AMERICAN UNIVERSITY OF BEIRUT

ASSOCIATION BETWEEN PHYSICAL ACTIVITY, SOCIOECONOMIC STATUS, BLOOD BIOMARKERS AND DIET IN LEBANESE ADULTS

by
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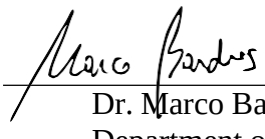

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ABSTRACT
OF THE THESIS OF

Maria Fouad Abou Mourad for Master of Science
Major: Nutrition

Title: Association between Physical Activity, Socioeconomic Status, Blood Biomarkers and Diet in Lebanese Adults

The prevalence of physical activity (PA) varies by age, gender, socioeconomic status (SES), blood profile, and diet. These factors have been correlated with PA. The objective of this study is to evaluate the effect of these determinants on PA in a representative sample of the Lebanese adult population.

A secondary cross-sectional analysis was done on a data collected in 2008 on a national level. The original study interviewed adults of age greater or equal to 18. For the purpose of this study, only 323 adult participants were included. Demographic and socio-economic data were gathered. Dietary intake was obtained using food frequency questionnaire (FFQ). Blood biomarkers were analyzed after having collected blood samples. The prevalence of PA in 2008 was evaluated. Logistic regression analysis was executed to study the association between PA and its different relevant determinants, excluding data from outliers.

Approximately, a third of the sample belongs to the low PA level category. Highly physically active participants included more females (57%) than males (43%), and younger adults (mean=37.1 years). The odds of being physically active significantly increased among participants with high low-density lipoprotein (LDL) levels (OR = 2.027, 95% CI = 1.024 – 4.015) (OR = 2.604, 95% CI = 1.1119 – 6.061). On the other hand, the odds of being physically active significantly decreased among participants with moderate levels of triglycerides (OR = 0.436, 95% CI = 0.209 – 0.908), and among male participants (OR = 0.475, 95% CI = 0.235– 0.962).

The prevalence of PA among Lebanese adults is affected by many demographics and socio-economic factors. Furthermore, larger studies, especially longitudinal studies, are needed to set recommendations in order to increase PA among Lebanese adults, while taking into consideration factors that could affect their level of PA.

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ABBREVIATIONS

ACSM	American College of Sports Medicine
ANOVA:	Analysis of Variance
AUB:	American University of Beirut
BMI	Body Mass Index
CDC:	Centers for Disease Control and Prevention
CI	Confidence Interval
CI:	Crowding Index
CRP:	C-reactive protein
FFQ:	Food Frequency Questionnaire
GPAQ:	Global Physical Activity Questionnaire
HDL	High-density lipoprotein
IPAQ:	International Physical Activity Questionnaire
IRB:	Institutional Review Board
LDL:	Low-density lipoprotein
LTPA:	Leisure-time physical activity
MENA:	Middle East and North Africa
MET:	Metabolic Equivalent Task
NCD	Non-communicable disease
OR	Odd Ratio
PA:	Physical Activity
PAG:	Physical Activity Guidelines
SES:	Socioeconomic Status
UK:	United Kingdom

VLDL: Very Low-density lipoprotein

WHO: World Health Organization

WtHR: Waist-to-height ratio

CHAPTER I

INTRODUCTION

A. General Overview

The prevalence of non-communicable diseases (NCDs), such as cardiovascular diseases, cancer, diabetes, and chronic respiratory disease, is on the rise, with the mortality from many NCDs increasing worldwide, reaching 41 million deaths annually (WHO, 2018). One of the main factors which increase the risk of dying from NCDs is the lack of physical activity (PA) (Haileamlak, 2019). The lack of PA can lead to raised blood pressure, high blood glucose, elevated blood lipids, and obesity (Booth et al., 2012). Thus, engaging in regular PA seems to be an important component for a healthier lifestyle. However, global data shows that one in four adults do not do enough PA (WHO, 2018). In fact, Lebanon, a small country in the Middle East, had a prevalence of insufficient PA equal to 36.41% among adults aged 18+ in 2016, according to WHO (WHO, 2016). It is important to identify factors which could explain PA (Rech et al., 2014). Most studies have focused on the consistent correlates of PA, such as age, gender; marital status, and socioeconomic status. In this regard, male sex, age (inversely), education level are reported correlates of PA (Bauman et al., 2012). Few studies in Lebanon addressed the association between the level of PA and its determinants (Al-Tannir et al., 2009). It would be interesting to look into new areas of research of determinants which contribute to an individual being physically active, such as blood biomarkers and diet, especially in Lebanese adults. The reason behind this approach is that these factors could be new potential mediators for use in future

interventions (Bauman et al., 2012), because diet, blood biomarkers, and PA are usually linked.

B. Objectives

- Estimate the prevalence of physical activity among the 323 adults who were recruited in this study and for whom we have blood samples lists.
- Study the demographic, dietary, socioeconomic and blood biomarkers determinants of physical activity in Lebanese adults.

C. Aim of the Study

The aim of this study is to investigate the association between physical activity and the sociodemographic characteristics, socioeconomic status, blood biomarkers and diet in Lebanese adults.

CHAPTER II

LITERATURE REVIEW

A. Definition, Benefits, Recommendations, and Prevalence of Physical Activity

Physical activity (PA) is, as defined by Caspersen et al., any bodily movement produced by skeletal muscles that results in energy expenditure (Caspersen et al., 1985). Strong evidence supports the health benefits of PA, which is associated with a reduced risk for all-cause mortality and many chronic medical conditions such as cardiovascular diseases, and type 2 diabetes (Warburton & Bredin, 2017). Martin-Borrás et al. (2014) defined sedentary behavior as any waking behavior characterized by ≤ 1.5 METs (MET stands for Metabolic Equivalent Task). One MET corresponds to the amount of energy a person expends while lying down or sitting quietly at rest (approximately 3.5 mL of oxygen per kilogram of body weight). Physical inactivity is the second leading modifiable risk factor (right after smoking) responsible for many diseases such as breast and colon cancer, type 2 diabetes and ischemic heart disease (Mathers et al., 2000). Physical inactivity also contributes to total mortality, as it led to 5.3 million premature deaths worldwide in 2008 (Li & Siegrist, 2012). For all of these reasons, the American College of Sports Medicine (ACSM) and the Centers for Disease Control and Prevention (CDC) recommend that adults should do at least 150 minutes a week of moderate-intensity aerobic PA, or 75 minutes a week of vigorous-intensity aerobic PA. Adults should also do muscle-strengthening activities of moderate or greater intensity on 2 days or more a week (PA Guidelines for Americans, 2018). Although meeting the PA guidelines (PAG) should be the goal, health benefits begin to appear before reaching 150 mins a week for most outcomes (Warburton & Bredin, 2017). According to the

guidelines, it is also recommended to use MET as reference thresholds of absolute intensities of PA (light, <3.0 METs; moderate, 3.0– 5.9 METs; vigorous, >6.0 METs) (Haskell et al., 2007).

Few published research articles tackle the PA of the Lebanese people. One cross-sectional study assessed the prevalence of PA among Lebanese adults and the association between sociodemographic variables and PA behavior (Al-Tannir et al., 2009). However, one of its limitations was the sample, which was not representative of the whole population of Lebanon because it only took into account four districts of the country. Another study aiming at determining the prevalence and covariates of metabolic syndrome in a Lebanese adult population found that, approximately, half of the subjects were physically inactive (54.0% of men and 52.1% of women) (Sibai et al., 2008). Moreover, a similar study focused on hypertension and its coexistence with other CVD risk factors, one of which is sedentary lifestyle. Data showed that 40.3% of the participants admitted to be physically inactive (Tohme et al., 2005).

B. Physical Activity and Blood Biomarkers

In sports, biomarkers are important parameters to assess the effect of exercise on organs, tissues and systems (Bouchard, & Shephard, 1994). The association between PA and blood biomarkers is studied in the literature; however, the impact of PA on lipid levels has shown conflicting results (Thompson et al., 2003), and the biological mechanism of it is not completely understood. A study investigating the association between blood lipid levels and PA found that women who were physically active had significantly lower levels of total serum cholesterol, LDL and oxidized LDL-cholesterol (the so-called ‘’bad cholesterol’’), triglycerides and apolipoprotein B and higher levels

of HDL-cholesterol (the so-called ‘’good cholesterol’’) and apolipoprotein A1 (Panagiotakos et al., 2003). According to another cross-sectional study done in the United Kingdom (UK), and after adjusting for SES, moderate PA was negatively associated with unhealthy cholesterol ratio and triglyceride levels (Brown et al., 2016). A Korean study showed an inverse correlation between PA (METs, time and energy expenditure) and blood triglyceride level in young adults (Hwang et al., 2019).

A study conducted by Fung et al., examined the relations of PA and sedentary behavior to biomarkers of obesity and CVD risk. The results showed that men with a higher level of exercise had lower plasma levels of leptin, triglycerides, fasting insulin, and C-peptide and higher HDL cholesterol when compared with those with lower levels of activity (Fung et al., 2000). Each 20 MET-hr increment per week (equivalent to about an additional hour of walking per day) is associated with a 1.4 mg/dl (95 percent CI: 0.2, 2.6) higher level of HDL cholesterol ($p < 0.05$), a 0.6 ng/ml (95 percent CI: –0.4, –0.8) lower level of leptin ($p < 0.0001$), and 0.1 ng/dl (95 percent CI: –0.2, –0.002) lower level of C-peptide ($p < 0.05$) (Fung et al., 2000).

More recent studies showed similar results. One study found a decreasing trend of CRP and VLDL/HDL ratio with higher total PA level (Lee et al., 2019). Additionally, a new recent study from the Aerobics Center Longitudinal Study assessed the level of the cardiorespiratory fitness and the development of dyslipidemia, including HDL < 40 mg/dL, VLDL > 200 mg/dL and LDL > 160 mg/dL, and observed a 43% lower risk of the dyslipidemic phenotype associated with high fitness level (Breneman et al., 2016).

Blood biomarkers could also be a determinant of PA. Usually, obese people are more prone to have an abnormal lipid profile than lean subjects (Njelekela et al., 2002).

A cross-sectional study was conducted to see whether high BMI is a determinant or a consequence of a sedentary lifestyle. The results were clear that an increase in BMI was associated with the risk of becoming sedentary (Mortensen et al., 2006).

