MD adherence may partly explain the lack of expected associations between other socio-demographic and lifestyle factors with MD adherence. Therefore, larger studies among the general Lebanese population may be needed to validate our findings and understand the mechanisms underlying the effect of individual factors on MD adherence. Meanwhile, national and regional efforts should be concentrated on spreading the MD as a concept that encompasses health, quality, sustainability, and cultural legacy. Medical doctors, nutritionists, researchers, media, producers, and consumers should play an active role in preserving this diet by promoting it as an "Intangible Cultural Heritage".

## APPENDICES

## Appendix A-Consent Form (Arabic)

كلية التمريض والعلوم الصحية في جامعة سيّدة اللّويزة (NDU)  
استمارة الموافقة على المشاركة في دراسة بحثية

إنّ هذه الورقة استمارة موافقة على المشاركة في دراسة بحثية. إذا قرّرت المشاركة في الدراسة، سيتعيّن عليك التعبير عن موافقتك أدناه وإعادة الاستمارة إلى الباحثين.

من نحن؟

مجموعة من الباحثين من كلية التمريض والعلوم الصحية في جامعة سيّدة اللّويزة (NDU).

ما الغرض من الدراسة؟

يهدف هذا البحث إلى دراسة العناصر التي تحدّد مدى التزام اللبنانيين البالغين الذين يتمتعون بصحة جيّدة بالنظام الغذائي لمنطقة البحر الأبيض المتوسط (المعروف أيضاً بإسم حمية البحر الأبيض المتوسط) قبل الوباء والأزمة الاقتصادية، قبل فبراير 2020.

علام تنطوي المشاركة في الدراسة؟ ما هي إجراءات المشاركة في الدراسة؟

سيطلب من المشارك ملء استبيان على الإنترنت يحتوي على أسئلة عن معلومات خلفية واسئلة لفحص الالتزام بحمية البحر الأبيض المتوسط (MEDAS)، كما على استبيان لقياس كيفية إدراك البيئة الغذائية (NEMS-P-MED-AR). تستغرق المشاركة في هذه الدراسة البحثية حوالي 10 دقائق.

هل تنطوي المشاركة في الدراسة على أيّ مخاطر محتملة؟

لا تنطوي المشاركة في الدراسة على أيّ مخاطر محتملة، وسيتمّ استخدام المعلومات التي يتمّ جمعها فقط للغرض الموضّح أعلاه في الاستمارة.

### هل تحفظ هذه الدّراسة هويّة المشارك وسريّة المعلومات؟

لن يُطلَب من المشارك ذكر اسمه أو رقم بطاقة هويّته أو أي معلومات أخرى تفضح هويّته. وسيتمّ حفظ كلّ البيانات المجمّعة في هذه الدّراسة في مكان آمن، كما ستقتصر إمكانيّة الوصول إلى البيانات والمعلومات على الباحثين المشاركين في الدّراسة.

### ما هي حقوق المشارك في الدّراسة؟

إنّ المشاركة في هذه الدّراسة طوعيّة تمامًا، وللمشارك الحق في رفض المشاركة في بعض أقسام الدراسة ورفض الإجابة عن أيّ سؤال، كما ويجوز له الانسحاب من الدراسة في أي وقت كان ولأي سبب كان عن طريق الاتصال بأيّ من الباحثين.

### بمن يجب الاتصال للاستفسار أو طرح الأسئلة؟

للأسئلة المتعلّقة بالدّراسة، يُمكن الاتّصال بأيّ من الباحثين على الأرقام التّالية: ٤٢٣٤٤٣/٠٣ أو ٢٢٢٤١٣/٧١ أو ٧٨٢٠٢٠/٧٨ أو ٨٧٧١٢١/٠٣

### بيان الموافقة على المشاركة:

لقد قرأت هذه الاستمارة، وقد أُتيحت لي إمكانيّة طرح الأسئلة والحصول على إجابات مرضية في ما يتعلّق بالدّراسة، كما وأنّ الباحثين قد أكّدوا لي أنّه يمكنني طرح أيّ أسئلة حول الدّراسة في المستقبل وسيقومون بالإجابة عليها.

من خلال وضع علامة في هذا المربّع، أعلن أنّني أوافق طوعًا على المشاركة في الدّراسة.

من خلال وضع علامة في هذا المربّع، أعلن أنّني غير مهتمّ بالمشاركة في الدّراسة.

التّاريخ: \_\_\_\_\_



## Appendix A'-Mediterranean Diet Flyer (Arabic)



### محددات الالتزام بحمية البحر الابيض المتوسط

دراسة بحثية عبر الانترنت



لتأهل/ي للمشاركة في هذه الدراسة  
يجب ان تكون/ي، قبل فبراير ٢٠٢٠

- لبناني/ة، مقيم/ة في لبنان
- ١٨ سنة و ما فوق
- مسؤولة عن تسوق المواد الغذائية
- غير حامل او مرضعة في ذلك الوقت
- لا تعاني من مشاكل صحية تستدعي التزامك بنظام غذائي خاص

للاستفسار أو طرح الأسئلة، يُمكن الإتصال بأي  
من الباحثين على الأرقام التالية:

٧٨/ ٨٧٢٠٢٠ أو ٧١/ ٢٢٢٤١٣

#### من نحن؟

مجموعة من الباحثين من كلية التمريض والعلوم الصحية  
في جامعة سيدة اللويزة (NDU).

#### ما الغرض من الدراسة؟

يهدف هذا البحث إلى دراسة العناصر التي تحدد مدى  
التزام اللبنانيين البالغين الذين يتمتعون بصحة جيدة بحمية  
البحر الأبيض المتوسط، قبل الوباء والأزمة الاقتصادية  
(قبل فبراير ٢٠٢٠).

#### الوقت المطلوب لملء الاستبيان:

حوالي ١٠ دقائق

\* لن يُطلب من المشارك ذكر اسمه أو رقم بطاقة هويته أو  
أي معلومات أخرى تفضح هويته وسوف تستخدم  
المعلومات التي يتم جمعها فقط للغرض الموضح أعلاه.

