AMERICAN UNIVERSITY OF BEIRUT

ASSESSEMENT OF DIETARY AND DRUG ADHERENCE AMONGST CARDIOVASCULAR DISEASE PATIENTS ADMITTED FOR HOSPITALIZATION IN LEBANON

by
MELODIE JOSEPH AL DACCACHE

A thesis
submitted in partial fulfillment of the requirements
for the degree of Master of Sciences
to the Department of Nutrition and Food Sciences
of the Faculty of Agricultural and Food Sciences
jointly with the Faculty of Health Sciences
at the American University of Beirut

Beirut, Lebanon
June 2021

AMERICAN UNIVERSITY OF BEIRUT

ASSESSEMENT OF DIETARY AND DRUG ADHERENCE AMONGST CARDIOVASCULAR DISEASE PATIENTS ADMITTED FOR HOSPITALIZATION IN LEBANON

by

MELODIE AL DACCACHE

Approved by:

Dr. Lara Nasreddine, Assistant Professor — Advisor
Nutrition and Food Sciences

Dr. Abla Sibai, Dean and Professor — Member of Committee
Epidemiology and Population Health

Dr. Hussain Ismail, Assistant Professor — Member of Committee
Internal Medicine, Cardiology

Dr. Kamal Badr, Professor — Member of Committee
Internal Medicine, Nephrology and Hypertension

Dr. Laila Al-Shaar, Assistant Professor — Member of Committee
Public Health Sciences

Date of thesis defense: June 10, 2021

AMERICAN UNIVERSITY OF BEIRUT

THESIS RELEASE FORM

Student Name: ___Al Daccache_____Melodie_____Joseph_____
Last First Middle

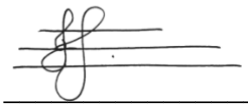
I authorize the American University of Beirut, to: (a) reproduce hard or electronic copies of my thesis; (b) include such copies in the archives and digital repositories of the University; and (c) make freely available such copies to third parties for research or educational purposes:

☐ As of the date of submission

☐ One year from the date of submission of my thesis.

☐ Two years from the date of submission of my thesis.

☒ Three years from the date of submission of my thesis.



_____30 June 2021___

Signature Date

ACKNOWLEDGEMENTS

My sincerest gratitude for each and every member of my family and friends for their endless support and love.

A special thanks to my adviser Dr. Lara Nasreddine for her guidance and expertise in this field. Her continuous support and professional remarks were constructive and essential to the success of my thesis.

Appreciation to Dr. Laila Al Shaar's support, time and useful guidance in my thesis's statistical analysis part.

Thank you, my committee members Dean Abla Sibai, Dr. Kamal Badr, and Dr. Hussain Ismael for the valuable suggestions, critical reviews and continuous encouragement.

It was a privilege for me to work with each and every member of my committee.

Last but not least, I would like to thank the vascular medicine program (VMP) at AUB for making this work happen.

My faith remains strong in my eternal being due to being surrounded by endless and countless blessings & Love.

ABSTRACT
OF THE THESIS OF

Melodie Joseph Al Daccache for Master of Public Health
Major: Public Health Nutrition

Title: Assessment of Dietary, and Drug Adherence amongst Cardiovascular Disease Patients Admitted for Hospitalization in Lebanon

Background: CVD is increasing at an alarming rate worldwide, reaching epidemic proportions in countries of the Eastern Mediterranean Region, including Lebanon. Despite the growing proportions of patients suffering from CVDs, there is a scarcity of data on whether these patients adhere to therapeutic dietary guidelines, drug prescriptions and physical activity recommendations and whether such adherence differs according to demographic, socioeconomic, lifestyle, behavioral or psychosocial characteristics.

Objectives: This study aims to assess adherence to dietary guidelines, drug regimens and physical activity recommendations amongst CVD patients admitted for hospitalization in Lebanon, as well as to describe their demographic, socioeconomic, lifestyle, behavioral, and psychosocial characteristics and investigate the association of these characteristics with dietary, drug and physical activity adherence in the study population.

Methods: A cross-sectional study was conducted among 367 Lebanese adult CVD patients admitted for hospitalization at various hospital sites in Lebanon (AUBMC, AWH, LMC, and CHN). Patients were interviewed to collect information on demographic, socioeconomic, lifestyle, psychosocial, and behavioral characteristics. Dietary assessment was performed using a culture-specific validated food frequency questionnaire, and physical activity (PA) levels were assessed using the international physical activity questionnaire (IPAQ). Anthropometric measurements, blood pressure, and biochemical markers were collected from the patient's medical charts. Mental well-being was assessed based on the World Health Organization 5 items well-being index (WHO-5) and drug adherence was assessed using the 8 items Morisky medication adherence scale (MMAS-8). The median and IQR were reported for continuous variables and frequencies and percentages for categorical variables. Regression analyses were used to investigate associations between variables.

Results: The majority of the patients were males (67.8%), overweight or obese (74%), smokers (62.1%), unemployed or retired (54.5%) and previously diagnosed with high

blood pressure (61%). Almost 35% of the patients were found to be lonely and nearly one in four patients (26%) were at a high risk of poor mental health. Approximately two-thirds of the patients were found to have poor adherence to drug prescriptions (69%), and close to half had low levels of PA (52%). In this study sample, poor dietary adherence was estimated at almost 43% for the American Heart Association (AHA) dietary guidelines and 45% for the Therapeutic Lifestyle Changes (TLC) diet. Loneliness was significantly associated with lower odds of drug adherence (OR= 0.4, 95% CI: 0.21-0.8), while patient's admission to hospitals other than AUBMC as well as patient's perception of having high-income status were significantly associated with higher odds of adherence compared to patients who perceived to have low-income status (OR= 40.7, 95% CI: 11.35-146 and OR= 3.08, 95% CI: 1.1-8.7). A lower sense of well-being was associated with lower odds of adherence to the AHA dietary recommendations (OR=0.2, 95% CI: 0.067-0.69), while overweight and obesity were associated with higher odds of diet adherence (OR=5.9; 95% CI: 1.4-25.9), reflecting potential reverse causality bias. Owning a house was a significant predictor of adherence to the TLC diet (OR=2.86, 95% CI: 1.1-7.48). Finally, female gender and high levels of loneliness were inversely associated with high PA (OR=0.38, 95% CI: 0.23-0.66; and OR=0.5, 95% CI: 0.31-0.8).

Conclusion: This study showed that dietary and drug adherence rates were low in this patient population and that close to half did not follow the PA recommendations. Importantly, the study identified several demographics, socioeconomic, and psychosocial characteristics that may affect the patients' adherence to diet, drug and PA recommendations. These findings may serve as the basis for future interventions aimed at enhancing adherence amongst CVD patients and thus improving their health status and quality of life.

TABLE OF CONTENTS

ILLUSTRATIONS

Figure

TABLES

Table

ABBREVIATIONS

ACS	Acute Coronary Syndrome
AHA	American Heart Association
AUB	American University of Beirut
AUBMC	American University of Beirut Medical Center
AWZ	Ain Wazain Hospital
BMI	Body Mass Index
BUN	Blood Urea Nitrogen
C.I.	Crowding Index
CAD	Coronary Artery Disease
CHD	Coronary Heart Disease
CHN	Centre Hospitalier du Nord
CVD	Cardiovascular Diseases
DBP	Diastolic Blood Pressure
DT2M	Diabetes Mellitus Type II
eGFR	Estimated Glomerular Filtration Rate
FFQ	Food Frequency Questionnaire
GI	Glycemic Index
HbA1c	Glycated Hemoglobin
HBP	High Blood Pressure
HDL	High Density Lipoproteins
HF	Heart Failure
HTN	Hypertension

IPAQ	International Physical Activity Questionnaire
LDL	Low Density Lipoproteins
LMC	Labib Medical Center
LMICs	Low Middle Income Countries
MENA	Middle East and North Africa
METs	Metabolic Equivalents
MI	Myocardial Infraction
MMAS	Morisky Medication Adherence Scale
MUFA	Monounsaturated Fatty Acids
NCD	Non-communicable diseases
PA	Physical Activity
PUFA	Polyunsaturated Fatty Acids
SBP	Systolic Blood Pressure
SFA	Saturated Fatty Acids
TC	Total Cholesterol
TG	Triglyceride
TLC	Therapeutic Lifestyle Change
WC	Waist Circumference
WHO	World Health Organization

CHAPTER I

INTRODUCTION

The prevalence of non-communicable diseases (NCDs) is rapidly escalating worldwide, with a particular increase in low and middle-income countries (Virani et al., 2020). More specifically, cardiovascular diseases (CVDs) are considered the leading cause of mortality, contributing to an estimated 31% of death globally (Virani et al., 2020; World Health Organization, 2018a). In Lebanon, NCDs are estimated to account for 91% of all deaths, from which 47% are attributed to CVDs (World Health Organization, 2018a). According to the World Health Organization (WHO), the age-adjusted death rate from coronary heart disease (CHD) reached 214.24 per 100,000 people in Lebanon, ranking the country in the 20th place worldwide (World Life Expectancy, 2016).