C. Physical Activity and Gender

Gender is one of the most consistent demographic determinants of PA in adults (Trost et al., 2002). According to the WHO, men perform more PA than women. This was further supported by Hallal et al., (2012) who pointed out that PA tends to be lower in women. However, women tend to adhere more to PA recommendations than men (Hansen et al., 2018). Artazcoz et al., (2004) argues that, "the gender differences in activity in leisure time can be explained by cultural patterns that encourage more sports among men, but also by the time constraints related to greater occupation of women (work and housework)" (Artazcoz et al., 2004). A study which intended to evaluate PA measures found that women reported much higher levels of household PA compared to men (Richardson et al., 1994).

D. Physical Activity and Age

Age has been shown to be inversely associated with PA in many previous studies, meaning that a negative relationship usually exists between age and PA (Kokolakakis et al., 2011). A study found that the percentage of inactivity increases with age in both sexes (Caspersen et al., 2000). However, a study analyzed the sociodemographic and lifestyle-behavioral factors of PA in Malaysia. The results of this study showed that age is positively associated with the likelihood of being engaged in PA frequently (Cheah, 2011).

E. Physical Activity and Diet

As for the association between dietary intake and PA, a study conducted in 1995 to study the association between leisure-time PA and dietary fat in American adults showed that fat consumption decreased markedly with PA (Simoes et al., 1995). A more recent study conducted in Croatia investigated the association between the adherence to the Mediterranean diet and PA among the working population. The results showed that the energy intake was statistically significantly the lowest among those who had high PA level, whom, in addition, had greater intake of proteins, cholesterol, legumes, eggs, vegetables and olive oil. They also had significantly the lowest intake of alcoholic beverages (Žeželj et al., 2019). Another study conducted in Spain showed that those who adhered more to the Mediterranean diet were more physically active (Alvarez-Alvarez et al., 2018). A similar Italian study found that higher adherence score to the Mediterranean diet was found in individuals with higher PA levels (Marventano et al., 2017). There were positive associations between PA and healthy diet; however, only a small number of studies examined dietary behavior (Brownson et al., 2000). The same study by Fung et al. that examined the relations of PA and sedentary behavior to biomarkers of obesity and CVD risk, found that men with a higher level of exercise ate less saturated fat (Fung et al., 2000). A study that aimed to assess food patterns and their association with PA among Spanish older adults found that participants who were in the fourth quartile of adherence to the Mediterranean diet, which is characterized by high intake of whole grains, fish, fruits, vegetables, legumes and nuts, and olive oil, were more likely to be classified in the second (medium) and third (high) tertile of LTPA (leisure-time PA). Moreover, these associations remained significant even after adjustments for age, body fat and WtHR (waist-to-height ratio) (Bibiloni et al., 2017).

Another study examined patterns and correlates of PA among US women 40 years and older and found that among behavioral risk factor categories, having no leisure-time activity was most common among persons not consuming five or more servings of fruits and vegetables per day (Brownson et al., 2000). One of the aims of a similar study that was conducted is to describe the relation between Healthy Eating Index, Mediterranean Diet Score and PA. The highest quintiles of Healthy Eating Index, Mediterranean Diet Score and Healthy Dietary Pattern were statistically associated with higher PA (all $P<0.001$) (Mullie et al., 2010).

F. Physical Activity and Socioeconomic Status

Sociodemographic factors have an effect in whether people participate in PA or not (Cheah & Poh, 2014). Socioeconomic position is a key determinant of PA (Trost et al., 2002). Krieger, Williams, and Moss (1997) define socioeconomic position as "an aggregate concept that includes both resource-based and prestige-based measures, as linked to both childhood and adult social class position" (Krieger et al., 1997). Individual measures of SES such as income, education, and occupation reflect the opportunities and resources people might have (Lynch & Kaplan, 2000). PA was positively associated with several indicators of SES, such as education and occupation (Kokolakaki et al., 2012) and income (Parks et al., 2003). Indeed, low PA during childhood is associated with low levels of PA during adulthood (Gidlow et al., 2006). Several studies have reported that people with higher SES are more likely to participate in PA than people with lower SES (Steenhuis et al., 2009). A study examining patterns and correlates of PA among US women 40 years and older, found that the probability of being active during leisure time tended to increase with increasing educational level

(Brownson et al., 2000). Wardle and Steptoe found an increased likelihood of performing no vigorous intensity activity in sequentially lower classes (Wardle, 2003). In Italy, a study was conducted to describe the socioeconomic differences in sport and PA among Italian adults. The study showed similar results, meaning that higher educated participants were more likely to be physically active than their lower educated counterparts (Federico et al., 2013). However, while all three indicators of socioeconomic position were positively related to sport participation, only education was positively related with PA. Occupation had instead a negative association with PA, whereas material conditions were not significantly associated with PA.

G. Research Question

To what extent do physically active individuals have higher socioeconomic status, better blood biomarkers, and follow a healthier diet?

CHAPTER III

METHODOLOGY

A. Study Design

The proposed study is a secondary analysis of the National WHO Stepwise survey "Nutrition and Non-Communicable Diseases Risk factors cross-sectional survey" conducted in Lebanon between years 2008 and 2009 (WHO, 2005). The survey was conducted on a nationally representative sample of Lebanese individuals >6 years of age (Lebanese Republic Ministry of Social Affairs (Lebanon) et al. 2006). Based on the original study, where a power of 0.8, a confidence interval of 95%, and an error margin of ±1.5 were considered, the sample size was determined using the following formula: n= (Z1- α /2)2 P (1- P)/E2 (Sharon L., 1999). Survey participants >18 years of age and with no chronic diseases were contacted to give blood samples (n=1331). Of these participants who were invited to participate, 323 subjects gave a blood sample (response rate: 25.2%) and their data were used for the purpose of this study. Further details about the design of the original survey are found elsewhere (Naja et al. 2013). Pregnant and lactating women as well as subjects with mental disabilities and learning difficulties were excluded. For this thesis, only the adult population who gave blood was selected in order to investigate PA and its determinants and the association between them. Furthermore, only participants who provided blood samples will be studied in this thesis.

The dependent variable of this thesis is PA. The independent variables are socioeconomic-status proxies which are crowding index, education level, and occupation; diet, and blood biomarkers.

Crowding index calculated as the number of persons in the household divided by the number of rooms.

CI (crowding index)

- <1 person/room
- ≥ 1 person/room

Educational level was coded into 3 categories:

- Complementary or less
- Secondary or technical
- University

Occupation or work status was coded into 2 categories for the analysis.

- Self-employed or employee
- Not working, looking for a job, unable to work, student, volunteer, or retired

Body mass index was calculated considering the height and weight self-reported by participants, and was classified into 3 categories:

- Underweight or Normal weight (BMI < 25)
- Overweight (BMI ≥ 25 Kg/m^2)
- Obese (BMI ≥ 30 Kg/m^2)

Dietary information included energy consumption in Kcal/day, percentage of calories coming from carbohydrates, protein, and fat per day.

B. Ethical Consideration

The original study protocol, including its integrated nutrition component, has been approved by the Institutional Review Board (IRB) of the American University of Beirut (AUB).

C. Data Collection

Household visits and face-to-face interviews were done by trained interviewers because the interviewer can potentially influence data quality (Koch et al., 2009) and can lead to a misclassification of the exposure which is the interviewer bias (Tripepi et al., 2008). Municipalities in the regions where the study was conducted facilitated the field work. Participants were randomly selected from the households. One adult ≥18 years was selected in every household. All participating subjects signed a written informed consent for their participation before beginning.

1. The Interview Questionnaire

The questionnaire used to interview the participants was written in Arabic and was entitled the Adult Questionnaire. It was validated and used in health studies in the MENA region (Sibai et al., 2003; Zindah et al., 2008; Nasreddine et al., 2009; Chamieh et al., 2015). The Adult Questionnaire includes questions on demographics, household characteristics, smoking, dietary intake, PA, and reported diseases. In addition, assessment of the PA level of each participant was done using the short form-International Physical Activity Questionnaire (IPAQ) instead of the Global Physical Activity Questionnaire (GPAQ), because the IPAQ does not focus on one specific domain of PA (Cora et al., 2003). As for the nutrition section of the questionnaire, it

was replaced by a 61-item food frequency questionnaire (FFQ) that measured food intake over the past year.

2. Dietary Assessment Tools

There are several methods to assess food intake. To select the right tool for a study, one has to know the advantages and the disadvantages of each method. In this study, two dietary assessment instruments were used to evaluate the diet of the Lebanese adult population: the semi-quantitative food frequency questionnaire and the 24 hour recall. After considering the advantages and disadvantages of both methods, the researcher decided to use the FFQ for collecting dietary data for this study for numerous reasons (Biró et al., 2002). First, the participants' eating patterns are not affected when assessing food intake with FFQ, because they rely on a longer recall period. Moreover, this study is about finding which dietary pattern is more associated with the participation in PA. Second, FFQs may be self-administered, cause a little burden on the respondents, and require little time if checked by an interviewer. Third, FFQs are inexpensive. Fourth, FFQs are pre-coded which makes it easier to handle the data. Finally, FFQs are suitable for large population studies (Biró et al., 2002).

A standard portion size was indicated, and five frequency choices were given for every food item listed on the FFQ. This FFQ was designed by a panel of nutritionists and included culture-specific dishes and recipes. It was tested on a convenient sample to check for clarity and cultural sensitivity. Daily gram intakes of food items, energy, and macronutrients intake were computed using the food composition database of the Nutritionist IV software (Nutritionist IV program, 1997, First DataBank Inc., San Bruno, CA). The FFQ was administered by a trained dietitian.

3. The Physical Activity Recall Questionnaire

There are several methods to evaluate PA. PA can be assessed using objective or subjective methods: objective methods comprise motion sensors, heartrate monitors, accelerometers, pedometers, and indirect calorimeters, while subjective methods include questionnaires and diaries (Welk, 2002). The most convenient tool is the self-report method because it can assess the PA of a large number of people in a short time (Matthews, 2002; Armstrong & Bull, 2006).