الرجاء الضغط على هذا الرابط لملء الاستبيان <https://forms.gle/mBH1myrZcnb4Qh5d8>

شكرا للمشاركة!

## Appendix B-Background Questionnaire (Arabic)

### استبيان المعلومات العامة

يرجى تقديم إجابتك بناءً على الفترة الزمنية السابقة للوباء والأزمة الاقتصادية

#### الوضع الاجتماعي – الديموغرافي

##### 1. الجنس :

ذكر  أنثى

2. العمر : ----- سنة (مثال: ٣٥ سنة) (قبل فبراير ٢٠٢٠)

3. الوزن: ----- كلغ (شهر يناير ٢٠٢٠)

الطول: ----- سنتم (شهر يناير ٢٠٢٠)

4. في اي منطقة في لبنان كنت تسكن قبل فبراير ٢٠٢٠؟

بيروت  جنوب لبنان  البقاع  
 جبل لبنان  شمال لبنان

5. الوضع العائلي (قبل فبراير ٢٠٢٠):

أعزب/عزباء  منفصل(ة)/مطلق(ة)  
 متزوج/متزوجة  أرمل/أرملة

6. هل كان لديك أولاد؟

كلا  
 نعم  
 لا ينطبق

7. حدد درجة تحصيلك العلمي (قبل فبراير ٢٠٢٠):

- إجازة جامعيّة او ما يعادلها  
 تعليم ثانوي او ما يعادلها  
 تعليم ما قبل الثانوي او ما يعادلها

8. هل تخصصت في مجال متعلق بالصحة (الطب، علم الأحياء، الصحة العامة، التغذية، الصيدلة...)?

- نعم  
 لا  
 لا ينطبق

9. كيف تصف وضعك الوظيفي (قبل فبراير ٢٠٢٠)?

- موظف(ة) بدوام كامل  
 موظف(ة) بدوام جزئي  
 عاطل(ة) عن العمل ولكن كنت ابحث عن عمل  
 عاطل(ة) عن العمل ولكنني لم أكن أبحث عن عمل (طالب(ة)، ربة منزل، متقاعد(ة)، من ذوي الاحتياجات الخاصة)

#### أسئلة عن نمط الحياة

يرجى تقديم إجابتك بناءً على الفترة الزمنية السابقة للوباء والأزمة الاقتصادية (قبل فبراير ٢٠٢٠)

10. كم عدد الوجبات (بما فيها الوجبات الخفيفة) التي كنت تتناولها في اليوم الواحد؟

- أربع وجبات او اكثر  
 ثلاث وجبات  
 وجبتين  
 وجبة واحدة

11. كم مرة في الأسبوع كنت تتناول كل وجبات الطعام الرئيسية (الافطار والغداء والعشاء)?

- ست إلى سبع مرات في الأسبوع  
 ثلاث إلى خمس مرات في الأسبوع  
 مرتين أو أقل في الأسبوع

12. كم مرة في الأسبوع تقريباً كنت تتناول وجبة الافطار؟

- ست إلى سبع مرات في الأسبوع  
 ثلاث إلى خمس مرات في الأسبوع  
 مرتين أو أقل في الأسبوع

13. كم مرة في الأسبوع تقريبًا كنت تأكل في المطعم؟

- ست إلى سبع مرات في الأسبوع  
 ثلاث إلى خمس مرات في الأسبوع  
 مرتين أو أقل في الأسبوع

14. هل كنت تدخن (سجار ، سجانر، اركيلة...) قبل فبراير ٢٠٢٠ ؟

- لا  
 نعم

15. هل كنت تتبع روتينًا منتظمًا للتمارين البدنية قبل فبراير ٢٠٢٠ ؟

- نعم  
 لا

16. هل تعتقد ان الازمة الاقتصادية/ جانحة فيروس كورونا كان لهما تأثيرًا سلبيًا على عاداتك الغذائية؟

- لا  
 جزئيًا  
 نعم

17. كيف تقيّم جودة نومك بشكل عام؟ (قبل فبراير ٢٠٢٠)

- جيدة جدًا  
 سيئة إلى حد ما  
 جيدة إلى حد ما  
 سيئة جدًا

18. بشكل عام، قبل فبراير ٢٠٢٠ ، تصف صحتك بأنها:

- ممتازة  
 جيدة  
 مقبولة  
 سيئة

**Appendix C-14-item-Mediterranean Diet Adherence Screener (14-MEDAS)**  
(Arabic)

**فحص الالتزام بحمية البحر الأبيض المتوسط**

للتذكير: يرجى تقديم إجابتك بناءً على الفترة الزمنية السابقة للوباء والأزمة الاقتصادية (قبل فبراير ٢٠٢٠)

1. هل كنت تستخدم زيت الزيتون في الطهي كمصدر رئيسي للدهون؟

نعم  لا

2. هل كنت تتناول ٤ ملاعق طعام كبيرة (١ ملعقة طعام كبيرة = ١٥ مل) أو أكثر من زيت الزيتون كل يوم؟  
(بما في ذلك الزيت المستخدم للقلي، والسلطات، والوجبات خارج المنزل، وما إلى ذلك)؟

نعم  لا

3. هل كنت تتناول حصتين أو أكثر من الخضار كل يوم؟

(حصة واحدة = ½ كوب من الخضار المطبوخة أو ١ كوب من السلطة الخضراء النيئة)

نعم  لا

٤. هل كنت تتناول ٣ حصص أو أكثر من الفاكهة (بما في ذلك عصائر الفاكهة الطبيعية) كل يوم؟

(حصة واحدة = فاكهة متوسطة الحجم أو ½ كوب عصير)

نعم  لا

٥. هل كنت تتناول أقل من حصة واحدة (= أقل من ١٥٠ جرام، حجم كف يد شخص بالغ) من اللحوم المطبوخة مثلاً اللحوم