The etiology of cardiovascular disease involves a complex interplay between genetic predisposition and environmental factors that increase the risk of the disease. Lifestyle and behavioral risk factors are amongst the leading modifiable risk factors that can modulate the development and progression of CVDs (Rippe, 2019). Lebanon, like other countries of the Eastern Mediterranean region (EMR), is currently witnessing the nutrition transition with its characteristic shifts in diet, lifestyle and body composition (Abla Mehio Sibai et al., 2010). Amongst other environmental and behavioral risk factors, physical inactivity, and the shift from the traditional diet to an energy-dense diet rich in sugar, fat and animal-based products may explain the increasing burden of CVDs in Lebanon (Abla Mehio Sibai et al., 2010). An energy-dense diet can induce excessive weight gain, leading to increases in blood glucose and triglyceride levels, coupled with

decreases in HDL-cholesterol, and increases in blood pressure and inflammatory markers (Wozniak, Krótki, Anyzewska, Górnicka, & Wawrzyniak, 2017). Hence, in addition to medications adherence, therapeutic dietary strategies represent an integral component of the treatment of patients with CVDs (Arnett et al., 2019). Lifestyle strategies including regular physical activity, decreasing sedentary time and smoking abstinence are also crucial for the treatment of CVDs (Buttar, Li, & Ravi, 2005).

Studies investigating dietary intakes and lifestyle characteristics of subjects with CVDs are scarce at the international, regional and national levels. There is also a lack of scientific evidence on whether patients with CVDs adhere to therapeutic dietary guidelines, drug prescriptions and physical activity recommendations and whether such adherence differs according to demographic, socioeconomic, lifestyle or psychosocial characteristics. In fact, most of our knowledge related to CVDs and diet in Lebanon and the EMR is derived from cross-sectional surveys and census-level data to approximate CVD patients' dietary intakes, social environment and behavior. However, acknowledging that CVDs are the leading cause of hospitalization in older adults (A Mehio Sibai, Fletcher, Hills, & Campbell, 2001) and considering the massive human and financial costs of hospitalization for these patients, there is a crucial need to better understand the spectrum of clinical and nonclinical characteristics of CVD patients and to identify the factors that may enhance adherence to dietary, drug and physical activity recommendations (Dupre et al., 2017).

In 2015, the American Heart Association released a scientific statement calling for greater attention to the social and behavioral determinants of CVD in different parts of the world (Havranek et al., 2015). The present study responds to this call by investigating the demographic, socioeconomic, lifestyle, behavioral and psychosocial

factors associated with higher adherence to dietary guidelines, prescribed drug regimens and physical activity recommendations amongst CVD patients in Lebanon.

The specific aims of this study are to:

(1) Describe the demographic, socioeconomic, psychosocial, lifestyle and behavioral characteristics of patients hospitalized with CVD in Lebanon,

(2) Assess drug adherence amongst CVD patients and by gender,

(3) Assess dietary adherence amongst CVD patients and by gender,

(4) Assess physical activity in the study population and its compliance with international recommendations,

(5) Investigate the association of the demographic, socioeconomic, psychosocial, lifestyle and behavioral characteristics with dietary adherence, drug adherence and high physical activity level in the study sample.

CHAPTER II

LITERATURE REVIEW

A. Cardiovascular Diseases

1. Nutrition Transition and CVD

Many developing countries have been witnessing a significant epidemiologic transition over the past decades with a shift in disease types and prevalence (Abla Mehio Sibai et al., 2010). This transition linked to rapid urbanization, modernization, and globalization, has been attributed to the ongoing nutrition transition (Abla Mehio Sibai et al., 2010). The nutrition transition, with its characteristic shifts in food intake, physical activity, and body composition, has contributed to replacing the high prevalence of infectious diseases by a growing burden of non-communicable diseases, most notably cardiovascular diseases (CVDs) (Abla Mehio Sibai et al., 2010; World Health Organization, 2018b).

2. Definition of CVD

CVDs are a group of disorders of the heart and blood vessels and include coronary health disease (CHD), high blood pressure (HBP), heart failure (HF), congenital cardiovascular defects, and stroke (Farley, McLafferty, & Hendry, 2012). Heart attacks and strokes are acute events caused by fat deposits on the inner walls of the blood vessels, preventing blood flow from supplying the heart or the brain (World Health Organization, 2017). The reduced blood flow to the tissues can cause chest pain, fatigue, and shortness of breath, warning signs for potential heart problems (Davis, 2019).

3. Physiopathology of CVD

Atherosclerosis is the pathogenic process underlying CVD, leading to decreased blood flow from stenosis of the blood vessels (Libby, Ridker, & Hansson, 2011). The mechanism behind atherosclerosis includes an abnormal elevation of plasma LDL concentration which increases the entry rate of LDL particles inside the artery wall. The accumulation of LDL particles traps and thickens the artery wall making it prone to oxidative damages (Lapointe, Couillard, & Lemieux, 2006). Oxidized LDL particles can lead to the injury of the endothelial lining, a process that attracts monocytes to the injury site. These monocytes will be later differentiated into lipid-laden macrophages. The lipid-laden macrophages which accumulate important amounts of oxidized LDL particles, release chemical proinflammatory cytokines to further recruit monocytes. This process of oxidation and further inflammation trigger the formation of the fatty streak, which can expand over time to constitute the atherosclerotic plaque (Napoli et al., 1997; Stary et al., 1994).

4. Epidemiology of CVD

Currently, CVD is the leading cause of death worldwide with one in four people dying from any type of CVD (Centers for Disease Control and Prevention, 2020). CHD, which is the most common type of CVD, accounts for more than half of all CVD-related mortality, with higher deaths observed in older age groups (Roger et al., 2011). In the aging population, CHD accounts for almost 82% of all death among older adults aged ≥ 65 years (D. Lloyd-Jones et al., 2009). Each year, nearly half-million individuals aged ≥ 75 years are diagnosed with MI (D. Lloyd-Jones et al., 2009). Likewise, the incidence of MI increases by 10-fold in individuals aged 65-74 years compared to

adults aged 35-44 years (D. Lloyd-Jones et al., 2009). The number of patients with stroke is expected to double in the next 40 years with a considerable proportion amongst the elderly population (Ama Moor et al., 2016). Besides, recent studies are devoting greater attention to gender discrepancy in the burden of CVDs (Woodward, 2019). Although the incidence of CVD is higher among males, especially in younger age groups, the rates of death and poor prognosis are higher in females following acute cardiovascular events (Gao, Chen, Sun, & Deng, 2019). This may be partly explained by the increased risk of stroke among menopausal women and the longer life expectancy of the female gender, constituting the larger prevalence of the elderly population (Gao et al., 2019; Mosca, Barrett-Connor, & Kass Wenger, 2011).

Countries in the Middle East and North Africa (MENA) region are currently witnessing an alarming rate of CVD and stroke, which are considered the main underlying causes of mortality and morbidity in the region (Galal, 2002; Abla M Sibai, Nuwayhid, Beydoun, & Chaaya, 2002). Recent statistics show that CVD is responsible for 54% and 36.6% of all-cause mortality in Syria and Jordan, respectively (Institute for Health Metrics and Evaluation, 2019b, 2019d). In Egypt, mortality rates from CVD have risen considerably from 39% to 46% in men and 41% to 49% in women between the years 2000 and 2019 (Institute for Health Metrics and Evaluation, 2019a). These drastic changes in the MENA region are partially explained by the aging of the population and the nutrition transition (Galal, 2002).

Similar to other countries in the region, the prevalence of CVD in Lebanon is steadily increasing over time and is responsible for almost 50% of all-cause mortality in the country (Institute for Health Metrics and Evaluation, 2019c). More precisely, 75% of all strokes occur in older adults aged >65 years (Yousufuddin & Young, 2019). In

2019, all-cause mortality from CVD reached 30%, 47%, and 54% among individuals aged 15 to 49 years, 50 to 69 years, and ≥70 years, respectively (Institute for Health Metrics and Evaluation, 2019c). According to the World Life Expectancy, the age-adjusted death rate from CHD reached 214.24 per 100,000 people in Lebanon, ranking the country in the 20th place worldwide (World Life Expectancy, 2016).

5. Impact of CVD on Health, Mortality, and Economy

Currently, CVD is the leading cause of disability, morbidity, and mortality worldwide especially among people of working age (Mozaffarian et al., 2016; Strong, Mathers, Epping-Jordan, & Beaglehole, 2006). These high rates of CVD exert enormous strain and substantial costs related to health care, productivity losses, and failure to recover (Fuster, Kelly, Medicine, Health, & Countries, 2010; Strong et al., 2006). In the US, an estimated $329.7 billion were spent annually on CVD and stroke-related conditions between the years 2013 and 2014, accounting for up to 14% of total health expenditures (Nicholson, Gandra, Halbert, Richhariya, & Nordyke, 2016).