The International Physical Activity Questionnaire (IPAQ) has been validated and used in many countries throughout the world (Cora et al., 2003) to evaluate the prevalence of PA as well as to identify associates of PA behaviors. There are two forms of the IPAQ: the short and the long version. In this study, the short form was adopted because it is a surveillance study (Cora et al., 2003). Indeed, the long form was reported as being "too boring and repetitive," and too long, and therefore expensive, for routine surveillance (CRAIG et al., 2003). The short form of the IPAQ consists of seven items which provides information on time spent in walking, in vigorous and moderate intensity physical activities, and in sedentary activity (Cora et al., 2003). It is a measure of total PA in all its settings including transportation, work and leisure time (Ainsworth et al., 2006).

4. Blood Biomarkers

Blood samples were collected after an overnight fast. Serum was centrifuged on site and shipped on dry ice to the American University of Beirut Laboratory. Levels of triglycerides, HDL-C, and glucose were measured by an enzymatic spectrophotometric technique using Vitros 350 analyzer (Ortho-Clinical Diagnostics, Johnson & Johnson,

50–100 Holmers Farm Way, High Wycombe, Buckighamshire, HP12 4DP, United Kingdom). The inter-assay variation of measurements did not exceed 4%. Quality control was performed within each run using standard performance verifier solutions provided by Ortho-Clinical Diagnostics. All samples were analyzed in duplicates, and the average value was used in statistical analysis (Naja et al., 2011).

D. Data Treatment

Data on PA was cleaned, coded and processed according to the guidelines for data processing and analysis of the international PA questionnaire, protocol for short form (IPAQ, 2005). A measure of total PA was calculated by weighing each type of activity by its energy requirements defined in METs (multiples of the resting metabolic rate; walking=3.3 METs, Moderate intensity= 4.0METs, Vigorous intensity= 8.0METs). This was done in order to yield a score in MET-minutes/week that was later categorized into three levels of activity: low, moderate, and high (IPAQ, 2005) as shown in appendix A.

In order to run the binary logistic regression, the dependent variable ‘’PA’’ was dichotomized into 2 categories: no physical activity or sedentary, and physically active. Participants who were in the low PA level were considered sedentary and used as reference category. Furthermore, participants who were in the moderate or vigorous PA level were considered physically active.

Additionally, some of the continuous variables, such as age, HDL levels, LDL levels, VLDL levels, and CRP levels were categorized. Age was categorized according to its frequency in the data set. Levels of HDL, LDL, VLDL, and CRP were categorized following the CDC range (Grundy et al., 2019).

E. Statistical Analysis

IBM SPSS Statistics ver. 20.0 (IBM Co., Armonk, NY, USA) was used to showcase the descriptive statistics, such as the PA prevalence among the study population, and to see the association between dependent variable (PA), and the independent variables (diet, blood biomarkers and SES). The associations between two categorical variables were determined by applying Chi-squared test, while those between a continuous variable and a categorical one was obtained by ANOVA. Energy intake and percentage of macronutrients consumption are presented as means plus or minus standard deviation (Means ± SD). A binary logistic regression was carried out because the outcome variable, which is PA, is binary and many possible independent variables might predict PA level. Odds ratios (OR) with their 95% confidence intervals (CI) were obtained. A p-value less than 0.05 was considered statistically significant.

CHAPTER IV

RESULTS

The general characteristics of the study population are summarized in table 1. Out of 323 Lebanese adults participating in the study, 159 (49.2%) were males, and 164 (50.8%) were females. The mean age of the study population is 38 years old. As related to blood biomarkers, the mean values of the lipid profile of the study sample are 51.1 mg/dL, 131.1 mg/dL and 137.9 mg/dL respectively for HDL, LDL and VLDL. The mean value of CRP level in the study population is 4.8 mg/L. Almost the third of the study sample is single, doesn't work/retired/unemployed, has a crowding index (CI) less than 1, consumes alcohol, smokes, and has a low PA level. Almost 70% of the study sample owns a house, and perceives themselves as being in the middle socioeconomic level. For dietary measures, the mean value of the participants' caloric intake is 2643.4 Kcal/day, and the percentage of calories coming from carbohydrates, proteins and fats are 48.3%, 15.7% and 36.3%, respectively.

Table 1 Demographic characteristics, blood biomarkers, dietary measures, and physical activity in the study sample (n=323)

Categorical Variables	**N (%)**
Gender	
Females	164 (50.8)
Males	159 (49.2)
Marital status	
Single	114 (35.3)
Married	200 (61.9)
Widowed, Separated, Divorced	9 (2.8)
Educational level	
Complementary or less	127 (39.3)
Secondary or technical	95 (29.4)
University	101 (31.3)
Work status	
Self-employed or Employee	170 (52.6)
Student or Volunteer	27 (8.4)
Not working, looking for a job, unable to work, or retired	126 (39)
Household assets[1]	
< 7 items	120 (37.4)
7-8 items	137 (42.7)
≥ 9 items	64 (19.9)
Crowding index[1]	
CI<1 person/room	115 (35.6)
CI≥1 person/room	206 (63.8)
Income[2]	
< 1 million	90 (29.7)
1-6 million	208 (68.6)
>6 millions	5 (1.7)
Self-perceived socioeconomic status[3]	
Low SES	83 (25.7)
Middle SES	228 (70.6)
High SES	9 (2.8)
Alcohol consumption	
Yes	131 (40.6)
No	192 (59.4)
Smoking	
Yes	103 (31.9)
No or past smoker	220 (68.1)

Table 1 (*continued*): Demographic characteristics, blood biomarkers, dietary measures, and physical activity in the study sample (n=323)

Categorical variables	**N (%)**
Body mass index (Kg/m^2)[4]	
Underweight or Normal weight	133 (41.6)
Overweight	111 (34.7)
Obese	76 (23.8)
Physical activity	
Low	117 (36.2)
Moderate	64 (19.8)
High	142 (44)
Continuous variables	**Mean (± SD)**
Age (years)	38.8 (± 14.9)
Blood biomarkers	
HDL (mg/dL)	51.1 (± 14.3)
LDL (mg/dL)	131.1 (± 39.9)
VLDL (mg/dL)	137.9 (± 77.4)
CRP[5] (mg/L)	4.8 (± 4.9)
Caloric intake (Kcal/day)	2643.4 (± 1127.6)
% Calories from carbs	48.3 (± 6.9)
% Calories from proteins	15.7 (± 2.9)
% Calories from fat	36.3 (± 6.8)

[1] 2 values are missing

[2] 20 values are missing

[3] 1 value is missing, 1 participant refused to answer, and 1 participant didn't know.

[4] 3 values are missing

[5] 4 missing values and 1 outlier removed

Table 2 shows the sociodemographic characteristics as well as blood biomarkers stratified by levels of PA (low, moderate, high) in Lebanese adults (n=323). Participants who have the highest VLDL value are in the low PA level, and those who have the highest level of HDL value (52.2 mg/dL) are in the high PA level, which is predictable but not statistically significant. Participants who have the highest level of LDL value are in the high PA level. There was a statistically significant difference in gender between the three levels of PA, with the prevalence of low PA being higher in males than females (70% vs 47% respectively) (p-value = 0.017), and the prevalence of high PA being higher in females than males (57% vs 43% respectively). Another statistically significant value is the association between marital status and levels of PA, (p-value= 0.002). To find out the significance is at what level, a post-hoc analysis was therefore conducted which showed a statistically significant difference between married participants who belong to the high PA level and the other categories. Furthermore, a statistically significant p-value (0.047) was seen between household income and the different levels of PA among Lebanese adults.

Table 2 Distribution of baseline characteristics among Lebanese adults (n=323) according to levels of physical activity

Variables	Physical activity levels			
	Low (n= 117)	Moderate (n= 64)	Vigorous (n= 142)	p-value
Categorical Variables	N (%)			
Gender[1]				
Females	47[a] (40.2)	36[a] (56.3)	81[b] (57)	**0.017**
Males	70[c] (59.8)	28[d] (43.8)	61[d] (43)	
Education				
Complementary or less	50 (39.4)	29 (22.8)	48 (37.8)	
Secondary or Technical	27 (28.4)	16 (16.8)	52 (54.7)	0.133
University	40 (39.6)	19 (18.8)	42 (41.6)	
Marital status				
Single	50 (42.7)	23 (35.9)	41 (28.9)	
Married	62 (53)	37 (57.8)	**101 (71.1)**	**0.002**
Widowed, Separated, Divorced	5 (4.3)	4 (6.3)	0 (0)	
Work				
Self-employed or employee	68 (40)	33 (19.4)	69 (40.6)	
Student or volunteer	14 (51.9)	3 (11.1)	10 (37)	0.086
Not working, looking for a job, unable to work, or retired	35 (27.8)	28 (22.2)	63 (50)	
BMI[2]				
Underweight or Normal weight	52 (39.1)	28 (21.1)	53 (39.8)	
Overweight	36 (32.4)	19 (17.1)	56 (50.5)	0.520
Obese	28 (36.8)	17 (22.4)	31 (40.8)	

Table 2 (*continued*): Distribution of baseline characteristics among Lebanese adults (n=323) according to levels of physical activity

Variables	Physical activity levels			
	Low (n= 117)	**Moderate (n= 64)**	**Vigorous (n= 142)**	**p-value**
Categorical Variables	**N (%)**			
Household Assets				
< 7 items	37 (31.9)	29 (45.3)	54 (38.3)	
7-8 items	53 (45.7)	25 (39.1)	59 (41.8)	0.484
≥ 9 items	26 (22.4)	10 (15.6)	28 (19.9)	
Crowding index				
≥ 1 person / room	45 (39.1)	21 (18.3)	49 (42.6)	0.723
<1 person / room	72 (35.0)	43 (20.9)	91 (44.2)	
Household income (Lebanese Lira)[3]				
Less than 1 million	23 (25.6)	23 (25.6)	44 (48.9)	
Between 1 and 6 million	83 (39.9)	32 (15.4)	93 (44.7)	**0.047**
More than 6 million	3 (60)	0 (0)	2 (40)	
Continuous Variables	**Mean (± SD)**			
Age (years)	38.8 (± 16.5)	42.5 (± 15.6)	37.1 (± 12.7)	0.051
Triglycerides (mg/dL)	141.6 (± 80.1)	132.1 (± 69.4)	137.4 (±78.8)	0.731
HDL (mg/dL)	49.9 (± 14.5)	51.1 (± 14.3)	52.2 (± 14.2)	0.453
LDL (mg/dL)	127.4 (± 40.0)	130.6 (± 34.2)	134.5 (±42.1)	0.357
CRP (mg/L)	5.3 (± 5.4)	4.5 (± 4.4)	4.6 (± 4.6)	0.384

Continuous variable are presented as Mean (± SD) and categorical variables are presented as frequencies n (percentages %). Significance at p-value < 0.05

P-values for continuous variables were derived using one-way ANOVA and categorical variables were derived using chi-squared tests.