الحمراء، الهامبرغر، اللحوم المصنعة (لحم الخنزير، السجق، النقانق) يوميًا؟

نعم  لا

6. هل كنت تتناول أقل من ملعقة كبيرة (١٢ جرام) من الزبدة أو السمن أو الكريمة كاملة الدسم للطبخ كل يوم؟

نعم  لا

7. هل كنت تشرب أقل من علبة واحدة (٣٥٥ مل) من المشروبات الغازية أو المحلاة بالسكر كل يوم؟

نعم  لا

٨. هل كنت تشرب كأس إلى كأسين في اليوم أي ٧-١٤ كأس من النبيذ في الأسبوع؟

(كأس واحد = ١٥٠ مل)

نعم  لا

9. هل كنت تتناول ٣ حصص أو أكثر من البقوليات (البازلاء، الفاصوليا، أو العدس) في الأسبوع؟

(الحصة الواحدة تساوي كوب واحد مطبوخ أو ١٥٠ جرام)

نعم  لا

١٠. هل كنت تتناول ٣ حصص أو أكثر من الأسماك أو المأكولات البحرية (قريدس، اخطبوط، سلطعون، كركند...) أو

المحار في الأسبوع؟ (الحصة الواحدة ١٠٠-١٥٠ جرام سمك مطبوخ، ٤-٥ قطع من المأكولات البحرية المطبوخة،

٢٠٠ جرام محار مطبوخ)

نعم  لا

١١. هل كنت تأكل المخبوزات الغير المصنوعة في المنزل (مثل البسكويت أو الكعك أو الكيك...) أقل من ٣ مرات في

الأسبوع؟

نعم  لا

١٢. هل كنت تأكل المكسرات الغير مملحة (بما في ذلك الفول السوداني) ٣ مرات أو أكثر في الأسبوع؟

(الحصة الواحدة تساوي ربع كوب أو مقدار قبضة يد شخص بالغ أو ٣٠ جرام)

نعم  لا

13. هل كنت تفضل تناول الدجاج أو الديك الرومي بدلاً من لحم البقر أو لحم الخنزير أو الهامبرغر أو النقانق؟

نعم  لا

١٤. هل كنت تستهلك الخضار أو المعكرونة أو الأرز أو غيرها من الأطباق المتبلّة بصلصة مصنوعة من الطماطم

وبصل أو ثوم مطهو بزيت الزيتون مرتين أو أكثر في الأسبوع؟

نعم  لا

## Appendix D-Perceived Nutrition Environment Measures Survey (NEMS-P-MED-AR)

استبيان لقياس كيفية إدراك البيئة الغذائية في سياق منطقة البحر الأبيض المتوسط

(NEMS – P MED–AR) (13 سؤالاً، 6 صفحات)

للتذكير: يرجى تقديم إجابتك بناءً على الفترة الزمنية السابقة للوباء والأزمة الاقتصادية (قبل فبراير ٢٠٢٠)

### أ. البيئة الغذائية في المنزل

لا	نعم	1. يرجى تحديد ما إذا كانت العناصر الغذائية/عناصر الطعام التالية كانت متوفرة في المنزل:
		أ. فاكهة
		ب. خضار
		ت. الحلويات والمخبوزات والكعك (كوكيز) والبسكويت
		ث. رقائق البطاطا المقلية أو الوجبات الخفيفة
		ج. اللحوم الباردة والشاركوتري
		ح. المشروبات الغازية العادية (ليست دايت، أو لايت، أو قليلة السكر)
		خ. المشروبات الغازية الدايت
		د. المعكرونة البيضاء أو الأرز الأبيض أو الطحين الأبيض
		ذ. معكرونة قمحة كاملة (سمراء) أو أرز قمحة كاملة (أسمر) أو طحين قمحة كاملة (أسمر)
		ر. خبز أبيض
		ز. خبز أسمر (قمحة كاملة)
		س. البقوليات/الحبوب
		ش. اللحوم (الدجاج، لحم الخنزير أو لحم البقر أو لحم العجل...)
		ص. الأسماك الطازجة أو المجمدة
		ض. الحليب كامل الدسم
		ط. حليب نصف منزوع الدسم (قليل الدسم) أو منزوع الدسم (خالي الدسم)
		ظ. مشتقات الحليب كاملة الدسم
		ع. مشتقات الحليب نصف منزوع الدسم (قليل الدسم) أو منزوعة الدسم (خالي الدسم)

دائمًا	غالبًا	أحيانًا	أبداً أو نادراً	2. بأي وتيرة كانت تتوفر العناصر الغذائية الثالثة في منزلك (قبل فبراير ٢٠٢٠):
				أ. الفواكه والخضار في البراد
				ب. الفواكه والخضار على طاولة المطبخ
				ت. الحلويات والمخبوزات والكعك والبسكويت ورقائق البطاطا المقلية وغيرها من الوجبات الخفيفة على طاولة المطبخ

3. بأي وتيرة كنت تتشارك وجبات الطعام مع أفراد الأسرة في المنزل؟ (قبل فبراير ٢٠٢٠)

- أ. دائماً  
ب. أحياناً  
ت. أبداً/نادراً

4. بأي وتيرة كان يشجعك والداك/إخوتك على تناول خيارات غذائية صحية (فواكه، خضار، بقول... ) بدلاً من الوجبات السريعة غير الصحية الغنية بالدهون و السكر التي كنت ترغب في تناولها؟

- أ. دائماً  
ب. أحياناً  
ت. أبداً/نادراً

ب. أسئلة متعلقة بالتسوق للمواد الغذائية / كيفية إدراك البيئة الغذائية في المتاجر

5. أين كنت تقوم بالتسوق لمعظم المواد الغذائية والبقالة؟ (اختر كل الإجابات التي تنطبق)