In developing countries, the economic loss associated with CVD is estimated to account for $3.7 Trillion between the years 2011 and 2015, representing more than half of the NCD burden and 2% of the Gross Domestic Production (GDP) (Bloom et al., 2011). In Lebanon, total health expenditure represents 7.2% of the GDP and 42% of out-of-pocket expenditure (Georges A. Saade et al., 2014), a fact that was declared as catastrophic by the WHO (World Health Organization, 2011). Considering the enormous financial and human costs, CVD creates a challenge for public health and clinical care especially in fragile settings with limited resources (Abla Mehio Sibai et al., 2010). These challenges in low-middle income countries (LMICs) may be explained

by poor governance, focus on treatment at the expense of prevention, inadequate healthcare infrastructure, and insufficient health spending (S. Yusuf, Wood, Ralston, & Reddy, 2015).

6. Etiology: Diet and Lifestyle as Modifiable Risk Factors

The etiology of CVD involves a complex interplay between genetic predisposition and environmental factors that increase the risk of the disease. Lifestyle and behavioral risk factors are amongst the leading modifiable risk factors that can modulate the development and progression of CVDs (Rippe, 2019). Lebanon, like other countries of the EMR, is currently witnessing the nutrition transition with its characteristic shifts in diet, lifestyle, and body composition (Abla Mehio Sibai et al., 2010). Amongst other environmental and behavioral risk factors, physical inactivity, and the shift from the traditional diet to an energy-dense diet rich in sugar, fat and animal-based products may explain the increasing burden of CVDs (Abla Mehio Sibai et al., 2010). An energy-dense diet can induce excessive weight gain, leading to increases in blood glucose and triglyceride levels, coupled with decreases in HDL-cholesterol, and increases in blood pressure and inflammatory markers (Wozniak et al., 2017).

According to the INTERHEART study conducted in 52 developing and developed countries, nine modifiable risk factors were identified as major contributors to CVD mortality and morbidity and accounted for more than 90% of all MI (Dzau et al., 2006; Salim Yusuf et al., 2004). These risk factors include tobacco smoking, dyslipidemia, diabetes, hypertension, psychological factors, abdominal obesity, unhealthy diet, and physical inactivity. Similarly, the Reduction of Atherothrombosis

for Continued Health (REACH) study conducted in 44 countries confirmed the findings from the INTERHEART study and demonstrated that atherosclerotic risk factors are consistent and common amongst different ethnic populations (Bhatt et al., 2006).

In line with the previous studies, the Framingham Heart Study (Fox et al., 2008) and NHANES III (Vasan et al., 2005) found a strong association between CVD and dyslipidemia, high blood pressure, glucose intolerance, and tobacco smoking. The findings of these cohorts showed that sixty to ninety percent of coronary heart disease (CHD) events occurred in individuals with more than one risk factor. These risk factors interact synergistically to increase the risk of CVD from 4-fold for an individual with 1 risk factor to 60-fold with 5 risk factors (Kannel, 1976; Wilson, Kannel, Silbershatz, & D'Agostino, 1999).

As a result of the identified risk factors, the World Health Organization (WHO) emphasized seven recommendations to decrease the risk of CVD. These recommendations include eating healthy food, avoid tobacco smoking, controlling cholesterol levels, glucose levels, blood pressure, body weight, and staying physically active (World Health Organization, 2017). These recommendations are consistent with the American Heart Association (AHA), except that the latter places additional emphasis on avoiding harmful alcohol consumption (D. M. Lloyd-Jones et al., 2010; Members et al., 2010; Van Horn, Carson, Appel, Burke, Economos, Karmally, Lancaster, Lichtenstein, Johnson, & Thomas, 2016).

a. Cardiometabolic risk factors of CVD

- Obesity and CVD:

The growing prevalence of overweight and obesity rates have risen drastically over the past three decades in developed and developing countries particularly in countries of the MENA region (Nasreddine et al., 2012). In Lebanon, the dramatic and worrying increases in overweight and obesity rates raise serious public health concerns calling for urgent action (Nasreddine et al., 2012). In 2016, almost 54% of the Lebanese population were classified as overweight and 17% as obese (Mallat et al., 2016). An identical trend was seen in different countries from the MENA region such as Kuwait (Al-Kandari, 2006), KSA (Al-Baghli et al., 2008), and Iran (Esteghamati et al., 2010). Numerous studies have reported a clear association between BMI and CVD. Findings from a Framingham Heart Study have shown that for every 1 unit increase in BMI, the risk of heart failure increases by 5% in men and 7% in women (Kenchaiah et al., 2002). The positive association between obesity and CVD is partially linked to insulin resistance and its pathophysiological impacts (Robert H. Eckel, Kahn, Robertson, & Rizza, 2006).

- Diabetes and CVD:

Diabetes is an independent risk factor for CVD (Einarson, Acs, Ludwig, & Panton, 2018). Patients with diabetes have a 2-4 folds increase in the risk of CHD and ischemic stroke and an increase by 1.5-3.6 folds in mortality (Bertoluci & Rocha, 2017; The Emerging Risk Factors & Emerging Risk Factors, 2010). In line with the previous study, a 1% decrease in HbA1c results in a 37% decrease in microvascular complications (Stratton et al., 2000; Sweileh, Abu-Hadeed, Al-Jabi, & Sa'ed, 2014). In

Lebanon, the prevalence of diabetes was reported to be 13.8%, exceeding the worldwide prevalence rates, but lower than other neighborhood countries such as Bahrein (25%), UAE (23%), and KSA (23%) (Abla Mehio Sibai et al., 2010). Available evidence from Lebanon showed that the prevalence of diabetes is rising, reporting a 3% increase in 5 years (Shaw, Sicree, & Zimmet, 2010). This increase is mainly attributed to the high obesity rates in the region and the consumption of an unhealthy diet rich in saturated and trans-fat and low in fruits and vegetable intake (Nasreddine et al., 2014).

- Dyslipidemia and CVD:

Dyslipidemia is defined by the elevation of LDL-C or TG levels with a decrease in HDL-C levels (Kopin & Lowenstein, 2017). The serum levels of LDL-C, HDL-C, and TG are shown to be independent predictors of CVDs (Klop, Elte, & Cabezas, 2013; Niroumand et al., 2015). Two large cohort studies have well documented the role of high TG levels with the occurrence of CVD, showing an increase in small dense LDL-C and a decrease in HDL-C levels (Nordestgaard, 2016; Reiner, 2017). Studies showed that for every 1 mmol/L reduction in LDL levels, the risk of CVD decrease by 23% (Cziraky, Watson, & Talbert, 2008; Doll, 2008). The Framingham Study confirmed the correlation between HDL-C levels and the severity of CAD and found that the risk of CAD increases sharply for HDL-C levels below 40mg/dL (Castelli et al., 1986). In line with the previous studies, the Quebec Cardiovascular Study showed to be consistent with the Framingham study demonstrating a 13% increase in CVD risk for every 10% decrease in HDL levels (Després, Lemieux, Dagenais, Cantin, & Lamarche, 2000).

In the MENA region, wide variation in lipid profiles exists across the countries. The highest prevalence of LDL-C was shown in Saudi Arabia (57-70%), followed by

Lebanon (32%) and Jordan (22%) (Abla Mehio Sibai et al., 2010). According to the African Middle East Cardiovascular Epidemiological study (ACE), the prevalence of CVD reached 70% following the ATP III guidelines, and death related to high LDL-C reached 18% in Lebanon (Alsheikh-Ali et al., 2014; Institute for Health Metrics and Evaluation, 2019c). The inflammatory response linked to fat accumulation and dyslipidemia is suggested to influence CVD risk through insulin resistance, body weight homeostasis, endothelial dysfunction, and atherosclerosis (Vazzana, Santilli, Sestili, Cuccurullo, & Davi, 2011).

- High blood pressure and CVD:

Hypertension is defined as a SBP ≥ 140mmHg and/or DPB ≥ 90mmHg (Chobanian et al., 2003). BP is a critical risk factor for CVD with almost 54% of strokes and 47% of CHD are attributed to hypertension (J. He & Whelton, 1999; Lawes, Hoorn, Rodgers, for the International Society of, & International Society of, 2008; Stamler, Stamler, & Neaton, 1993). A recent study conducted among older adults showed that a SBPs of 160 mmHg or DBPs >90 mmHg significantly increases CVD risk and CVD mortality risk (C.-Y. Wu et al., 2015). The crude prevalence of HTN is higher amongst the Arab world (29.5%) compared to Sub-Saharan Africa (27.6%), and the USA (28%) (Tailakh et al., 2014).

In the EMR, Lebanon has the highest prevalence of HTN when compared to other countries such as Palestine and Egypt (Matar et al., 2015). The overall prevalence of hypertension in Lebanon increased by 3-fold in the past decade (A.-M. Sibai et al., 2008). Currently, one in three Lebanese individuals has HTN, with an additional 30% classified as prehypertensive (Matar et al., 2015). This high prevalence of HTN is

significantly associated with older age, male gender, illiteracy, urban settings, and poor lifestyle characteristics (Noubani, Nasreddine, Sibai, Tamim, & Isma'eel, 2018; T. Jackson, 2001; Tailakh et al., 2014).

b. Lifestyle risk factors of CVD

- Diet and CVD:

The role of nutrition in health and disease, especially in modulating CVD risk is currently well-documented (F. J. He & MacGregor, 2010; Sharrett et al., 2001; Vazzana et al., 2011). There is growing evidence showing that high fat intake especially saturated fat has an unfavorable effect on LDL-C and other CVD markers (Astrup et al., 2011; Vafeiadou et al., 2012). Conversely, replacing saturated fats with polyunsaturated fats or monounsaturated fats showed beneficial effects on lipid levels and cardiovascular risk (Astrup et al., 2011). However, replacing saturated fat with trans-fat significantly increases the risk of CHD by reducing HDL-C and increasing LDL-C and TC to HDL ratio (Wang & Hu, 2017). In Lebanon, the alarming increase in nutrition-related CVD risk is mostly attributed to poor dietary practices (Nasreddine et al., 2014). The increase in energy intake over the years has substantially increased dietary fat intake to almost 41% and doubled trans-fat intake, exceeding the WHO recommendations (Chamieh et al., 2015; Farhat, Jaalouk, Moukarzel, & Ayoub, 2016).