[1] Values with superscripts of the same letter are not significantly different; values with superscripts of different letters are significantly different at p < 0.05.

[2] 3 values are missing

[3] 20 values are missing

The sociodemographic and socioeconomic characteristics as well as blood biomarkers stratified by levels of PA (low, moderate, high) in Lebanese men of the study population (n=159) are shown in table 3. There was a statistically significant difference in age between the three levels of PA according to the ANOVA test (p-value = 0.025), with men who are older (mean age: 46.5 years) being in the moderate section of PA. The association of each blood parameter with the three levels of PA is also studied, with the males who have the lowest value of VLDL (149.7 mg/dL), and CRP (4.3 mg/L), and the highest level of HDL (45 mg/dL) being in the high PA level. However, these were not significant. The association of the different proxies of SES with PA is not statistically significant.

Table 3 Distribution of baseline characteristics among Lebanese men (n=159) according to levels of physical activity

Variables	Total (n=159)	Physical activity levels			
		Low (n= 70)	Moderate (n= 28)	Vigorous (n= 61)	p-value
Categorical Variables			N (%)		
Education					
Complementary or less	66 (41.5)	34 (51.5)	12 (18.2)	20 (30.3)	
Secondary or Technical	48 (30.2)	17 (35.4)	8 (16.7)	23 (47.9)	0.405
University	45 (28.3)	19 (42.2)	8 (17.8)	18 (40.0)	
Marital status					
Single	71 (44.7)	28 (40)	12 (42.9)	31 (50.8)	
Married	83 (52.2)	40 (57.1)	13 (46.4)	30 (49.2)	0.101
Widowed, Separated, Divorced	5 (3.1)	2 (2.9)	3 (10.7)	0 (0)	
Work					
Self-employed or employee	119 (74.8)	49 (41.2)	22 (18.5)	48 (40.3)	
Student or volunteer	16 (10.1)	8 (50)	1 (6.3)	7 (43.8)	0.458
Not working, looking for a job, unable to work, or retired	24 (15.1)	13 (54.2)	5 (20.8)	6 (25)	
BMI					
Underweight or Normal weight	52 (33.1)	24 (46.2)	13 (25)	15 (28.8)	
Overweight	62 (39.5)	25 (40.3)	9 (14.5)	28 (45.2)	0.354
Obese	43 (27.4)	20 (46.5)	6 (14)	17 (39.5)	

Table 3 (*continued*): Distribution of baseline characteristics among Lebanese men (n=159) according to levels of physical activity

Variables	Total (n=159)	Physical activity levels			p-value
		Low (n= 70)	Moderate (n= 28)	Vigorous (n= 61)	
Categorical Variables			N (%)		
Household Assets[1]					
< 7 items	50 (31.6)	22 (31.9)	11 (39.3)	17 (27.9)	
7-8 items	70 (44.3)	29 (42)	13 (46.4)	28 (45.9)	0.683
≥ 9 items	38 (24.1)	18 (26.1)	4 (14.3)	16 (26.2)	
Crowding index					
≥ 1 person / room	68 (42.8)	32 (47.1)	12 (17.6)	24 (35.3)	0.763
<1 person / room	91 (57.2)	38 (41.8)	16 (17.6)	37 (40.7)	
Household income (Lebanese Lira)[2]					
Less than 1 million	33 (22)	13 (39.4)	8 (24.2)	12 (36.4)	
Between 1 and 6 million	114 (76)	50 (43.9)	18 (15.8)	46 (40.4)	0.745
More than 6 million	3 (2)	2 (66.7)	0 (0)	1 (33.3)	
Continuous Variables			Mean (± SD)		
Age[3] (years)	39.9 (± 17.42)	40.7[a] (± 17.3)	46.5[a,b] (± 19.9)	36.0[a,c] (± 15.5)	**0.025**
Triglycerides (mg/dL)	155.0 (± 82.7)	160.2 (± 85.6)	153.5 (± 82.0)	149.7 (± 80.4)	0.767
HDL (mg/dL)	44.0 (± 10.7)	43.8 (± 11.0)	42.4 (± 9.0)	45.0 (± 11.1)	0.553
LDL (mg/dL)	133.6 (± 37.2)	128.5 (± 35.8)	132.4 (± 34.9)	140.1 (± 39.3)	0.205
CRP (mg/L)	4.9 (± 4.6)	5.6 (± 5.5)	4.3 (± 3.1)	4.3 (± 4.0)	0.217

Continuous variable are presented as Mean (± SD) and categorical variables are presented as frequencies n (percentages %). Significance at p-value < 0.05

P-values for continuous variables were derived using one-way ANOVA and categorical variables were derived using chi-squared tests.

[1] 1 value is missing in the vigorous level of physical activity

[2] 9 values are missing

[3] Values with superscripts of the same letter are not significantly different; values with superscripts of different letters are significantly different at p < 0.05.

Table 4 shows the sociodemographic and socioeconomic characteristics as well as blood biomarkers stratified by levels of PA (low, moderate, high) in Lebanese women of the study population. The association of each blood parameter and the proxies of SES with the three levels of PA is also studied. The only significant p-value is the one showing the association between marital status and the level of PA among Lebanese women (p-value < 0.05), where there was a significant association between marital status and the level of PA. After having run the Post Hoc analysis, the significant association was seen more specifically between single/low PA, single/high PA, married/low PA, and married/high PA. The association between levels of PA and the other variables was not statistically significant.

Table 4 Distribution of baseline characteristics among Lebanese women (n=164) according to levels of physical activity

Variables		Physical activity levels			
	Total (n=164)	**Low (n= 47)**	**Moderate (n= 36)**	**Vigorous (n= 81)**	**p-value**
Categorical Variables			**N (%)**		
Education					
Complementary or less	61 (37.2)	16 (26.2)	17 (27.9)	28 (45.9)	
Secondary or Technical	47 (28.7)	10 (21.3)	8 (17.0)	29 (61.7)	0.181
University	56 (34.1)	21 (37.5)	11 (19.6)	24 (42.9)	
Marital status					
Single	43 (26.2)	**22 (46.8)**	11 (30.6)	**10 (12.3)**	
Married	117 (71.3)	**22 (46.8)**	24 (66.7)	**71 (87.7)**	**0.000**
Widowed, Separated, Divorced	4 (2.4)	3 (6.4)	1 (2.8)	0 (0)	
Work					
Self-employed or employee	51 (31.1)	19 (37.3)	11 (21.6)	21 (41.2)	
Student or volunteer	11 (6.7)	6 (54.5)	2 (18.2)	3 (27.3)	0.077
Not working, looking for a job, unable to work, or retired	102 (62.2)	22 (21.6)	23 (22.5)	57 (55.9)	
BMI					
Underweight or Normal weight	81 (49.7)	28 (34.6)	15 (18.5)	38 (46.9)	
Overweight	49 (30.1)	11 (22.4)	10 (20.4)	28 (57.1)	0.283
Obese	33 (.2)	8 (24.2)	11 (33.3)	14 (42.4)	

Table 4 (*continued*): Distribution of baseline characteristics among Lebanese women (n=164) according to levels of physical activity

Variables		Physical activity levels			
	Total (n=164)	**Low (n= 47)**	**Moderate (n= 36)**	**Vigorous (n= 81)**	**p-value**
Categorical Variables			**N (%)**		
Household Assets[1]					
< 7 items	70 (42.9)	15 (31.9)	18 (50)	37 (46.3)	
7-8 items	67 (41.1)	24 (51.1)	12 (33.3)	31 (38.8)	0.432
≥ 9 items	26 (16)	8 (17)	6 (16.7)	12 (15)	
Crowding index					
≥ 1 person / room	47 (29)	13 (27.7)	9 (19.1)	25 (53.2)	0.745
<1 person / room	115 (71)	34 (29.6)	27 (23.5)	54 (47.0)	
Household income (Lebanese Lira)[2]					
Less than 1 million	57 (37.3)	10 (17.5)	15 (26.3)	32 (56.1)	
Between 1 and 6 million	94 (61.4)	33 (35.1)	14 (14.9)	47 (50)	0.068
More than 6 million	2 (1.3)	1 (50)	0 (0)	1 (50)	
Continuous Variables			**Mean (± SD)**		
Age (years)	37.7 (± 11.8)	36.0 (± 15.1)	39.4 (± 10.5)	37.9 (± 10.2)	0.412
Triglycerides (mg/dL)	121.2 (± 68.1)	113.8 (±62.3)	115.4 (± 53.1)	128.1 (± 76.7)	0.441
HDL (mg/dL)	58.0 (± 14.1)	59.0 (± 14.4)	57.9 (± 14.1)	57.5 (± 14.0)	0.855
LDL (mg/dL)	128.8 (± 42.3)	125.7 (±45.9)	129.2 (± 34.2)	130.3 (± 43.8)	0.837
CRP (mg/L)	4.8 (± 5.1)	4.9 (± 5.2)	4.6 (± 5.3)	4.8 (± 5.1)	0.961

Continuous variable are presented as Mean (±SD) and categorical variables are presented as frequencies n (percentages %).

Significance at p-value <0.05

P-values for categorical variables were derived from chi-squared tests.

[1] 1 value is missing

[2] 11 values are missing

The energy intake of the whole study sample (n=323), as well as the percentage of calories from each of the three macronutrients across the three levels of PA are shown in table 5. The mean of the actual energy intake is the highest among those who are in the moderate PA level category; however the difference across all three groups is not statistically significant. Participants who have the highest level of PA eat slightly more fat (mean= 36.8% of total caloric intake) and more protein (mean=15.8% of total caloric intake) than their other counterparts. However, the difference of energy intake and percentages of calories coming from carbs, proteins, and fat across levels of PA is not statistically significant.