- أ. متجر صغير/محل بقالة صغير



ب. ميني ماركت

ت. سوبر ماركت

مهم جدًا	مهم بعض الشيء	قليل الأهمية	غير مهم على الإطلاق	6. يرجى تحديد مدى أهمية كل من العوامل التالية في اختيارك للمكان الذي كنت تقوم فيه بالتسوق لمعظم المواد الغذائية والبقالة؟ (قبل فبراير ٢٠٢٠)
				أ. المكان قريب من منزلي
				ب. المكان قريب من أو على نفس طريق الأماكن الأخرى التي أذهب إليها
				ت. أصدقائي وأقاربي يقومون بالتسوق للمواد الغذائية في هذا المكان
				ث. تتوع المواد الغذائية المعروضة
				ج. نوعية/جودة المواد الغذائية المعروضة
				ح. أسعار المواد الغذائية المعروضة

7. 7. كيف كنت تقيم أسعار الفواكه والخضار الطازجة، قبل فبراير ٢٠٢٠، في المتجر حيث تشتري معظم المواد الغذائية لمنزلك مقارنةً بالمتاجر الأخرى؟

أ. رخيصة

ب. غير باهظة (مقارنةً بالمتاجر الأخرى)

ت. باهظة

ث. باهظة جدًا

ج. لا أعلم

8. يرجى تحديد مدى موافقتك أو عدم موافقتك على العبارات التالية:

أوافق بشدّة	أوافق	لا أوافق ولا أعارض	لا أوافق	لا أوافق أبداً	في المتجر حيث تشتري معظم المواد الغذائية لمنزلي، كان من السهل أن أشتري:
					أ. الفواكه والخضار الطازجة
					ب. مجموعة متنوّعة من المنتجات
					ت. الفواكه والخضار المعلّبة
					ث. المنتجات قليلة الدسم
					ج. اللحوم قليلة الدهن (الدجاج والحبش...)
					ح. الحلويات والمخبوزات والكعك والبسكويت
					خ. رقائق البطاطا المقلّية و/أو الوجبات الخفيفة
					د. المشروبات الغازية و/أو المشروبات التي تحتوي على نسبة عالية من السكر (المشروبات الرياضية التي تحتوي على عصائر فاكهة مركّزة)

9. فكّر في المتجر حيث تشتري معظم المواد الغذائية/البقالة لمنزلك، وحدّد كيف تذهب عادةً إليه (اختر كلّ الإجابات التي تنطبق).

- أ. سيرًا على الأقدام  
 ب. في سيارتي الخاصة  
 ت. أذهب في السيارة مع جاري  
 ث. أتصل وأطلب توصيل المنتجات إلى منزلي  
 ج. طريقة أخرى (يرجى التحديد): \_\_\_\_\_

في السؤال 10، يشير المصطلحان "أغذية صحيّة" و"أغذية غير صحيّة" إلى التّالي:

الأغذية الصحيّة: الفاكهة والخضار واللحوم والسّمك والبيض والبقول وزيت الزّيتون البكر الممتاز...

الأغذية غير الصحيّة: الحلويات/السكريّات ورقائق البطاطا المقلية والمشروبات الغازية والكورن فليكس التي تحتوي على سكر مضاف المعجنات المنتجة في المصنع ...

10. يرجى تحديد مدى موافقتك أو عدم موافقتك على العبارات التّالية:

أوافق بشدّة	أوافق	لا أوافق ولا أعارض	لا أوافق	لا أوافق أبداً	في المتجر حيث كنت أشتري معظم المواد الغذائية لمنزلي:
					أ. أرى علامات تشجعي على شراء أغذية صحيّة.
					ب. توضع الأغذية غير الصحيّة عادةً في آواخر الممرّات أو الرّفوف.
					ت. أشتري المنتجات المعروضة على مستوى العين على الرّفوف.
					ث. هنالك علامات تشجعي على شراء أغذية غير صحيّة.
					ج. غالباً ما أشتري المنتجات الغذائيّة المعروضة بالقرب من الصّنديق.
					ح. عادةً ما تكون المنتجات الغذائيّة المعروضة بالقرب من الصّنديق غير صحيّة.
					خ. تحتوي المنتجات الغذائيّة المعلّبة مسبقاً على ملصقات المعلومات الغذائيّة.
					د. في الكثير من الأحيان، أقرأ ملصقات المعلومات الغذائيّة.
					ذ. أجد أنه من السهل فهم ملصقات المعلومات الغذائيّة.

11. لماذا كنت تقرأ ملصقات المعلومات الغذائيّة، اذ ينطبق؟

- أ. تساعدني على اتّخاذ خيارات غذائيّة صحيّة
- ب. الطّبيب/أخصائيّ التّغذية أوصى بذلك

- ت. لخسارة أو ضبط الوزن  
ث. بداعي الحشوية (المقارنة بين المنتجات الغذائية المختلفة)  
ج. لا ينطبق

ت. عاداتك الغذائية وأفكارك في ما يتعلّق بالغذاء والطعام

مهم جدًا	مهم بعض الشيء	غير مهم على الإطلاق	12. ما مدى أهمية كل من العوامل التالية في تحديد خياراتك عندما كنت تتسوق للمواد الغذائية/الطعام؟
			أ. الطعم/المذاق
			ب. الخصائص التغذوية الصحية
			ت. السعر
			ث. سهولة الطهي والتّحضير
			ج. ضبط الوزن

13. عندما كنت تذهب للتسوق للمواد الغذائية/البقالة، ما كانت وتيرة استخدامك للائحة/قائمة بالمشتريات؟