Evidence from previous studies has shown a consistent and significant association between salt intake and CVD risk (Cappuccio, 2013; Cohen & Alderman, 2007). Findings from a cohort study have shown that for a daily increase in 5g of salt intake, the risk of CVD increases by 17%, and the risk of stroke increases by 34%,

mainly through the influence of salt on blood pressure (Strazzullo, D'Elia, Kandala, & Cappuccio, 2009).

Fruits and vegetables are essential components of a healthy diet. There is current evidence demonstrating an inverse relationship between fruit and vegetable intake and CHD risk (Dauchet, Amouyel, Hercberg, & Dallongeville, 2006; F. J. He, Nowson, Lucas, & MacGregor, 2007) and stroke (Dauchet, Amouyel, & Dallongeville, 2005; F. J. He, Nowson, & MacGregor, 2006). Evidence has shown that a daily increase in 1 serving of fruit and vegetables decreases the risk of ischemic stroke by 6% (Joshipura et al., 2001). Although the exact mechanism remains unclear, the WHO suggests that the synergetic effect of various nutrients available in fruits and vegetables confer their cardioprotective benefits (World Health Organization, 2014). Besides, dietary fiber especially soluble fibers were demonstrated to reduce CVD by decreasing LDL-C and improving insulin resistance (Erkkilä & Lichtenstein, 2006). Therefore, current evidence promotes a food-based approach favoring an increased intake of fruits and vegetables that comprises different types of fibers for CHD prevention (Erkkilä & Lichtenstein, 2006).

Several previous prospective studies have focused on nut consumption and CVD risk (Aune et al., 2016; Mayhew, de Souza, Meyre, Anand, & Mente, 2016). According to the Nurses' Health Study (NHS), weekly consumption of 5oz of nuts decreases CHD risk by lowering LDL-C amongst diabetic and hypercholesterolemic patients (Rimm et al., 1998). A recent study cohort study showed that substituting red meat by high quality plant foods such as nuts, and legumes might reduce CHD risk (Al-Shaar, Satija, et al., 2020). Besides, a meta-analysis of prospective cohort studies has shown a positive and significant association between glycemic index (GI) and all-cause mortality in women,

mainly caused by the effect of GI on insulin resistance and blood lipid profile (Shahdadian, Saneei, Milajerdi, & Esmaillzadeh, 2019). Also, added sugar was positively and significantly associated with CVD mortality (Yang et al., 2014).

- Tobacco smoking and CVD:

Tobacco smoking is one of the most critical and reversible risk factors for CVD. According to the WHO, around 25% of all deaths from CVD are related to tobacco consumption (WHO, 2020). The Finnmark study showed that the incidence of acute MI increased by sixfold in females and threefold in males for consumers ≥ 20 cigarettes per day (Njølstad, Arnesen, & Lund-Larsen, 1996). In the MENA, huge variations in the rates of cigarette smoking exist between countries, with the highest prevalence in Lebanon (55.8%), followed by Jordan (29%) and Syria (28.1%) (Abla Mehio Sibai et al., 2010). In Lebanon, a recent case-control study conducted among hospitalized patients showed that the risk of ischemic stroke increased by 2.6-fold and 6.2-fold for current cigarette and waterpipe smokers, respectively (El-Hajj, Salameh, Rachidi, Al-Hajje, & Hosseini, 2019). Available experimental data have linked cigarette smoking to oxidative stress, the underlying mechanism that initiates cardiovascular dysfunction (Ambrose & Barua, 2004).

- Physical activity and CVD:

Over the past decades, numerous studies have examined the impact of PA on cardiovascular health (Nystoriak & Bhatnagar, 2018). These evidence were reinforced by expert panels such as Disease Control and Prevention (CDC) and AHA linking regular physical activity to better cardiac outcomes (Medicine, 2013; Pate et al., 1995).

The WHO recommends practicing at least 75 minutes of vigorous-intensity PA or 150 minutes of moderate-intensity PA every week, for individuals aged 18 to 64 years (World Health Organization, 2010). A report consisted of five large cohort studies found that the intensity and the duration of PA were significantly and inversely associated with the incidence of CVD (Kohl, 2001). The STABILITY trial conducted over 39 countries, showed a significant decrease in mortality rates with the increase of self-reported PA level amongst patients with stable CHD (Stewart et al., 2017). The inverse association between PA and CVD is mainly explained by the effect of PA on blood pressure, insulin sensitivity, and blood lipid profile (Nystoriak & Bhatnagar, 2018).

- Psychosocial factors and CVD:

More recently, psychological factors are identified as an independent risk factor for CVD and show important implications in the etiology, development, and consequences of the disease (Sims, Glover, Gebreab, & Spruill, 2020). Compelling evidence has shown that high psychosocial problems such as depression, anxiety, and lack of social support were strongly linked to adverse CVD outcomes (Albus, 2010; Rutledge et al., 2009). Available studies have well documented the effect of depression on CVD risk factors such as physical activity, cigarette smoking, drug and diet adherence (Gonzalez et al., 2008; Lett et al., 2004; Shin & Kim, 2019). While studies classified psychosocial factors as determinants of CVD risk, other studies found that CVD patients were more likely to experience psychological problems (Thombs et al., 2006). For instance, depression was three times more common in patients experiencing MI compared to the general population (Thombs et al., 2006). Therefore, recent studies

highlight the importance of understanding psychosocial factors amongst CVD patients to improve CVD risks and outcomes (Dupre et al., 2017).

B. Management Principles: Drug Adherence, Diet Adherence, and Physical Activity.

1. Drug Adherence

a. Definition and scores

According to the WHO, drug adherence is the extent to which patients take their medications as prescribed by their health care provider (Dobbels, Damme-Lombaert, Vanhaecke, & Geest, 2005). Amongst the different methods available, the Morisky Medication Adherence Scale (MMAS) in its short and long versions, is the most commonly used to assess patients with non-adherence to prescribed drug regimens. This tool, although used to predict nonadherence in patients with various chronic conditions, was commonly used amongst cardiac and hypertensive patients (Morisky, Green, & Levine, 1986; Shalansky, Levy, & Ignaszewski, 2004).

In 2009, the MMAS-8 items retrieved from the MMAS-4 short version was developed, with additional questions assessing the emotional aspects of non-adherence (Pedersini & Vietri, 2014). This instrument originally tested by Dr. Morisky (Morisky, Ang, Krousel-Wood, & Ward, 2008), showed high reliability, validity, and sensitivity, and became widely used among patients with hypertension (Granger et al., 2015; Vinluan, Wittman, & Morisky, 2015), diabetes mellitus (Bramlage et al., 2014; Chan & Hassali, 2014), acute coronary syndrome (Kassab et al., 2013; L. G. Park, Howie-Esquivel, Chung, & Dracup, 2013) and other chronic diseases (Chung, Chua, Lai, & Morisky, 2015; Viswanathan et al., 2012). This tool has been adapted to Arab countries

such as Lebanon, and the Arabic version demonstrated acceptable reliability and validity to measure drug adherence amongst diabetic and hypertensive patients (Ashur, Shamsuddin, Shah, Bosseri, & Morisky, 2015; Yassine et al., 2016)

Subsequently, this effective tool consists of 8 items formulated in a way to avoid the "yes-saying" bias (Morisky et al., 2008). The first seven items include yes/no questions, addressing common reasons for nonadherence. The last item includes a five-point Likert scale on how often patients have difficulty remembering to take their medications. The scores are ranked on a scale from 0 to 8 points, with high adherence identified for patients with a score of 8, moderate adherence for a score of 6 or 7, and low adherence for a score below 6 (Morisky et al., 2008).

b. Impact of drug adherence on the management of CVD patients

Poor drug adherence is a major public health challenge and occurs in 60% of cardiac patients, resulting in severe health consequences (Insull, 1997; McDermott, Schmitt, & Wallner, 1997). Evidence from studies has shown that patients with high drug adherence have a significantly lower risk of CVD events compared to nonadherent patients (Mazzaglia et al., 2009). Findings from a large study showed that nonadherent patients post-MI have an 80% higher odds of death, and moderately adherent patients have 44% higher odds of death compared to highly adherent patients (Jackevicius, Li, & Tu, 2008). In line with the previous study, the results of a cohort study showed that drug adherence was inversely associated with CVD and all-cause mortality risk, in addition to stroke mortality even after adjusting for potential confounders (S. Kim et al., 2016). Besides, a recent prospective study has positively associated drug adherence with a better quality of life among patients with heart failure (Silavanich, Nathisuwan,

Phrommintikul, & Permsuwan, 2019). The results of Bansilal et al., (2016) further supports the results of the previous study, showing significantly lower rates of long-term adverse cardiac events and higher cost-saving among adherent patients post-MI when compared to nonadherent patients (Bansilal et al., 2016). In Lebanon, a recent study showed an association between high drug adherence and low risk of stroke among patients with atrial fibrillation (Hajj et al., 2020).