Table 5 Energy and macronutrients intake among Lebanese adults (n=323) according to physical activity levels

Variables	Levels of Physical activity			
	Low (n=117)	Moderate (n= 64)	Vigorous (n= 142)	P-value
	Mean (± SD)			
Energy intake (Kcal/day)	2615.9 (± 940.4)	2418.6 (± 910.6)	2445.3 (± 879.3)	0.250
Protein intake (g/day)	101.7 (± 35.7)	99.3 (± 42.0)	102.4 (± 52.7)	0.747
% of calories from protein	15.6 (± 2.7)	15.7 (± 2.5)	15.8 (± 3.3)	0.940
Fat intake (g/day)	106.6 (± 42.6)	102.7 (±52.8)	109.2 (± 55.6)	0.698
% of calories from fat	36.2 (± 6.3)	35.5 (± 7.2)	36.8 (± 7.2)	0.439
Carbohydrate intake (g/day)	324.8 (± 138.8)	315.2 (± 142.9)	315.6 (± 147.5)	0.857
% of calories from carbohydrates	48.3 (± 6.7)	49.3 (± 6.9)	47.9 (± 7.1)	0.410

Significance at p-value <0.05

Table 6 shows the energy intake of males (n=159), as well as the percentage of calories from each of the three macronutrients across the three levels of PA. The difference in protein intake of the males across the three levels of PA almost reached statistical significance, while the difference in the other two macronutrients intake of the males across the three levels of PA was not significant.

Table 6 Energy and macronutrients intake among Lebanese men (n=159) according to levels of physical activity

Variables	Total (n=159)	Levels of Physical activity			
		Low (n= 70)	Moderate (n= 28)	Vigorous (n= 61)	P-value
	Mean (± SD)				
Energy intake (Kcal/day)	3068.7 (±1252.7)	2931.6 (±1059.0)	3025.7 (±1354.3)	3246.2 (± 1402.5)	0.365
Protein intake (g/day)	119.5 (± 51.1)	111.3 (± 37.8)	113.3 (± 51.5)	131.8 (± 61.7)	0.061
% Calorie intake from protein	15.8 (± 3.4)	15.6 (± 2.9)	15.1 (± 2.0)	16.4 (± 4.2)	0.184
Fat intake (g/day)	120.9 (± 54.3)	115.8 (± 43.6)	115.8 (± 59.9)	129.1 (± 62.2)	0.342
% Calorie intake from fat	35.5 (± 6.3)	35.9 (± 6.7)	34.3 (± 6.8)	35.5 (± 5.5)	0.515
Carbohydrate intake (g/day)	372.8 (± 161.6)	358.3 (± 151.5)	379.3 (± 169.2)	386.6 (± 170.5)	0.603
% Calorie intake from carbs	48.5 (± 7.0)	48.2 (± 7.0)	50.8 (± 7.3)	47.8 (± 7.0)	0.181

Significance at p-value <0.05

Table 7 shows the energy intake of the females (n=164), as well as the percentage of calories from each of the three macronutrients across the three levels of PA. The difference in energy intake and in the percentage of calorie intake from all three macronutrients across different levels of PA is not statistically significant.

Table 7 Energy and macronutrients intake among Lebanese women (n=164) according to levels of physical activity

Variables	Total (n=164)	Levels of Physical activity			
		Low (n= 47)	Moderate (n= 36)	Vigorous (n= 81)	P-value
	Mean (± SD)				
Energy (Kcal/day)	2239.3 (± 811.7)	2283.8 (± 796.4)	2239.8 (± 821.0)	2212.5 (± 825.6)	0.894
Protein intake (g/day)	86.1 (± 30.3)	87.8 (± 27.1)	88.8 (± 29.8)	83.8 (± 32.4)	0.648
% calorie intake from protein	15.6 (± 2.4)	15.7 (±2.5)	16.2 (± 2.7)	15.3 (± 2.2)	0.166
Fat intake (g/day)	93.7 (± 42.7)	93.3 (± 37.6)	92.8 (± 45.1)	94.3 (± 45.0)	0.982
% calorie intake from fat	37.1 (± 7.3)	36.6 (± 5.7)	36.4 (± 7.4)	37.8 (± 8.1)	0.546
Carbohydrate intake (g/day)	267.5 (± 99.1)	276.2 (± 101.3)	267.1 (± 96.9)	262.5 (± 99.8)	0.757
% calorie intake from carbs	48.0 (± 6.8)	48.3 (± 6.3)	48.1 (± 6.5)	47.9 (± 7.3)	0.947

Significance at p-value <0.05

The odds ratios (with 95% CI) of relevant determinants of PA derived from a multivariate logistic regression are shown in Table 8. Being older than 30 years old, being male, having higher levels of HDL and VLDL, being single, divorced, separated, or widowed, being at university, as well as being a smoker were negatively associated with being physically active. Having levels of LDL > 100 mg/dL, and high CRP levels, being in secondary or technical school, not working, looking for a job, unable to work, being a student, volunteer or retired, having a crowding index less than 1, considering oneself as being from middle or high SES, having a high BMI, consuming alcohol, having high energy consumption from fat, carbohydrates and proteins were positively associated with being physically active. However, only higher levels of LDL, higher levels of triglycerides, and being male were statistically significantly associated with being physically active (p-value < 0.05).

Table 8 Odds ratio and their 95% confidence intervals from multivariate logistic regression associating individual, social, lifestyle, blood profile, and dietary factors with physical activity (reference category is sedentary or no PA versus physically active)

Variables	OR (95% CI)
Gender	
Female	1.00
Male	**0.475 (0.235 – 0.962)**
Age (years)	
18 to 30	1.00
31 to 50	0.712 (0.333 – 1.525)
≥ 51	0.622 (0.231 – 1.673)
Triglycerides (mg/dL)	
<150	1.00
150 to 199	**0.436 (0.209 – 0.908)**
≥ 200	0.958 (0.450 – 2.042)
HDL (mg/dL)	
< 40	1.00
40 to 59	0.610 (0.302 – 1.233)
≥ 60	0.750 (0.311 – 1.809)
LDL (mg/dL)	
≤ 100	1.00
101 to 159	**2.027 (1.024 – 4.015)**
≥ 160	**2.604 (1.119 – 6.061)**
CRP (mg/L)	
< 1	1.00
1 to 3	1.214 (0.453 – 3.252)
≥ 4	1.014 (0.372 –2.761)
Marital Status	
Married	1.00
Single, divorced, separated or widowed	0.544 (0.285 – 1.039)
Education	
Complementary or less	1.00
Secondary or technical	1.560 (0.788 – 3.089)
University	0.733 (0.363 –1.482)
Work Status	
Self-employed or employee	1.00
Not working, looking for a job, unable to work, student, volunteer or retired	1.120 (0.614 – 2.043)

Table 8 (*continued*): Odds ratio and their 95% confidence intervals from multivariate logistic regression associating individual, social, lifestyle, blood profile, and dietary factors with physical activity (reference category is sedentary or no PA versus physically active)

Variables	OR (95% CI)
BMI (Kg/m^2)	
Underweight or Normal weight	1.00
Overweight	1.353 (0.731 – 2.505)
Obese	1.181 (0.574 – 2.430)
Crowding Index	
≥ 1 person / room	1.00
<1 person / room	1.116 (0.640 –1.945)
SES_SELF	
Low	1.00
Middle	1.321 (0.716 – 2.435)
High	1.459 (0.304 – 7.002)
Smoking	
No	1.00
Yes	0.837 (0.461 – 1.520)
Alcohol	
No	1.00
Yes	1.144 (0.661 – 1.978)
Energy Consumption (Kcal/d)	1 (1 – 1)
Energy consumption from Fat (%)	1.032 (0.908 – 1.172)
Energy consumption from Carbohydrates (%)	1.036 (0.913 – 1.176)
Energy consumption from Proteins (%)	1.051 (0.904 – 1.222)

Significance at p-value <0.05

CHAPTER V

DISCUSSION

A. Major Findings of the Study

This study is a secondary analysis and a cross-sectional study that aims at determining the prevalence of PA among Lebanese adults and the association of PA with its various determinants.

This study shows that out of the 323 participants who were included in this study, 117 (36.2%) were in the low PA section, 64 (19.8%) were in the moderate PA section, and 142 (44%) were in the vigorous PA section. After merging the last two categories into one section, PA is now a dichotomous variable, with 117 (36.2%) participants being considered in the ‘’no PA’’ category, and 206 (63.8%) participants being considered physically active. The results are higher than a similar study done in Lebanon in 2009 where the proportion of physically active people was 55.5% (Al-Tannir et al., 2009). However, the method of assessment of PA (asking participants if they practice any type of PA) was different to that used in this study (IPAQ). The proportion of physically active people was similar to the values reported in a Swedish cross-sectional study which showed a total of 63% (95% CI: 60.5 – 65.4) of the study population classified as either moderately or highly physically active (Bergamn et al., 2008), but was lower than the results reported in a Moroccan national cross-sectional study which showed that 83.5% of the adult population have moderate to high levels of PA (Najdi et al., 2011).

There was a statistically significant difference in gender between the three levels of PA, with the low PA section having statistically significantly more males than

females than the other two sections. This could be due to women doing more household chores, which contributed to more vigorous PA.

There was a statistically significant difference in age between male participants in the moderate level of PA and those in the vigorous level of PA, with those in the vigorous level being younger than those in the moderate level. This is in line with other studies that showed am inverse association between age and PA, like in a Moroccan cross-sectional study where PA diminishes with age in men exclusively (Najdi et al., 2011).

The odds of being physically active increase with increased levels of LDL. This could be explained by the fact that people who want to improve their blood profile, tend to follow a healthier lifestyle, therefore, start engaging more in regular PA.

The odds of being physically active decrease with increased levels of triglycerides. Usually, people who have high levels of triglycerides tend to be overweight or obese. Overweight and obese people may have lower levels of PA due to their weight status. In fact, a study conducted in 2002 showed that participants with higher body mass index (BMI) perceived more barriers to engaging in PA (Stutts, 2002). Indeed, overweight individuals may be less likely to participate in PA due to psychosocial factors such either as fear of teasing, or because they are less athletic (Weiss et al., 2007). Another reason could be that obese people could experience higher fatigue and pain when exercising due to greater oxygen cost because of their bigger weight (Poston et al., 2000). According to Williams et al., weight loss was found to be strongly associated with increases in HDL during exercise training (Williams et al., 1983). Lower levels of CRP appear also to be among participants with higher physical activity levels. This may be explained by the fact that regular exercise has the ability to

attenuate the age-associated increase in oxidative stress, which further explains the chronic anti-inflammatory effect of exercise (Stewart et al., 2005).