- أ. أبدًا  
ب. نادرًا  
ت. في بعض الأحيان  
ث. دائمًا أو في أغلب الأحيان

## REFERENCES

1. Achón, M., Serrano, M., García-González, Á., Alonso-Aperte, E., & Varela-Moreiras, G. (2017). Present Food Shopping Habits in the Spanish Adult Population: A Cross-Sectional Study. *Nutrients*, 9(5), 508. <https://doi.org/10.3390/nu9050508>
2. Agnoli, C., Krogh, V., Gioni, S., Sieri, S., Palli, D., Masala, G., Sacerdote, C., Vineis, P., Tumino, R., Frasca, G., Pala, V., Berrino, F., Chiodini, P., Mattiello, A., & Panico, S. (2011). A priori-defined dietary patterns are associated with reduced risk of stroke in a large Italian cohort. *The Journal of nutrition*, 141(8), 1552–1558. <https://doi.org/10.3945/jn.111.140061>
3. Andrade, V., Jorge, R., García-Conesa, M. T., Philippou, E., Massaro, M., Chervenkov, M., Ivanova, T., Maksimova, V., Smilkov, K., Ackova, D. G., Miloseva, L., Ruskovska, T., Deligiannidou, G. E., Kontogiorgis, C. A., & Pinto, P. (2020). Mediterranean Diet Adherence and Subjective Well-Being in a Sample of Portuguese Adults. *Nutrients*, 12(12), 3837. <https://doi.org/10.3390/nu12123837>
4. Baalbaki, S.A.T. (2015). Assessment of the Lebanese dietary pattern as a Mediterranean dietary pattern and its association with obesity and the metabolic syndrome -. *Aub.edu.lb*. <https://doi.org/b18352753>
5. Bach, A., Serra-Majem, L., Carrasco, J. L., Roman, B., Ngo, J., Bertomeu, I., & Obrador, B. (2006). The use of indexes evaluating the adherence to the Mediterranean diet in epidemiological studies: a review. *Public Health Nutrition*, 9(1a), 132–146. <https://doi.org/10.1079/phn2005936>
6. Bach-Faig, A., Berry, E. M., Lairon, D., Reguant, J., Trichopoulou, A., Dernini, S., Medina, F. X., Battino, M., Belahsen, R., Miranda, G., Serra-Majem, L., & Mediterranean Diet Foundation Expert Group (2011). Mediterranean diet pyramid today. Science and cultural updates. *Public health nutrition*, 14(12A), 2274–2284. <https://doi.org/10.1017/S1368980011002515>
7. Baroudi, M. B. (2019). Validity and reproducibility of a food frequency questionnaire among Lebanese adults for the assessment of food groups. *Aub.edu.lb*. <https://doi.org/b23224721>
8. Biener, L., Glanz, K., McLerran, D., Sorensen, G., Thompson, B., Basen-Engquist, K., Linnan, L., & Varnes, J. (1999). Impact of the Working Well Trial on the worksite smoking and nutrition environment. *Health Education & Behavior: The Official Publication of the Society for Public Health Education*, 26(4), 478–494. <https://doi.org/10.1177/109019819902600407>
9. Bonaccio, M., Di Castelnuovo, A., Bonanni, A., Costanzo, S., Persichillo, M., Cerletti, C., Donati, M. B., de Gaetano, G., Iacoviello, L., & INHES Study Investigators. (2018). Socioeconomic status and impact of the economic crisis on dietary habits in Italy: results from the INHES study. *Journal of Public Health (Oxford, England)*, 40(4), 703–712. <https://doi.org/10.1093/pubmed/fox144>

10. Bonaccio, M., Di Castelnuovo, A., Costanzo, S., De Lucia, F., Olivieri, M., Donati, M. B., de Gaetano, G., Iacoviello, L., Bonanni, A., & Moli-sani Project Investigators (2013). Nutrition knowledge is associated with higher adherence to Mediterranean diet and lower prevalence of obesity. Results from the Moli-sani study. *Appetite*, 68, 139–146. <https://doi.org/10.1016/j.appet.2013.04.026>
11. Bottcher, M. R., Marincic, P. Z., Nahay, K. L., Baerlocher, B. E., Willis, A. W., Park, J., Gaillard, P., & Greene, M. W. (2017). Nutrition knowledge and Mediterranean diet adherence in the southeast United States: Validation of a field-based survey instrument. *Appetite*, 111, 166–176. <https://doi.org/10.1016/j.appet.2016.12.029>
12. Buckland, G., Gonzalez, C. A., Agudo, A., Vilardeell, M., Berenguer, A., Amiano, P., Ardanaz, E., Arriola, L., Barricarte, A., Basterretxea, M., Chirlaque, M. D., Cirera, L., Dorronsoro, M., Egues, N., Huerta, J. M., Larranaga, N., Marin, P., Martinez, C., Molina, E., & Navarro, C. (2009). Adherence to the Mediterranean Diet and Risk of Coronary Heart Disease in the Spanish EPIC Cohort Study. *American Journal of Epidemiology*, 170(12), 1518–1529. <https://doi.org/10.1093/aje/kwp282>
13. Cavaliere, A., De Marchi, E., & Banterele, A. (2018). Exploring the Adherence to the Mediterranean Diet and Its Relationship with Individual Lifestyle: The Role of Healthy Behaviors, Pro-Environmental Behaviors, Income, and Education. *Nutrients*, 10(2), 141. <https://doi.org/10.3390/nu10020141>
14. CDC. (2020, September 17). Defining Adult Overweight and Obesity. Centers for Disease Control and Prevention. <https://www.cdc.gov/obesity/adult/defining.html>
15. Cobo-Cuenca, A. I., Garrido-Miguel, M., Soriano-Cano, A., Ferri-Morales, A., Martínez-Vizcaíno, V., & Martín-Espinosa, N. M. (2019). Adherence to the Mediterranean Diet and Its Association with Body Composition and Physical Fitness in Spanish University Students. *Nutrients*, 11(11), 2830. <https://doi.org/10.3390/nu11112830>
16. Ekman, A., Dickman, P., Klint, Å., Weiderpass, E. and Litton, J., 2006. Feasibility of Using Web-based Questionnaires in Large Population-based Epidemiological Studies. *European Journal of Epidemiology*, 21(2), pp.103-111.
17. El Hajj, J. S., & Julien, S. G. (2021, January 25). Factors Associated with Adherence to the Mediterranean Diet and Dietary Habits among University Students in Lebanon. *Journal of Nutrition and Metabolism*. <https://www.hindawi.com/journals/jnme/2021/6688462/>
18. Evert, A. B., Boucher, J. L., Cypress, M., Dunbar, S. A., Franz, M. J., Mayer-Davis, E. J., Neumiller, J. J., Nwankwo, R., Verdi, C. L., Urbanski, P., Yancy, W. S., Jr, & American Diabetes Association (2013). Nutrition therapy recommendations for the management of adults with diabetes. *Diabetes care*, 36(11), 3821–3842. <https://doi.org/10.2337/dc13-2042>
19. Farhat, A. G., Jaalouk, D., & Francis, S. (2016). Adherence to the Mediterranean diet in a Lebanese sample. *Www.growkudos.com*. <https://doi.org/10.1108/nfs-09-2015-0108>
20. Fox, C. S., Golden, S. H., Anderson, C., Bray, G. A., Burke, L. E., de Boer, I. H., Deedwania, P., Eckel, R. H., Ershow, A. G., Fradkin, J., Inzucchi, S. E., Kosiborod, M., Nelson, R. G., Patel, M. J., Pignone, M., Quinn, L., Schauer, P. R., Selvin, E., Vafiadis, D.