2. Dietary Management of CVD

a. The American Heart Association (AHA) dietary recommendations

i. Definitions and scores

In 2013, the AHA released a scientific statement calling for greater attention to the heart-healthy diet to reduce the risk of CVD (Jensen et al., 2014; National Heart & Institute, 2015). The concerns about poor dietary intakes, micronutrient deficiency, and the existing obesity pandemic were the underlying causes towards the implementation of the AHA heart-healthy dietary and lifestyle recommendations (Van Horn, Carson, Appel, Burke, Economos, Karmally, Lancaster, Lichtenstein, Johnson, & Thomas, 2016). This healthy eating pattern has been adapted to meet the AHA recommendations and to be used by different ethnic, age, race, and cultural groups (Van Horn, Carson, Appel, Burke, Economos, Karmally, Lancaster, Lichtenstein, Johnson, & Thomas, 2016). The heart-healthy diet is characterized by increased consumption of fruits, vegetables, whole grains, low-fat or fat-free dairy, fish, poultry, legumes, vegetable oil, nuts, and a limited intake of sweets, salty foods, processed or fatty meats, and sugar-sweetened beverages (Van Horn, Carson, Appel, Burke, Economos, Karmally, Lancaster, Lichtenstein, Johnson, & Thomas, 2016). This diet emphasizes the

importance of limiting saturated fat due to the number of studies confirming the atherogenic effect of SFA on CVD risk (Hooper, Martin, Abdelhamid, & Smith, 2015). More specifically, the AHA recommends an intake of < 7% of total calories from SFA, avoiding trans fats, and reducing sodium intake to <2300mg/d (Robert H Eckel et al., 2014).

Existing evidence has shown that the heart-healthy diet address multiple CVD risk factors such as obesity and diabetes (Van Horn, Carson, Appel, Burke, Economos, Karmally, Lancaster, Lichtenstein, Johnson, Thomas, et al., 2016). According to the NHANES survey, a very low proportion of Americans were adherent to the heart-healthy dietary pattern with more than 70% exceeding the recommendations of added sugars and saturated fats and almost 90% exceeding those of sodium. In contrast, less than 10% reported an adequate intake of dairy and vegetables and less than 25% were adherents to fruit recommendations (Van Horn, Carson, Appel, Burke, Economos, Karmally, Lancaster, Lichtenstein, Johnson, Thomas, et al., 2016).

The American Heart Association (AHA) specified the recommended amount of intake for 12 food groups and subgroups as well as four nutrients based on different energy intakes ranging from 1000 calories to 3200 calories per day. Patients who consume the recommended amount of dietary components specified by the AHA based on their caloric intake were considered adherent to the specific food group, subgroup, or nutrient (Table 1) (Van Horn, Carson, Appel, Burke, Economos, Karmally, Lancaster, Lichtenstein, Johnson, & Thomas, 2016).

Table 1: The AHA eating pattern recommendations according to energy needs based on the healthy US-style eating pattern

Food Group (Subgroups)	Calorie Level of Pattern*											
	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	3200
Fruits: fresh/frozen/canned unsweetened preferred, cups	1	1	1½	1½	1½	2	2	2	2	2½	2½	2½
Vegetables: fresh/frozen/ canned,§ cups/d	1	1½	1½	2	2½	2½	3	3	3½	3½	4	4
Dark green vegetables, cups/wk	½	1	1	1½	1½	1½	2	2	2½	2½	2½	2½
Red/orange vegetables, cups/wk	2½	3	3	4	5½	5½	6	6	7	7	7½	7½
Beans and peas, cups/wk	½	½	½	1	1½	1½	2	2	2½	2½	3	3
Starchy vegetables, cups/wk	2	3½	3½	4	5	5	6	6	7	7	8	8
Other vegetables, cups/wk	1½	2½	2½	3½	4	4	5	5	5½	5½	7	7
Grains: emphasize whole grains/high in dietary fiber, oz eq/d	3	4	5	5	6	6	7	8	9	10	10	10
Whole grains	1½	2	2½	3	3	3	3½	4	4½	5	5	5
Other grains	1½	2	2½	2	3	3	3½	4	4½	5	5	5
Protein foods, oz eq/d	2	3	4	5	5	5½	6	6½	6½	7	7	7
Lean meat, poultry, eggs, oz eq/wk	10	14	19	23	23	26	28	31	31	33	33	33
Fish, preferably oily fish, oz eq/wk	3	4	6	8	8	8	9	10	10	10	10	10
Nuts, seeds, legumes, oz eq/wk (unsalted preferred)	2	2	3	4	4	5	5	5	5	5	6	6
Dairy: fat free or low fat, cups/d	2	2½	2½	3	3	3	3	3	3	3	3	3
Oils: unsaturated sources, g/d (Tbsp)	25 (2)	24 (2)	24 (2)	30 (2)	35 (2.5)	45 (3)	47 (3.5)	54 (4)	59 (4)	62 (4.5)	75 (5.5)	91 (6.5)
Fiber, g/d	14	18	21	25	29	31	35	37	42	45	48	48
Solid fats, g/d (% of total cal)	7 (6)	8 (6)	9 (6)	11 (6)	12 (6)	13 (6)	15 (6)	16 (6)	17 (6)	19 (6)	20 (6)	21 (6)
Added sugars, g/d (kcal)†	10 (40)	12 (46)	13 (50)	14 (54)	19 (75)	25 (100)	25 (100)	25 (100)	38 (150)	38 (150)	38 (150)	38 (150)
Sodium, mg/d‡	921	1221	1404	1602	1729	1787	1943	2089	2207	2300	2300	2300

Source: Van Horn, L., Carson, J. A. S., Appel, L. J., Burke, L. E., Economos, C., Karmally, W., . . . Thomas, R. J. (2016). Recommended dietary pattern to achieve adherence to the American Heart Association/American College of Cardiology (AHA/ACC) guidelines: a scientific statement from the American Heart Association. *Circulation, 134*(22), e505-e529.

ii. Impact on the management of CVD patients

A number of studies have used the AHA dietary and lifestyle recommendations to assess the relationships between lifestyle behaviors and diet with cardiac outcomes amongst CVD patients. A cohort study conducted among Boston Puerto Ricans showed

that high adherence to the AHA recommendations significantly lowered insulin level, C-reactive protein (CPR), and waist circumference and increased the level of HDL-C (Bhupathiraju, Lichtenstein, Dawson-Hughes, & Tucker, 2011). Remarkably, even a modest adherence to diet showed a significant impact on these markers (Bhupathiraju et al., 2011). Subsequently, another study conducted among Japanese men showed that a lower score of diet adherence was associated with a significant increase in the prevalence of metabolic syndrome (Kuroki, Kanauchi, & Kanauchi, 2012). Therefore, adherence to the AHA dietary recommendations may provide substantial benefits in populations at high risk of CVD.

b. Therapeutic lifestyle change (TLC) diet

i. Definition and scores

In 1988, the NCEP ATP recommends approaches to improve physical activity and the diagnosis, evaluation, and treatment of patients with high cholesterol levels (Expert Panel on Detection, 2001). These approaches were recently updated to include diet, physical activity, weight loss, and behavioral change components in the prevention and treatment plan to lower CHD risk. These updated approaches have changed the Step II diet of ATP II to the new TLC diet in ATP III that includes the same goals of Step II with an additional emphasis on diet and PA to further decrease LDL-C levels (Expert Panel on Detection, 2001).

The TLC diet emphasizes the importance of the quality of fat ingested rather than the quantity. This diet suggested a total fat intake of 25% to 35% of total energy intake while lowering saturated fat to <7% and retaining trans-fat intake as low as possible to decrease LDL-C levels and CHD risk (Stone & Van Horn, 2002). This is an

important step to keep carbohydrates under 60% of total calories, a major concern for patients with metabolic syndrome (Stone & Van Horn, 2002). Another important aspect of the TLC diet is encouraging regular PA and weight loss to reverse the adverse cardiometabolic abnormalities and obesity to ultimately decrease CVD risk (Stone & Van Horn, 2002). Finally, the ATP III underlines the importance of increasing sterol and stanol plants to further decrease the level of LDL-C beyond the levels seen with Step I and II diets (Stone & Van Horn, 2002).