When it comes to energy and macronutrients intake, male participants who engage in vigorous PA have a higher energy intake than male participants who engaged in low to middle PA level. Although this difference is not statistically significant, however the fact that males engaging in high PA eat more than their other counterparts may be due to a compensatory increase in energy intake, which demonstrates the capacity of eating to undermine perturbations in energy balance (Blundell et al., 2003).

Furthermore, male participants who engage in vigorous PA have a higher protein intake compared to the other male participants. This result almost reached statistical significance. This is in line with the result of another study where it was found that physically active participants consumed a significantly greater percent energy from protein as compared to inactive participants (Jokisch et al., 2012).

Our study shows that the association between marital status and different levels of PA in Lebanese adults is statistically significant (p-value = 0.002), with married individuals in the vigorous level of PA being statistically significantly different from their other counterparts. Additionally, the logistic regression shows that the odds of being physically active in single, divorced, separated, or widowed participants is 0.5 times lower than the odds of being physically active in married participants. Prior studies have shown mixed results about which status categories are physically active. Longitudinal analyses have reported that amount of PA decreases with entry into marriage (Bell and Lee, 2006). One study reported that never married men and women expend less energy than married men and women after controlling for age, ethnicity, and socioeconomic variables (Pettee et al., 2006). Some of this difference in energy

expenditure may be due to variation in occupation across marital categories. This also suggests that marital responsibilities and obligations do not necessarily impose time demands that prevent PA, but instead busy people develop strategies for being efficient and multitasking that lead to "time management'' (Robinson and Godbey, 1997). Another study studied PA and its association with other lifestyle factors and found that being single was negatively associated with a higher PA level. In fact, one study found that having no partner was associated with a greater likelihood of engaging in regular PA (Qi et al., 2006).

The odds of being physically active in participants with secondary or technical education is almost twice the odds of being physically active in participants with a complementary education level or less. This is in line with the literature that shows increased participation in PA as educational level of participants increased. Higher educated subjects may be more aware of the relevance of PA for health (Federico et al., 2013). One recent Canadian study revealed that Canadians with post-secondary education were more likely to comply with the national recommendations for PA (Whelan et al., 2017). Furthermore, one Swedish cross-sectional study showed, in the crude analyses, that subjects belonging to the highly physically activity category were more likely to have high school education (Bergman et al., 2008). However, after adjustment for all studied socio-demographic correlates, participants with an education at college/university level were less likely to be in the high category than those with basic education. This is explained by the fact that although subjects with higher educational level might do more leisure time exercise, they may have less physically demanding occupations with the result that their overall PA is lower than for those with lower educations who may perform more physically demanding work (Bergman et al.,

2008). Another study from Italy indicated that the likelihood of adopting healthy lifestyles, such as participation in PA, were positively associated with education level (Glorioso & Pisati, 2014).

In our study, the odds of being physically active decreases with being male (OR = 0.475, 95% CI = 0.235 – 0.962) compared to being female. A similar result was seen in a study that investigated the division of housework among various couples and within different European countries. Indeed, the study reported higher level of leisure-time physical activity among women (Fahlén et al., 2016). The author reported that this result might be explained by household chores, which are more commonly taken up by women.

B. Strengths and Limitations of the Study

1. Strengths

The several strengths of this study need to be mentioned. First, data on PA and dietary intake were collected using questionnaires that have been tested and validated before use. Moreover, data collection was performed by well-trained interviewers, in order to avoid interviewer bias as much as possible. Second, this cross-sectional study uses the IPAQ to assess PA. IPAQ takes into consideration all four domains of PA. Therefore, this can lead to different results than when accounting only for a specific area. Indeed, when examining PA across all activities, lower-SES people spend more time in PA than higher-SES individuals. However, when studies exclusively assess leisure-time PA, results show that higher-SES people engage more in PA (Cusatis & Garbarski, 2019). Third, this study is a secondary analysis of another national cross-sectional study that covered the six governates in Lebanon.

2. Limitations

This study is a cross-sectional study, which means it can show association between variables, but one cannot infer causality. However, cross-sectional studies can reveal relationships that may exist between different variables, and can generate new hypothesis for future research (Mann, 2003).

Furthermore, a sub sample of 323 participants, who have given blood, has been drawn out of the original sample. In order to be more representative, the sample size should have been larger.

Concerning data collection, the FFQ method has limitations which were mentioned in the methodology section. The completion of the FFQ by the participants may have imposed difficulties in remembering food consumed and estimating portion sizes. Some people tend to underreport due to social desirability (Yu & Tse, 2012).

Self-reported PA such as questionnaires and structured interviews has been the subject of over-reporting. This is why objective tools for the measurements of PA may be better choices to capture total energy expenditure (Livingstone, 2003), and minimize recall bias (Hallal et al., 2010). However, these methods are expensive and costly especially if they are used in large studies.

CHAPTER VI

CONCLUSION

The present study is a national cross-sectional study that highlights the association between the determinants of PA and the different PA levels in Lebanese adults, which could provide guidance for improving participation in PA in Lebanon. Research in the field of PA is constantly evolving because its correlates are complex. In the past twenty years, many new factors have been identified as determinants of PA some of which being SES and demographic correlates. Additionally, the study of the different correlates could shed some light on some possible ways of intervention (Sallis et al., 2000). In order to examine the causal effect, longitudinal studies need to be conducted to understand what predicts changes in PA (Koeneman et al., 2011). Therefore, and in light of the results, recommendations could be provided to enhance PA among Lebanese adult population. Indeed, acknowledging how different PA correlates can affect its participation is crucial in individualizing intervention programs aimed at satisfying each category's PA requirements.

APPENDIX I

Levels of physical according to IPAQ

Levels of Physical Activity	Description
Low	No activity is reported, or some activities are recorded but not enough to meet the level of high or moderate PA
Moderate	• Three or more days of vigorous activity of at least 20 min/day • Five or more days of moderate intensity activity and/or walking for at least 30 min/day • Five or more days of any combination of walking, moderate or vigorous intensity activities achieving a minimum of at least 600 MET min/week
High	• Vigorous intensity activity on at least three days and accumulating at least 1500 MET min/week • Seven or more days of any combination of walking, moderate or vigorous intensity activities accumulating at least 3000 MET min/week

Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ)

APPENDIX II

موافقة للإشتراك في البحث العلمي
استبيان مسح سلوكيات وعوامل الخطورة
للأمراض غير السارية في لبنان
(الفئة العمرية 18 سنة وما فوق)

الأشخاص اللذين سوف يجيبون على الإستمارة ويتم أخذ عينة دم منهم

إسم الباحث:الدكتورة عبله محيو السباعي
عنوان البحث: : الجامعة الأميركية في بيروت
تلفون: 350000 -01 المقسم 4640
مكان إجراء البحث: منزل المشترك في الدراسة.

أنت مدعو(ة) للمشاركة ببحث أكاديمي يجرى من قبل فريق في الجامعة الأميريكية في بيروت . الرجاء أن تأخذ(ي) الوقت الكافي لقراءة المعلومات التالية قبل أن تقرر(ي) إذا كنت تريد(ين) المشاركة أم لا. بإمكانك طلب إيضاحات أو معلومات إضافية عن أي شيء مذكور في هذه الإستمارة أو عن هذه الدراسة ككل من الباحث المذكور اسمه أعلاه أو من الشخص الذي يحمل الاستمارة.

يقوم فريق من الجامعة الأميريكية في بيروت بدراسة صحية حول إنتشار الأمراض المزمنة في لبنان والتي سوف تضم 2900 شخص: 2000 راشد، من بينهم 500 سوف يؤخذ منهم عينة من الدم للإطلاع على مستوى السكري و الدهنيات كما انه سوف يتم أخذ ضغطهم، وزنهم و طولهم، وقياس محيط الخصر والورك وسمك الجلد، كما سوف يتم مقابلة 900 قاصر. كما أن الدراسة سوف تتضمن إجراء مقابلة تلفونية من خلال الخليوي ل500 شخص منتقين عشوائيا من ال2000 راشد الذين كنا قد أجرينا المقابلة معهم. الهدف من هذه الدراسة جمع المعلومات حول نسبة تفشي الأمراض المزمنة في لبنان وعلاقتها ببعض السلوكيات ومقارنة الأجوبة بين المقابلة المنزلية والمقابلة الخليوية. المعلومات المجموعة من هذه الدراسة سوف تساعد الأطباء والعاملون في الحقل الصحي على تثقيف المرضى بشأن بعض الأمراض والسلوكيات استنادا على حقائق علمية. كما أن بعض المعلومات قد تؤثر إيجابياً على السياسة الصحية في لبنان. كما أنها سوف تمكن معرفة مدى صحة المعلومات الصحية الماخوذة عبر الخليوي.

إن المعلومات لهذه الدراسة ستجمع من خلال:

1- الإجابة على استمارة تتضمن معلومات حول صحتك.
2- قياس الوزن والطول و سمك الجلد و ضغط الدم.
3- أخذ عينة من الدم لقياس مستوى السكري والدهنيات.

نفيدك علماً بأن ليس هناك أي خطورة بالاشتراك بهذه الدراسة بإستثناء الوخز البسيط خلال سحب الدم، وأن كل المعلومات الواردة في هذه الاستمارة سيتم التعامل معها بسرية تامة، و لن تستعمل إلا لغاية علمية بحتة. يمكنك الاختيار بعدم المشاركة، ولك الحق بالرجوع، أو التوقف

في أي وقت دون أي تأثير سلبي عليك. إذا حصل أي عارض سلبي من جراء المشاركة في هذه الدراسة، لن يكون هناك اي تعويضات مالية لتغطية التكاليف في حال لم تغطيها شركات التأمين الطبي او الإستشفائي او أي برامج حكومية. إن المقابلة سوف تدوم حوالي 45 دقيقة وسوف يتم خلالها قياس ضغط الدم والوزن والطول وقياس محيط الخصر والورك و و قياس نسبة الدهون في الجسم بواسطة ألة خاصة تحمل في اليد. هذا الفحص سريع وغير مؤلم وهو يستغرق 5 دقائق فقط على الأكثر.سحب الدم سيتم إذا كنت لم تأكل(ي) شيئا خلال ال8 ساعات الماضية. في حال لم تكن صائماً سوف نأتي في الغد لأخذ العينة. إن ممرضة مجازة سوف تأخذ عينة من الدم لا تتجاوز ال10 ml بعد تطهير المنطقة جيداً.