- K., American Heart Association Diabetes Committee of the Council on Lifestyle and Cardiometabolic Health, ... American Diabetes Association (2015). Update on Prevention of Cardiovascular Disease in Adults With Type 2 Diabetes Mellitus in Light of Recent Evidence: A Scientific Statement From the American Heart Association and the American Diabetes Association. *Diabetes care*, 38(9), 1777–1803. <https://doi.org/10.2337/dci15-0012>
21. García-Conesa, M.-T., Philippou, E., Pafilas, C., Massaro, M., Quarta, S., Andrade, V., Jorge, R., Chervenkov, M., Ivanova, T., Dimitrova, D., Maksimova, V., Smilkov, K., Ackova, D. G., Miloseva, L., Ruskovska, T., Deligiannidou, G. E., Kontogiorgis, C. A., & Pinto, P. (2020). Exploring the Validity of the 14-Item Mediterranean Diet Adherence Screener (MEDAS): A Cross-National Study in Seven European Countries around the Mediterranean Region. *Nutrients*, 12(10), 2960. <https://doi.org/10.3390/nu12102960>
  22. García-Fernández, E., Rico-Cabanas, L., Rosgaard, N., Estruch, R., & Bach-Faig, A. (2014). Mediterranean Diet and Cardiometabolic Risk: A Review. *Nutrients*, 6(9), 3474–3500. <https://doi.org/10.3390/nu6093474>
  23. Gerber, M. (2006). Qualitative methods to evaluate Mediterranean diet in adults. *Public Health Nutrition*, 9(1a), 147–151. <https://doi.org/10.1079/phn2005937>
  24. Green, S. H., & Glanz, K. (2015). Development of the Perceived Nutrition Environment Measures Survey. *American Journal of Preventive Medicine*, 49(1), 50–61. <https://doi.org/10.1016/j.amepre.2015.02.004>
  25. Hardman, R. J., Kennedy, G., Macpherson, H., Scholey, A. B., & Pipingas, A. (2016). Adherence to a Mediterranean-Style Diet and Effects on Cognition in Adults: A Qualitative Evaluation and Systematic Review of Longitudinal and Prospective Trials. *Frontiers in Nutrition*, 3. <https://doi.org/10.3389/fnut.2016.00022>
  26. Hebestreit, K., Yahiaoui-Doktor, M., Engel, C., Vetter, W., Siniatchkin, M., Erickson, N., Halle, M., Kiechle, M., & Bischoff, S. C. (2017). Validation of the German version of the Mediterranean Diet Adherence Screener (MEDAS) questionnaire. *BMC Cancer*, 17(1). <https://doi.org/10.1186/s12885-017-3337-y>
  27. Institute of Medicine (US) Committee on Prevention of Obesity in Children and Youth. (2005). Preventing Childhood Obesity: Health in the Balance. In J. P. Koplan, C. T. Liverman, & V. I. Kraak (Eds.), *PubMed*. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/22379642/>
  28. Karam, J., Bibiloni, M. D. M., Serhan, M., & Tur, J. A. (2021). Adherence to Mediterranean Diet among Lebanese University Students. *Nutrients*, 13(4). <https://doi.org/10.3390/nu13041264>
  29. Keys, A., & Grande, F. (1957). Role of Dietary Fat in Human Nutrition. *American Journal of Public Health and the Nations Health*, 47(12), 1520–1530. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1551415/>