The ATP III recommends the MEDFICTS (Meats, Eggs, Dairy, Fried foods, fat In baked goods, Convenience foods, fats added at the Table and Snacks) score to assess the level of adherence to the TLC components (Kris-Etherton et al., 2001; Taylor et al., 2003). The MEDFICTS was previously used to assess adherence to the Step 1 and Step 2 diet in a less diverse population (Taylor et al., 2003; Teal, Baham, Gor, & Jones, 2007). The same tool was used to assess adherence to the TLC diet and has achieved a sensitivity score of 85.7% and 84% in an ethnically diverse population (Mochari, Gao, & Mosca, 2008). The only concern of MEDFICTS was the low specificity to identify nonadherent patients. Although this instrument has only been validated in small and selected populations, researchers suggest sex-specific recalibration of this tool to improve its specificity and utility in diverse clinical settings (Mochari et al., 2008).

Table 2: Nutrient Composition of the TLC diet

Component	Recommendation
Polyunsaturated fat	Up to 10% of total calories
Monounsaturated fat	Up to 20% of total calories
Saturated fatty acid	< 7% of total calories
Total fat	25-35% of total calories
Carbohydrates	50-60% of total calories
Soluble fibers	10-25g/d

Plant stanols and sterols	2g/d
Protein	15% of total calories
Cholesterol	<200mg/d
Total calories	Balance energy intake and expenditure to maintain healthy body weight/prevent weight gain
[a] Total fat can be increase to 35% of total calories and carbohydrates could be reduced to 50% for patients with metabolic syndrome. The increase in the fat intake should be from polyunsaturated or monounsaturated fat. [b] Main source of carbohydrate should derive from foods rich in complex carbohydrates and fiber such as whole grains, fruits, and vegetables	

ii. Impact on the management of CVD patients

Findings from a prospective study showed that patients who received consultation on the TLC diet had a significant improvement in blood lipid profiles and fasting glucose levels in postoperative cardiac rehabilitation (Lin, Tsai, Lin, & Tsay, 2010). Also, three months after hospital discharge, the TLC diet significantly improved blood pressure control and the frequency of PA (Lin et al., 2010). Adherence to the TLC diet was also shown to improve the quality of life of cardiac patients (Aldana et al., 2006). Therefore, it is important to incorporate the TLC diet in cardiac rehabilitation programs to effectively modify cardiac risk factors and improve recovery and CVD prognosis (Lin et al., 2010).

3. Physical Activity

a. Definition and scores

PA includes all types of movements such as work-related PA, domestic work, PA-related transportation, and leisure time (Strath et al., 2013). Over the past decades, recent attention was given to the different PA domains described in the IPAQ form. The IPAQ instrument developed in 1998 was originally tested for reliability and validity

against accelerometry in 14 centers across 12 countries. Subsequently, this tool became widely used in numerous populations and different languages (Craig et al., 2003). Also, the long IPAQ was cross-culturally adapted and validated to an Arabic version equivalent to the French version among the Lebanese population (Helou et al., 2018).

Two versions of the IPAQ questionnaire were developed, the short and the long IPAQ forms. The short form compromises seven items that cover all PA domains, whereas the long-form includes 27 items that measure the intensity-specific category for each of the four domains (Forde, 2018). The total weekly PA was calculated by weighting time spent in each activity with its corresponding MET energy expenditure. MET values to walking, moderate and vigorous intensity were 3.3, 4, and 8 METs, respectively (Committee, 2016). Following the same rigorous protocol, the long and short versions can be categorized into low, moderate, and vigorous PA levels or presented as median MET-minutes/week. The MET minutes is the amount of energy consumed during a PA level (Forde, 2018).

b. Impact on the management of CVD patients

The INTERHEART study showed that physical inactivity was one of the nine major contributors to heart disease mortality (Salim Yusuf et al., 2004). A large study showed that participants with high physical activity level (>6 MET hours/week) had a 17% lower risk of CHD mortality as compared to participants with low PA (1-3.9 MET hours/week) (Tanasescu et al., 2002). While patients with pre-existing CVD were more likely to be physically inactive, a current study highlighted the benefits associated with regular PA for patients with CVD compared to patients without CVD (Jeong et al., 2019). Using the Health Professionals Follow-up Study cohort, higher physical activity

levels among MI survivors was also associated with lower risk of all-cause and CVD mortality as compared to physical inactive participants (Al-Shaar, Li, et al., 2020). In Lebanon, a study showed that the lack of PA was significantly associated with higher odds of metabolic syndrome, even after adjusting for potential confounders (A.-M. Sibai et al., 2008).

CHAPTER III

METHODS AND MATERIALS

A. Study Design and Population

This is a cross-sectional study of cardiac patients admitted for hospitalization in Lebanon. Data collection took place in four different hospitals in Lebanon, as part of the parent study titled "Lebanese Cardiovascular /Cerebrovascular Health Cohort" (LC2HC). The four hospital sites included the American University of Beirut Medical Center (AUBMC), Labib Medical Center (LMC), AinWazein Hospital (AWH) and Centre Hospitalier du Nord (CHN), and data collection occurred between 2016 and 2018. Although the parent study recruited both cardiovascular and cerebrovascular patients, the present study focuses on cardiovascular patients only.

Any adult patient admitted to AUBMC, AWH, LMC, and CHN during the study period for cardiovascular reasons were eligible to participate in the study. Any patient aged 18 years or less, unconscious, or admitted for other reasons than cardiovascular disease, were excluded from the present study.

The total sample size included in this study was 367 participants from which 193 participants were recruited from AUBMC, 150 from CHN hospital, and 24 from AWH and LMC. Biochemical data were only collected from 193 patients admitted to AUBMC (Figure 1).

The approval to conduct the study was obtained from the Institutional Review Board (IRB) at the American University of Beirut (AUB), CHN, LMC and AWH before the initiation of fieldwork. All participants provided written informed consent

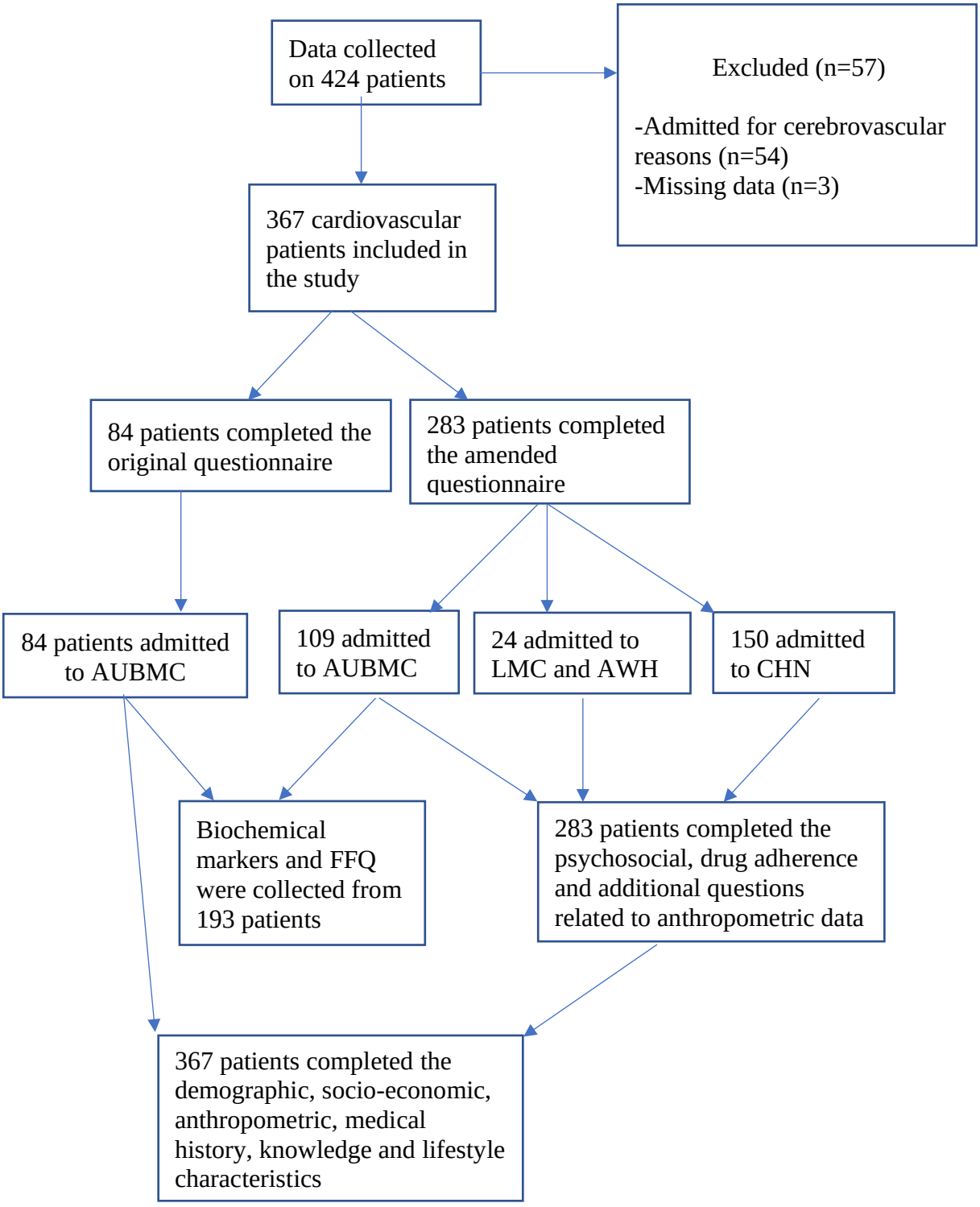
(Appendix A) prior of the study and were informed about their right to withdraw from participation at any time.