لن تحصل (ي) على أي مدخول مادي لقاء الأشتراك في الدراسة ولكن سوف نعلمك بنتائج الفحوصات في حال أردت ذلك. إذا أردت الحصول على نتائج هذه الدراسة يمكنك طلب ذلك المسؤول عن الدراسة.
في حال وافقت على المشاركة في هذه الدراسة، سيبقى إسمك طي الكتمان . لن يكون لأي شخص حق الإطلاع على المعلومات باستثناء المسؤول عن الدراسة ومعاونيه ولجنة الأخلاق الطبية.

موافقة الباحث:

لقد شرحت بالتفصيل للمشترك في البحث الطبي ل_____ (اسم المشترك) طبيعته ومجرياته. ولقد أجبت على كل أسئلته بوضوح على خير ما أستطيع. وسوف أعلم المشترك بأي تغييرات في مجريات هذا البحث في حال حصولها أثناء البحث.

_____ _____

إسم الباحث او الشخص المولى الحصول على موافقة المشترك

توقيع الباحث او الشخص المولى الحصول على موافقة المشترك

_____

التاريخ

موافقة المشترك:

لقد قرأت استمارة القبول هذه وفهمت مضمونها. تمت الأجابة على أسئلتي جميعها. وبناء عليه فأنني، حرا مختارا، أجيز إجراء هذه المقابلة وأوافق على الإشتراك في البحث، وإني أعلم ان الباحثة الدكتورة عبله محيو السباعي ومعاونيها سيكونون مستعدين للإجابة على أسئلتي، وأنه باستطاعتي الإتصال بهم على الهاتف 350000 -01المقسم4640 . واذا شعرت لاحقا ان الأجوبة تحتاج الى مزيد من الإيضاح فسوف أتصل بأحد اعضاء لجنة الأخلاقيات د. ابراهيم سلطي (01-350000 المقسم 4911). كما أعرف تمام المعرفة بانني حر في الإنسحاب من هذه المقابلة متى شئت حتى بعد التوقيع على الموافقة دون ان يؤثر ذلك على العناية الطبية المقدمة لي.

_____ _____

_____

إسم المشترك توقيع المشترك

التاريخ (بيد المشترك)

إسم الشاهد (إذا كان المشترك أميا) توقيع الشاهد

التاريخ

نشكر لكم تعاونكم على انجاح هذه الدراسة

APPENDIX III

FOOD FREQUENCY QUESTIONNAIRE

Think about your eating patterns during the past year while answering this questionnaire. Please indicate your usual intake of each of the following food items per Day, Week, or Month.
For example: Apple. If you consume 3 apples daily, write 3 in the "Day" column, if you think you average 3 apples a week over the year, write 3 in the "Week" column. However, if you rarely consume a food, let's say once or twice a year, then tick below "Rarely/Never".
Please be precise as much as you can.
Remember! The accuracy of the study results depends on the accuracy of your answers.

Food item	Serving size	Day	Week	Month	Rarely / Never
Example: Apple	1 item		3		
Bread and Cereals					
White bread (1 slice) .1	1 slice (30g)				
Brown or whole wheat bread .2	1 slice				
Breakfast cereals, regular/ bran .3	1 cup				
Rice, white, cooked .4	1 cup				
Pasta, plain, cooked .5	1 cup				
Wheat, whole, cooked / Bulgur .6	1 cup				
Dairy products					
Low-fat milk (2% fat) .7	1 cup				
Whole fat milk .8	1 cup				
Fat free / low fat yogurt .9	1 cup				
Whole fat yogurt .10	1 cup				
Cheese regular .11	1 slice (30g)				

Cheese low fat .12	1 slice (30g)				
Labneh .13	2 Tbsp				
Fruits & Juices					
Citrus Orange (1 item) / Grapefruit (1/2 item) .14	1 serving				
Deep Yellow or orange (Peach, plums, etc...) .15	1 item				
Strawberry .16	1 cup				
Grapes .17	1 cup				
Others: Banana, medium /Apple, fresh, small .18	1 item				
Dried fruits: raisins (2 Tbsp), dates (2), apricots (4) .19	1 serving				
Fresh fruit juice .20	1 cup				
Fruit drinks: canned/bottled .21	1 cup				
Vegetables					
Salad – green: lettuce, celery, green peppers, cucumber .22	1 cup				
Dark green or deep yellow vegetables (e.g.: spinach, .23	1 cup				
Tomatoes, fresh, medium .24	1 item				
Corn / green peas, cooked .25	1 cup				
potato, baked / boiled / mashed .26	1 item				
Squash, summer (kussa), Eggplant /cooked .27	1 cup				
Cauliflower/ Cabbage/ broccoli .28	1 cup				
Meat & Alternates	**Serving size**	**Day**	**Week**	**Month**	**Rarely / Never**
Legumes: lentils, broad beans, chickpeas, etc., cooked .29	1 cup				
Nuts and seeds: peanuts, almonds, sunflower seeds, etc. .30	1 cup				
Red Meat .31	1 item (3 oz.)				
Poultry .32	1 item (3 oz.)				
Fish, (including Tuna) .33	1 serving (3 oz.)				
Eggs, whole, large .34	1 item				
Organ Meats(Liver, kidneys, brain) .35	1 cup				
Luncheon meats: Mortadell, Jambon, salami, turkey, etc. .36	1 slice (20g)				
Sausages, makanek, hot dogs .37	1 item (30g)				
Fats and oils					
Oil: corn / sunflower / soy/olive .38	1 Tbsp				
Olives .39	1 item				
Butter/ghee .40	1 Tbsp				
Mayonnaise .41	1 Tbsp				
Sweets &Desserts					
Cake, Cookies ,Donut, muffin, croissant .42	1 item				

Ice cream .43	1 cup				
Chocolate bar .44	1 item				
Sugar, , honey, jam, molasses .45	1 Tbsp				
Arabic sweets, baklawa, maamoul, Knefeh .46	1 item (40g)				
Beverages					
Soft drinks, regular (1 can = 1½ cup) .47	1½ cup (11 fl. oz)				
Soft drinks, diet (1 can = 1½ cup) .48	1½ cup (11 fl. oz)				
Turkish coffee (1 small cup = ¼ cup) .49	¼ cup (2 fl oz)				
Coffee/Nescafe or tea .50	1 cup				
Hot chocolate or cocoa .51	1 cup				
Beer, regular (1 can = 1½ cup) .52	1½ cup				
Wine: red, white, or blush .53	½ cup (4 fl. oz)				
Liquor: whiskey, vodka, gin, rum .54	1/6 cup (1.5 fl oz.)				
Miscellaneous					
Manaeesh, zaatar, cheese **.55**	1 large				
French fries **.56**	1 cup				
Chips: potato, corn, tortilla **.57**	1 cup				
Falafel sandwich, medium **.58**	1 item				
Chawarma sandwich, medium **.59**	1 item				
Burgers(Beef, chicken, fish) **.60**	1 item				
Pizza **.61**	1 slice				

Are there any other foods not mentioned above that you usually eat at least once per week?

Other foods that you usually eat at least once /week	Usual serving size	Servings/week

APPENDIX IV

Socioeconomic and Dietary Determinants of Obesity in Lebanon

Household and adult Questionnaire

Family Number	----------
Governate	1. Beirut 2. Mount Lebanon 3. North 4. South 5. Bekaa 6. Nabatiyeh
Caza	
Region	
District	
Block Number	
Cluster Number	
Telephone Number	

	1st Visit	2nd Visit	Last Visit
Date:			
Result:			Total Number-----

Name of the interviewer:---------- Signature:----------

HOUSEHOLD INFORMATION:

a-Your House is:
1) Family's property
2) My property
3) Rented
4) A relative's/friend's property
5) I don't know
6) No answer

b- How many rooms are there in your house other than the kitchen, the bathroom, the parking, the open air balcony?

1) Number: ----------
2) No answer

c- Number of cars owned by the family:

0) Don't own a car
1) 1 car
2) 2 cars
3) 3 cars
4) 4 cars
5) More than 4 cars
6) Don't Know
7) No answer

d- Is there a servant who sleeps in your house?

1) No
2) Yes
3) No answer

e- Does the family have?

	Yes	No	No answer
Refrigerator			
Washing Machine			
Oven			
Television			
AC			
Video			
Computer			

Family members

f- Who is the head of the family? ----------

g- Total Family members number who usually sleep in this house (including married and those traveling): ---------- (number)

	HR_NAM	HR_RELHH	HR_SEX	HR_AGE	HR_EDU	HR_OCC	HR_MS	Cell
	Name	**Relation with to head of family** 1. Head of family 2. Husband/Wife 3. Son/ daughter 4. Son's wife/ Daughter's husband 5. Grandson/ Granddaughter 6. Father/ Mother 7. father / mother in law 8. Brother/ Sister 9. Sister/ brother in law 10. Grandmother/ Grandfather 11. Nephew/ niece 12. Other relatives 13. Others/ Not relatives	**Gender** 1. Male 2. Female	**Age** Write 0 for children younger than 1 year old	**Level of education** 1. Illiterate 2. Reads & Writes 3. Elementary school 4. Middle School 5-.High School 6.Baccalaureat 7. Higher Education 8. Doesn't know 9. Refuses to answer	**Occupation** 0. Doesn't work 1. Governmental employee 2. Nongovernmental employee 3. Self-employed 4. Voluntary worker (no paycheck) 5. Student 6. Retired 7. Unemployed (able to work) 8. Unemployed (unable to work) 9. Refuses to answer	**Marital Status** 1. Single 2. Married 3. Divorced 4. Separated 5. Widowed 6. Refuses to answer	**Does he have a cell** 1. No 2. Yes
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								

This table is for choosing the person (s) involved in this study:

Number of members in the family having 5 years old and more															
The first number of the family in the	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
0	1	1	1	1	3	3	2	8	3	9	3	11	12	3	5
1	1	1	2	1	4	2	1	2	5	1	8	4	1	14	7
2	1	1	3	4	1	1	4	5	5	3	6	1	2	9	11
3	1	2	2	2	2	5	7	3	7	5	9	2	3	7	15
4	1	1	1	3	1	6	1	6	1	10	8	9	7	11	1
5	1	1	2	2	4	5	1	1	9	6	6	1	5	1	4
6	1	1	2	4	2	4	4	7	9	2	8	6	4	10	13
7	1	1	2	4	2	1	1	5	6	6	5	12	9	5	11
8	1	2	2	4	1	4	4	6	7	6	9	4	8	2	12
9	1	2	3	2	1	3	4	8	7	10	3	6	4	6	7

For the interviewer:

In the first column, circle the number corresponding to the first number of the family; for example, if the number of the family is 5011, then circle the number 1.
In the first row, circle the number of family members, for example 7.
The point of intersection is the number of person asked for the research; for example7 and 5=>1. If the person is not present, you can choose the number that is below.