30. Kwon, Y.-J., Lee, H., Yoon, Y., Kim, H. M., Chu, S. H., & Lee, J.-W. (2020). Development and Validation of a Questionnaire to Measure Adherence to the Mediterranean Diet in Korean Adults. *Nutrients*, 12(4). <https://doi.org/10.3390/nu12041102>
31. Lăcătușu, C., Grigorescu, E., Floria, M., Onofriescu, A. and Mihai, B., 2019. The Mediterranean Diet: From an Environment-Driven Food Culture to an Emerging Medical Prescription. *International Journal of Environmental Research and Public Health*, 16(6), p.942.
32. León-Muñoz, L. M., Guallar-Castillón, P., Graciani, A., López-García, E., Mesas, A. E., Aguilera, M. T., Banegas, J. R., & Rodríguez-Artalejo, F. (2012). Adherence to the Mediterranean diet pattern has declined in Spanish adults. *The Journal of nutrition*, 142(10), 1843–1850. <https://doi.org/10.3945/jn.112.164616>
33. Liyanage, T., Ninomiya, T., Wang, A., Neal, B., Jun, M., Wong, M. G., Jardine, M., Hillis, G. S., & Perkovic, V. (2016). Effects of the Mediterranean Diet on Cardiovascular Outcomes—A Systematic Review and Meta-Analysis. *PLOS ONE*, 11(8), e0159252. <https://doi.org/10.1371/journal.pone.0159252>
34. Martínez-García, A., Trescastro-López E. M., Galiana-Sánchez, M. E., & Pereyra-Zamora, P. (2019). Data Collection Instruments for Obesogenic Environments in Adults: A Scoping Review. *International Journal of Environmental Research and Public Health*, 16(8), 1414. <https://doi.org/10.3390/ijerph16081414>
35. Martínez-García, A., Trescastro-López, E. M., Galiana-Sánchez, M. E., Llorens-Ivorra, C., & Pereyra-Zamora, P. (2020). Cultural Adaptation and Evaluation of the Perceived Nutrition Environment Measures Survey to the Mediterranean Spanish Context (NEMS-P-MED). *Nutrients*, 12(11). <https://doi.org/10.3390/nu12113257>
36. Martínez-González, M. A., García-Arellano, A., Toledo, E., Salas-Salvadó, J., Buil-Cosiales, P., Corella, D., Covas, M. I., Schröder, H., Arós, F., Gómez-Gracia, E., Fiol, M., Ruiz-Gutiérrez, V., Lapetra, J., Lamuela-Raventós, R. M., Serra-Majem, L., Pintó, X., Muñoz, M. A., Wärnberg, J., Ros, E., Estruch, R., ... PREDIMED Study Investigators (2012). A 14-item Mediterranean diet assessment tool and obesity indexes among high-risk subjects: the PREDIMED trial. *PloS one*, 7(8), e43134. <https://doi.org/10.1371/journal.pone.0043134>
37. Miller, L. M. S., & Cassady, D. L. (2015). The effects of nutrition knowledge on food label use. A review of the literature. *Appetite*, 92, 207–216. <https://doi.org/10.1016/j.appet.2015.05.029>
38. Mistretta, A., Marventano, S., Antoci, M., Cagnetti, A., Giogianni, G., Nolfo, F., Rametta, S., Pecora, G., & Marranzano, M. (2017). Mediterranean diet adherence and body composition among Southern Italian adolescents. *Obesity research & clinical practice*, 11(2), 215–226. <https://doi.org/10.1016/j.orcp.2016.05.007>
39. Naja, F., Hwalla, N., Itani, L., Baalbaki, S., Sibai, A., & Nasreddine, L. (2015). A novel Mediterranean diet index from Lebanon: comparison with Europe. *European Journal of Nutrition*, 54(8), 1229–1243. <https://doi.org/10.1007/s00394-014-0801-1>



40. Naja, F., Itani, L., Hamade, R., Chamieh, M. C., & Hwalla, N. (2019). Mediterranean Diet and Its Environmental Footprints Amid Nutrition Transition: The Case of Lebanon. *Sustainability*, 11(23), 1–18. <https://ideas.repec.org/a/gam/jsusta/v11y2019i23p6690-d291149.html>
41. Naja, F., Jomaa, L., Itani, L., Zidek, J., El Labban, S., Sibai, A. M., & Hwalla, N. (2018). Environmental footprints of food consumption and dietary patterns among Lebanese adults: a cross-sectional study. *Nutrition Journal*, 17(1). <https://doi.org/10.1186/s12937-018-0393-3>
42. Naja, F., Nasreddine, L., Itani, L., Adra, N., Sibai, A. M., & Hwalla, N. (2013). Association between dietary patterns and the risk of metabolic syndrome among Lebanese adults. *European Journal of Nutrition*, 52(1), 97–105. <https://doi.org/10.1007/s00394-011-0291-3>
43. Naja, F., Nasreddine, L., Itani, L., Chamieh, M. C., Adra, N., Sibai, A. M., & Hwalla, N. (2011). Dietary patterns and their association with obesity and sociodemographic factors in a national sample of Lebanese adults. *Public Health Nutrition*, 14(9), 1570–1578. <https://doi.org/10.1017/S136898001100070X>
44. Nasreddine, L., Naja, F. A., Sibai, A.-M., Helou, K., Adra, N., & Hwalla, N. (2014). Trends in nutritional intakes and nutrition-related cardiovascular disease risk factors in Lebanon: the need for immediate action. *Le Journal Medical Libanais. The Lebanese Medical Journal*, 62(2), 83–91. <https://doi.org/10.12816/0004102>
45. Navarrete-Muñoz, E., Torres-Collado, L., Valera-Gran, D., Gonzalez-Palacios, S., María Compañ-Gabucio, L., Hernández-Sánchez, S., & García-de-la-Hera, M. (2018). Nutrition Labelling Use and Higher Adherence to Mediterranean Diet: Results from the DiSA-UMH Study. *Nutrients*, 10(4), 442. <https://doi.org/10.3390/nu10040442>
46. Nowlin, S. Y., Hammer, M. J., & D'Eramo Melkus, G. (2012). Diet, inflammation, and glycemic control in type 2 diabetes: an integrative review of the literature. *Journal of Nutrition and Metabolism*, 2012, 542698. <https://doi.org/10.1155/2012/542698>
47. Oldways Mediterranean Diet Pyramid | Oldways. (2019). Retrieved from Oldways website: <https://oldwayspt.org/resources/oldways-mediterranean-diet-pyramid>
48. Panagiotakos, D.B., Pitsavos, C., & Stefanadis, C. (2006). Dietary patterns: a Mediterranean diet score and its relation to clinical and biological markers of cardiovascular disease risk. *Nutrition, Metabolism and Cardiovascular Diseases: NCMD* 16(8):559–568 23.
49. Papadaki, A., Johnson, L., Toumpakari, Z., England, C., Rai, M., Toms, S., Penfold, C., Zazpe, I., Martínez-González, M., & Feder, G. (2018). Validation of the English Version of the 14-Item Mediterranean Diet Adherence Screener of the PREDIMED Study, in People at High Cardiovascular Risk in the UK. *Nutrients*, 10(2), 138. <https://doi.org/10.3390/nu10020138>
50. Patino-Alonso, M. C., Recio-Rodríguez, J. I., Belio, J. F., Colominas-Garrido, R., Lema-Bartolomé, J., Arranz, A. G., Agudo-Conde, C., Gomez-Marcos, M. A., García-Ortiz, L.,