B. Data Collection

Cardiac patients admitted to the cardiac catheterization area or to the coronary care unit (CCU) were informed about the study and its importance by the treating physician or any other health care worker providing medical care. Then, participants who expressed interest in participating were approached by trained interviewers.

Data collection was based on the 1) administration of a multi-component questionnaire to patients admitted for hospitalization, and 2) review of medical charts for the collection of anthropometric characteristic and biochemical indicators. The questionnaire inquired about demographic and socio-economic characteristics, medical history, psychosocial attributes, knowledge and lifestyle characteristics, dietary intakes as well as drug adherence. Within the hospital premises, the questionnaire was administered to patients through face-to-face interviews that were conducted by trained interviewers. For each subject, the interview took about 30-40 minutes to complete the questionnaire. Participants admitted to the hospital after 11 July 2016 completed the amended questionnaire (Appendix B) and those admitted before 11 July 2016 completed the original version (Appendix C). In total, 84 patients received the original questionnaire, and 283 patients received the amended form.

Figure 1: Graphical representation of the included participants and their response to the amended and original questionnaire.



1. Demographic and Socio-Economic Characteristics

The demographic characteristics included information regarding age, gender, marital status (married or not married), site of recruitment (AUBMC, CHN, AWZ and CHN), governorate of residence (Beirut, North, Mount of Lebanon and others), and number of children. Socioeconomic characteristics included educational attainment (illiterate/elementary, intermediate or secondary/university), employment status (full time, part time, retired or unemployed), housing status (owned or rented), number of rooms in the house, perceived adequacy of household income (enough or not enough). Crowding index (C.I.) was calculated based on the total number of residents per household over the total number of rooms (excluding the bathrooms, garage and open balconies). Crowding index is a proxy measure of socioeconomic status with an index > 1 indicating an overcrowded household (Galobardes, Shaw, Lawlor, Lynch, & Smith, 2006).

2. Medical and Family History

The questionnaire inquired about the reason for hospital admission (chest pain or other complaints), as well as family and medical history (cardiovascular disease, high blood pressure, diabetes mellitus, elevated cholesterol and high blood glucose).

3. Anthropometric Measurements

Anthropometric measurements were collected from all the participants and included height (cm), current body weight (kg), and waist circumference (WC, in the amended questionnaire only). In addition, information about body weight at 21 years (kg) was collected from the study participants. Body Mass Index (BMI) was calculated

based on the World Health Organization (WHO) recommendation for adult population, BMI= current weight (kg)/ height $(m)^2$. BMI was classified into underweight <18 kg/m^2, normal weight 18.5-24.9kg/m^2, overweight 25-29.9kg/m^2 and obese >30kg/m^2 (WHO, 2000). Waist circumference (WC) was measured at the midpoint between the lower costal border and the top of the iliac crest (Ross et al., 2008). Abdominal obesity was defined as WC >94 cm in men and >80cm in women as classified by the Europids cut-offs (Zimmet, 2005). In addition, the amended questionnaire included information about body weight one year ago (kg).

4. Knowledge Related to Body Weight

Participants knowledge about overweight and obesity was examined based on the following question: "what is the best way to prevent overweight and obesity?". The options were multiple choice and included: avoid sweet drinks, avoid fatty foods, eat smaller portions, increase physical activity level. Participants perception about their body weight was assessed according to the following question: do you consider yourself as normal weight, overweight or obese.

5. Biochemical Measurements

Biochemical markers were collected from the medical charts of 193 patients at AUBMC, and included fasting glucose (mg/dl), creatinine (mg/dl), estimated glomerular filtration rate (eGFR) (mL/min) and blood urea nitrogen (BUN) (mg/dL) collected at admission and discharge from the hospital. In addition, systolic blood pressure (mmHg) and diastolic blood pressure (mmHg) were collected at admission. Glycated hemoglobin (HbA1c) and fasting lipid profile that includes serum

concentration of total cholesterol (TC), triglycerides (TGs), low density lipoproteins (LDL-cholesterol), high density lipoproteins (HDL- cholesterol) and cholesterol ratio (cholesterol/HDL) were also obtained from the medical chart based on assessments conducted during hospital stay or before discharge from the hospital.

Classification of lipid profile was assessed based on the Adult Treatment Panel III (ATP III) classification levels for LDL-cholesterol, HDL-cholesterol, Total Cholesterol and TGs (Grundy et al., 2002).

6. Psychosocial Characteristics

Psychosocial attributes including loneliness and mental well-being were assessed.

a. Assessment of loneliness

The evaluation of loneliness was based on the three-item loneliness scale. The questions were retrieved from the long scale version of the University of California Los Angeles (UCLA) loneliness scale that has been validated in previous studies (D. Russell, Peplau, & Cutrona, 1980). This validated three-items questionnaire (D. W. Russell, 1996) provides a quick and succinct method to collect information about social isolation. This three item tool was shown to be valid and reliable in assessing loneliness among different populations (Arimoto & Tadaka, 2019; Hughes, Waite, Hawkley, & Cacioppo, 2004).

Participants were asked the following (1) “how often do you lack companionship?”, (2) “how much do you feel lonely?”, (3) “how much do you feel that there are people you can talk to?” and responses ranged from 1 = hardly ever or never, 2= some of the time and 3=often. The scores for each patient were summed to give a

possible score from 3 to 9 points. The least lonely patients were identified based on a score ranging between 3 and 5 points while lonely patients were identified based on a score ranging between 6 and 9 points. The scores of the third question were reversed. A higher score indicates greater loneliness.

In addition to the loneliness scale, other questions were used to assess loneliness and include (1) “number of children you have a close relationship with”, (2) “number of family members you have a close relationship with” and (3) “number of friends you have a close relationship with”. Only married patients who reported having at least one child provided an answer to the first question.

b. Assessment of mental well-being

Mental well-being was assessed using the World-Health Organization five-item-well-being index (WHO-5) that was previously validated in screening for depression especially among older adults (Heun, Bonsignore, Barkow, & Jessen, 2001; Lucas-Carrasco, Allerup, & Bech, 2012; Lucas-Carrasco, 2012; Topp, Østergaard, Søndergaard, & Bech, 2015). The WHO-5 item questionnaire was validated among elderly population in Lebanon. A cut-off point of less than 13 determines a decreased sense of well-being and a higher risk of depression (Abla Mehio Sibai, Chaaya, Tohme, Mahfoud, & Al-Amin, 2009).

Mental health state was measured by summing responses to the following questions: How much during the last month (1) “Have you been a happy person?”, (2) “Have you felt so down in the dumps so that nothing could cheer you up?” (3) “Have you felt calm and peaceful?”, (4) “Have you been a very nervous person?”, (5) “You felt downhearted and blue?”. Each answer was scored on a scale from 0 to 5 points with

0 coded for “all of the time”, 1 for “most of the time”, 2 for “good bit of the time”, 3 for “some of the time”, 4 for “a little of the time” and 5 for “none of the time”. The total score was calculated by reversing the answers of the first and third question and summing the scores to a scale ranging from 0 to 25 points. Higher scores indicate an increased sense of well-being. The WHO-5 items questionnaire was included in the amended form and was administered during face-to-face interviews with the patients.

7. Lifestyle Characteristics

The assessment of lifestyle characteristics focused on smoking history (current, former or never smoked), physical activity (low, moderate or high level) and eating behavior (eat in front of the TV, eat at work on the desk, eat in a restaurant, eat on the go and eat fast food).

a. Smoking history

Smoking history was assessed using a four-item questionnaire for cigarette and waterpipe smoking. The questions were related to (a) cigarette smoking status (current, former or never), (b) frequency of cigarette smoked per day (for current smokers only), (c) waterpipe smoking status (current, former or never), and (d) frequency of waterpipe smoked per week (for current smokers).

For the frequency of cigarette and waterpipe smoking, the options were categorized based on prior research (Banks et al., 2015; Hurley, 2014). The frequency of cigarette smoking per day was trichotomized into “1-14”, “15-24” and “25+”. For waterpipe smoking per week, the options were categorized into “≤ 2 times”, “3-6 times”

or “daily”. Only patients who reported to be current cigarette or waterpipe smokers answered the question related to the frequency of cigarette or waterpipe consumption.

b. Eating behavior

Eating behavior was assessed using a six-item questionnaire inquiring about the following: how many times per week do you typically eat (1) “at home, at the kitchen/dining table”, (2) “at home, in front of the TV/computer”, (3) “at work, on your desk office”, (4) “on-the-go”, (5) “fast-food” and (6) “in a restaurant”. The options were categorized into “never”, “1-4 times/week” and “5+/week”. Only employed patients were asked to answer question (3) and patients who received the original questionnaire answered questions (5) and (6).

c. Assessment of physical activity levels

Physical activity was assessed using the short and long version of the International Physical Activity Questionnaire (IPAQ) during the one-on-one interview that was recently validated among the Lebanese population (Helou et al., 2018). The short IPAQ version was part of the original questionnaire that was replaced by the long IPAQ version and added in the amended questionnaire.