Name of the person involved in the study (18 +): ----------

Name of the person involved in the study (< 18): ----------

ADULT QUESTIONNAIRE (18+)

Family Number----------

Individual Number----------

1. PERSONAL INFORMATION

1.0- Name of the person: ----------

1.1- Sex: 1) Male
2) Female

1.2- Date of Birth (Day/Month/Year): ----------

1.3- Age in years: ----------

1.4- Educational Level; what is the highest educational level that you got?

1) Illiterate
2) Reads and Writes
3) Elementary School
4) Middle school
5) High School
6) Technical Diploma
7) Bachelor
8) Higher education (MSc., PhD)
9) don't know
10) Refused to answer

1.5- Marital Status:

1) Single
2) Married
3) Divorced
4) Separated
5) Widowed
6) Refused to answer

1.6- Occupation:

1) Not Working (housewife)
2) Governmental employee
3) Nongovernmental employee
4) Self- employed
5) Volunteer worker
6) Student
7) Retired
8) Unemployed (can work)
9) Unemployed (can't work)
10) Refuse to answer

1.7- How do you rank your living status?

1) Low
2) Medium
3) High

2. SMOKING:

2.1- Do you smoke or used to smoke cigarettes?

1) No, I never smoked
2) Yes, I currently do
3) I used to smoke and I stopped
4) Refuses to answer

If the answer to question 2.1 is:

- *"I used to smoke and I stopped", continue to the next question.*
- *"Yes, I currently do", go to question 2.4*
- *"No" or "no answer", go to question 2.9.*

2.2- When did you stop smoking? *(Write only one answer)*

1) Number of years: ----------
2) Number of month: ----------
3) Number of weeks: ----------

2.3- What is the reason that made you quit smoking? *(You can choose more than one answer)*

	Yes	No
Health reason/ disease		
Medical advice		
Family advice		
Financial reason		
Other reasons, please state		

2.4- How old were you when you started smoking?

1) Age in years:----------
2) Don't remember
3) Refused to answer

2.5- How many cigarettes do you smoke/ used to smoke daily? Please specify

1) Number of cigarettes----------
2) I don't know
3) Refused to answer

2.6- Have you ever thought of quiting smoking?

1) Yes

2) No

3) Don't know

4) Refused to answer

2.7- Does any of your parents smoke?

1) Yes

2) No

3) Don't know/not sure

4) Refuse to answer

2.8- If the answer above is yes, who's the smoker?

1) The father
2) The mother
3) Both
4) I don't know
5) Refused to answer

SMOKING/ARGUILEH:

2.9- Do you currently smoke arguileh?

1) Yes

2) No

3) Refused to answer

If the answer is "Yes", continue to the next question
If the answer in "No", or "Refuse to answer", go to Part 3 page 7(Alcohol consumption)

2.10- How often do you smoke arguileh?

1) Daily

2) Once or more per week

3) Once or more per month

4) Occasionally

5) Don't know

6) Refused to answer

2.11- How old were you when started smoking arguileh?

1) Age in years ----------

2) Don't know/don't recall

3) Refused to answer

2.12- How many "arguileh" did you smoke last month?

1) Number: ----------

2) Don't know/recall

3) Refuses to answer

2.13- Where do you usually smoke arguileh? *(You can choose more than one answer)*

	Yes	No
At home		
At a restaurant/ Coffee shop		
At a friend's place		
Other places	specify	

3. ALCOHOL CONSUMPTION:

3.1- Have you ever had an alcoholic beverage such as Beer, wine, whisky, etc., in the past 12 months?

1) Yes

2) No

3) Don't recall/not sure

4) Refused to answer

- *If the answer is other than "Yes" continue to the next question*
- *If the answer is no, don't know or refused to answer go to section 4(Dietary Habits) page 8.*

3.2- In average, how many days per week do you drink alcoholic beverages?

1) Only in occasions
2) Less than once per week
3) 1-2 times/week
4) 3-4 times per week
5) 5-6 times per week
6) Daily
7) Don't know
8) Refused to answer

3.3- When you drink alcohol: In average, how many glasses will you drink?

1) Quantity at one time----------
2) Don't know
3) Refused to answer

4. DIETARY HABITS AND PERCEPTIONS

4.1- Do you usually eat breakfast?

1) Never
2) Sometimes: times per week ----------
3) Regularly every day
4)

4.2- Do you eat lunch?

1) Never
2) Sometimes: times per weeks ----------
3) Regularly every day
4)

4.3- Do you eat dinner?

1) Never
2) Sometimes: times per weeks ----------
3) Regularly every day

4.4- Do you eat small snacks (chips, chocolate, fruits…) between main meals?

1) Never (go to question "f")
2) Sometimes: times per weeks ----------
3) Regularly every day

4.5- If the answer is "Yes", how many snacks do you eat daily?

1) 1
2) 2
3) 3
4) 4
5) More than 4 times, specify ----------

4.6- Do you eat while watching Television?

1) I don't watch Television
2) Never
3) Sometimes, days per week_____
4) Most of the times

4.7- In average, how many times per week will you eat outside your house?

1) Never
2) 1
3) 2
4) 3
5) More than 3 times, specify ----------

4.8- Do you use any kind of vitamins such as Vitamin A, B, D …?

1) Yes
2) No

4.9- Do you use any kind of minerals such as Calcium, Magnesium ...?

1) Yes
2) No

4.10- Do you use any kind of medication on regular basis?

1. Yes, specify ----------

   ----

2. No

4.11- How would you describe your body?

1) Very thin
2) Thin
3) Normal/Average
4) Overweight
5) very fat

4.12- Concerning your weight, what is the approach you follow?

1) I try to lose weight
2) I try to gain weight

3) I try to maintain my weight

4) No specific approach

4.13- Over the last 7 days, what was the method you used to lose weight, maintain your weight or to gain weight?

1) Didn't try to lose ,maintain , or gain weight

2) Followed a diet

3) Exercised

4) Exercised & changed my eating habits

5) Used other ways than Dieting or Exercising , specify: ----------

---

4.15- In the past 7 days did you did you

1) Take medication to reduce your appetite or weight

2) Take medication to increase your appetite or weight

3) Didn't take any medication to change my weight

4.16- Did you do any surgical procedure to lose weight?

1) yes

2) No

3) Don't know

4) Refused to answer

5. PHYSICAL ACTIVITY (IPAQ)

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at

work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.
Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

5.1- <u>During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling?</u>

1) Number of days: ----------

2) No vigorous activities

❖ *If your answer was "No Vigorous activities", then skip to question 5.3.*

5.2- <u>How much time did you usually spend doing vigorous physical activities on one of those days?</u>

1) Hours per day: ----------

2) Minutes per day: ----------

3) Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

5.3- <u>During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.</u>

1) Days per week: ----------

2) No moderate physical activities

❖ *If your answer was "No moderate physical activity", then skip to question 5.5.*

5.4- <u>How much time did you usually spend doing moderate physical activities on one of those days?</u>

1) Hours per day: ----------

2) Minutes per day: ----------

3) Don't know/not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.

5.5- <u>During the last 7 days, on how many days did you walk for at least 10 minutes at a time?</u>

1) Days per week: ----------

2) No walking

❖ *If the answer of your questions was "No walking", the skip to question 5.7.*

5.6- <u>How much time did you usually spend walking on one of those days?</u>

1) Hours per day: ----------

2) Minutes per day: ----------

3) Don't know/not sure

Think about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

5.7- <u>During the last 7 days, how much time did you spend sitting on a week day?</u>

1) Hours per day: ----------

2) Minutes per day: ----------

3) Don't know/ not sure

6. HEALTH STATUS:

6.1- Do you suffer from any health problem?

1) Yes, specify-------
2) No

6.2- In general, how would you evaluate your health now? Is it:

1) Excellent
2) Very good
3) Good
4) Acceptable
5) Weak
6) Do not know/not sure
7) Refused to answer

6.3- During the last month, how many days you were in a bad physical health status? (Ex; injuries)

1) Number of days: ----------
2) Never
3) Don't know
4) Refused to answer

6.4- During the last month, how many days were you in a bad psychological status and that includes psychological pressures, depression and bad mood?

1) Number of days: ----------
2) Never
3) Don't know
4) Refused to answer

- *If the answer of the questions 6.3 and 6.4 was "1 day and more…" then continue to the next question.*
- *If the answer of the questions 6.3 and 6.4 was "Never", "Don't know" or "Refuse to answer", then skip to sec7 "Changing Behavior"*

6.5- During the last 30 days, how many days did your bad health and psychological status prevented you from performing your regular activities? (House chores, studying, working…….)

1) Number of days: ----------
2) Never
3) Don't Know
4) Refused to answer

7. Family history of chronic diseases

7.1-Does any of your family members or relatives suffer from cardiovascular problems?
1) Yes
2) No
3) Don't know
4) Refused to answer

7.2-Does any of your family members or relatives suffer from high blood pressure?
1) Yes
2) No
3) Don't know
4) Refused to answer

7.3-Does any of your family members or relatives have diabetes?
1) Yes
2) No
3) Don't know
4) Refused to answer

7.4-Is any of your family members or relatives overweight or obese?
1) Yes
2) No
3) Don't know
4) Refused to answer

7.5--Does any of your family members or relatives suffer from any other chronic diseases?

1) Yes, specify----------
2) No
3) Don’t know
4) Refused to answer

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