- & EVIDENT Group (2014). Factors associated with adherence to the Mediterranean diet in the adult population. *Journal of the Academy of Nutrition and Dietetics*, 114(4), 583–589. <https://doi.org/10.1016/j.jand.2013.07.038>
51. Pereira-da-Silva, L., Rêgo, C., & Pietrobelli, A. (2016). The Diet of Preschool Children in the Mediterranean Countries of the European Union: A Systematic Review. *International Journal of Environmental Research and Public Health*, 13(6), 572. <https://doi.org/10.3390/ijerph13060572>
  52. Radd-Vagenas, S., Kouris-Blazos, A., Singh, M. F., & Flood, V. M. (2017). Evolution of Mediterranean diets and cuisine: concepts and definitions. *Asia Pacific journal of clinical nutrition*, 26(5), 749–763. <https://doi.org/10.6133/apjcn.082016.06>
  53. Ros, E., Martínez-González, M. A., Estruch, R., Salas-Salvadó, J., Fitó, M., Martínez, J. A., & Corella, D. (2014). Mediterranean diet and cardiovascular health: Teachings of the PREDIMED study. *Advances in nutrition (Bethesda, Md.)*, 5(3), 330S–6S. <https://doi.org/10.3945/an.113.005389>.
  54. Ruggiero, E., Di Castelnuovo, A., Costanzo, S., Persichillo, M., Bracone, F., Cerletti, C., Donati, M. B., de Gaetano, G., & Iacoviello, L. (2018). Socioeconomic and psychosocial determinants of adherence to the Mediterranean diet in a general adult Italian population. *European Journal of Public Health*, 29(2), 328–335. <https://doi.org/10.1093/eurpub/cky127>
  55. Schröder, H., Fitó, M., Estruch, R., Martínez-González, M. A., Corella, D., Salas-Salvadó, J., Lamuela-Raventós, R., Ros, E., Salaverría, I., Fiol, M., Lapetra, J., Vinyoles, E., Gómez-Gracia, E., Lahoz, C., Serra-Majem, L., Pintó, X., Ruiz-Gutierrez, V., & Covas, M. (2011). A Short Screener Is Valid for Assessing Mediterranean Diet Adherence among Older Spanish Men and Women. *The Journal of Nutrition*, 141(6), 1140–1145. <https://doi.org/10.3945/jn.110.135566>
  56. Schröder, H., Marrugat, J., & Covas, M. I. (2006). High monetary costs of dietary patterns associated with lower body mass index: a population-based study. *International Journal of Obesity*, 30(10), 1574–1579. <https://doi.org/10.1038/sj.ijo.0803308>
  57. Story, M., Kaphingst, K. M., Robinson-O'Brien, R., & Glanz, K. (2008). Creating Healthy Food and Eating Environments: Policy and Environmental Approaches. *Annual Review of Public Health*, 29(1), 253–272. <https://doi.org/10.1146/annurev.publhealth.29.020907.090926>
  58. Trichopoulou, A., Costacou, T., Bamia, C., & Trichopoulos, D. (2003). Adherence to a Mediterranean diet and survival in a Greek population. *The New England journal of medicine*, 348(26), 2599–2608. <https://doi.org/10.1056/NEJMoa025039>
  59. Trichopoulou, A., Orfanos, P., Norat, T., Bueno-de-Mesquita, B., Ocké, M. C., Peeters, P. H., van der Schouw, Y. T., Boeing, H., Hoffmann, K., Boffetta, P., Nagel, G., Masala, G., Krogh, V., Panico, S., Tumino, R., Vineis, P., Bamia, C., Naska, A., Benetou, V., & Ferrari, P. (2005). Modified Mediterranean diet and survival: EPIC-elderly prospective cohort study. *BMJ*, 330(7498), 991. <https://doi.org/10.1136/bmj.38415.644155.8f>

60. UNESCO - Decision of the Intergovernmental Committee: 5.COM 6.41. (n.d.). Retrieved from ich.unesco.org website: <https://ich.unesco.org/en/decisions/5.COM/6.41>
61. Vitale, M., Racca, E., Izzo, A., Giacco, A., Parente, E., Riccardi, G., & Giacco, R. (2019). Adherence to the traditional Mediterranean diet in a population of South of Italy: factors involved and proposal of an educational field-based survey tool. *International Journal of Food Sciences and Nutrition*, 70(2), 195–201. <https://doi.org/10.1080/09637486.2018.1481202>
62. Willett, C. W., Sacks, F., Trichopoulou, A., Drescher, G., Ferro-Luzzi, A., Helsing, E., & Trichopoulos, D. (1995). Mediterranean diet pyramid: a cultural model for healthy eating. *American Journal of Clinical Nutrition*, 61 (suppl), 1402S-6S
63. Wright, K., 2006. Researching Internet-Based Populations: Advantages and Disadvantages of Online Survey Research, Online Questionnaire Authoring Software Packages, and Web Survey Services. *Journal of Computer-Mediated Communication*, 10(3), pp.00-00.
64. Wu, L., & Sun, D. (2017). Adherence to Mediterranean diet and risk of developing cognitive disorders: An updated systematic review and meta-analysis of prospective cohort studies. *Scientific reports*, 7, 41317. <https://doi.org/10.1038/srep41317>
65. Yahia, N., Achkar, A., Abdallah, A., & Rizk, S. (2008). Eating habits and obesity among Lebanese university students. *Nutrition journal*, 7, 32. <https://doi.org/10.1186/1475-2891-7-32>