The short IPAQ form assesses the frequency and duration of vigorous, moderate and walking physical activity using six items of the IPAQ questionnaire. The questionnaire was scored using the established IPAQ protocol (Sjostram et al., 2009). These data were calculated to report PA in categories, by classifying the study population into low, moderate and vigorous intensity activities. Time spent in each of

walking, moderate and vigorous activities were weighted by the MET-minutes of PA (energy expended of these categories of activity).

The long IPAQ form consists of 27 questions, 7-day recall questionnaire, that covers four domains of PA, (1) Leisure time PA, (2) domestic and gardening (yard) activities, (3) Work-related PA, (4) transport-related PA. In each domain, the frequency and duration of time spent in each of the vigorous and moderate activity was recorded. The frequency and duration of walking time was included in work, transportation and leisure time domains. Activities that lasted at least 10 minutes were taken into account.

For both forms, energy expenditure from PA was calculated using the already existing formula: number of days spent doing the activity * duration of the activity per day * energy expenditure of the activity. The energy expenditure of an activity was expressed in metabolic equivalent tasks (METs), defined as the ratio of energy expenditure during an activity divided by the energy expenditure of an individual at rest (Control & Prevention, 2008). The following MET estimates were taken from the IPAQ protocol: 3.3 for walking, 3 for moderate domestic/inside chores activities, 4 for moderate PA, 5.5 for vigorous PA in the yard chores or garden, and 8 for vigorous PA (Committee, 2016).

The levels of physical activity were calculated separately for the short and long form and were classified into “low”, “moderate” and “high” according to the MET-min/week, duration of time and frequency of PA. The levels of PA were defined as follows, according to the IPAQ protocol (Committee, 2016):

- **High level:** Vigorous activity on at least 3 days and accumulating at least 1500 MET-min/week or at least 7 days of any combination of walking, moderate or vigorous intensity activities achieving at least 3000 MET-min/week.

- **Moderate level:** at least 3 days vigorous activity of at least 20 min/day or at least 5 days of moderate activity and/or walking for at least for 30 min/day or at least 5 more days of any combination of walking, moderate or vigorous activity achieving a minimum of at least 600 MET-min/week.
- **Low level:** No activity or some activity but not enough to meet the moderate or high level.

8. Assessment of Drug Adherence

The assessment of drug adherence was based on the eight-item Morisky Medication Adherence Scale (MMAS-8). In 1983, The MMAS-8 scale was developed by Dr. Morisky based on a previously validated four-item scale (Morisky et al., 1986), that was shown to give reliable and valid measure for patient with hypertension (Morisky et al., 2008). The tool consists of the following questions: (1) "do you sometimes forget to take your pill?", (2) "Thinking over the past two weeks, were there any days when you did not take your medicine for reasons other than forgetting?", (3) "have you ever cut back or stopped taking your medicine without telling your doctor because you felt worse when you took it?", (4) "when you travel or leave home, do you sometimes forget to bring along your medicine?", (5) "did you take all your medicine yesterday?", (6) "when you feel like your symptoms are under control, do you sometimes stop taking your medication?", (7) "taking medicine every day is a real inconvenience for some people, do you fell hassled about sticking to your treatment plan?", (8) "how often do you have difficulty remembering to take all your medicine?".

The total score was calculated according to an already published method, in which all items were calculated to give a score ranging from 0 to 8 for adherence. For

questions one to seven, there was a score of 1 for every “no” and 0 for every “yes” except for item 5, in which “yes” was scored as 1 and “no” was scored as 0 to avoid the “yes-saying” biases. Item 8 includes a five-point Likert response scale ranging from 0 for “all the time”, 0.25 for “usually”, 0.5 “sometimes”, 0.75 for “once in a while” and 1 for “never/rarely” (Morisky et al., 2008). The answers were summed and the scores were dichotomized into two level of drug adherence, high adherence for patients with a score of 8, otherwise non-adherent (Rehman, Siddiqui, Karim, Majeed, & Hashim, 2019). The drug adherence section was added in the amended questionnaire, therefore, patients who received the original questionnaire did not answer questions related to this section.

9. Dietary Intake Assessment

Dietary intake was assessed using a culture-specific semi-quantitative food frequency questionnaire (FFQ) that include 112 food items categorized into 16 food groups. This FFQ, has been recently validated for the assessment of nutrient intakes amongst adults in Lebanon (El Sayed Ahmad et al., 2020). The FFQ was administered during a one-on-one interview with patients admitted to AUBMC. A total of 154 patients completed the FFQ from which 5 patients were excluded due to missing dietary intake data and 20 patients were excluded given that their reported energy intake exceeded 6000Kcal per day (Hebert et al., 2002; Monteiro, 2009). The total number of patients included in the analysis was therefore 129 patients.

For each food item or beverage included in the FFQ, the frequency of consumption as reported by the individual was converted to daily intake. The Nutritionist Pro 1.2 software (Axxya Systems LLC, Stafford, TX, USA) was used for

the estimation of energy and macronutrient content. For culture-specific/traditional food items not included in the Nutritionist Pro database, recipes were added based on a local cookbook.

Energy and macronutrients were calculated per gram for each food item on the FFQ list. Individual daily energy intake was computed by summation of the respective products of the quantity consumed and the energy per gram value for each food item (Flegal, Larkin, Metzner, Thompson, & Guire, 1988). The same procedure was used to determine the daily intake of each macronutrient (Flegal & Larkin, 1990). For the study participants, percentage of energy from protein, total fat, saturated fatty acids (SFA), monounsaturated fatty acids (MUFA), polyunsaturated fatty acids (PUFA) and carbohydrates were calculated. In addition, daily intakes of cholesterol, salt and dietary fiber were determined.

Daily food group intake was also calculated, for the following:

- Fruits/day
- Vegetables/day
- Grains/day
- Protein foods/day
- Dairy products/day

a. Assessment Adherence to the AHA Recommendations

The American Heart Association (AHA) recommendations specify the recommended amount of intake for 10 food groups and 10 subgroups according to different energy intake levels ranging from 1000 calories to 3200 calories per day. Three food groups (solid fats, added sugars, unsaturated oils) and one sub-group (beans

& peas) were excluded from the current analyses due to data unavailability, yielding to a total of 16 food groups and subgroups. The intakes of food groups (fruits, vegetables, grains, protein food, dairy) in addition to whole grains and other grains were calculated in cups, or oz equivalent. The intakes of food subgroups (dark green, red, starchy and other vegetables, lean meat, fish and nuts) were calculated per cups or oz equivalent per week, multiplying the daily intake value by 7. The daily intakes of fiber and sodium were also determined in g/d. Daily intake values of food groups, subgroups and nutrients were compared to the AHA recommendations. For subjects with energy intake greater than 3200Kcal, the food group recommendations specific to the 3200kcal category were used. All the food groups and subgroups specified by the AHA recommendations were considered healthy, except for the group "other grains" (biscuits, white bread, cereals, kaak, pizza, pasta, rice etc.) that were excluded from the scoring system.

A total of 15 food groups, subgroups and nutrients were included in the scoring system. Patients were assigned a score of 1 if the consumption was equal or above the recommended value for each food group, subgroup or nutrient according to their daily energy intake. Patients were assigned a score of 0 if their consumption was below the recommended value (Van Horn, Carson, Appel, Burke, Economos, Karmally, Lancaster, Lichtenstein, Johnson, & Thomas, 2016). Only the score for sodium intake was reversed and patients were given a score of 1 for an intake equal or below the recommended amount and a score of 0 for an intake above the recommended amount. The score of all the components were summed to give a score ranging from 0 to 15, with the higher score indicating higher adherence.

b. Assessment of Adherence to the TLC Recommendations

Adherence to the Therapeutic Lifestyle Change (TLC) dietary recommendations was assessed for the study participants. A scoring system was developed based on nine components from which six components were calculated in percentage of energy intake and three micronutrient components assessed in mg/day or g/day. The percentage to total energy intake was calculated by multiplying the value of each carbohydrate, proteins and fats (in g) by 4, 4 and 9, respectively. The value obtained was divided by the daily energy intake and multiplied by 100. For each component, a score of 1 was given for meeting each of following criteria: cholesterol <200mg/d, sodium <2300mg/day, fiber ≥20g/d, total fat ≤35% of energy intake, saturated fat ≤7%, polyunsaturated fat ≥ 10%, monounsaturated fat ≥ 20%, carbohydrate ≥ 50% and ≤ 60%, and proteins between 15-25%, and 0 otherwise (Expert Panel on Detection, 2001). Each of the components were summed to give a score ranging from 0 to 9 with a higher score indicating a greater adherence to TLC diet.

C. Statistical Analysis

The collected data from all the participants were cleaned. Data analysis was conducted using the Statistical Package for Social Sciences (IBM SPSS, version 23 for Mac). Given the non-normally distributed data evaluated using the Shapiro-Wilk tests of normality, descriptive analysis was performed to portray the characteristic of the patients where median and interquartile range (IQR) were used for continuous variables and frequencies and percentages for discrete variables. Continuous variables were compared between males and females using the two independent Mann-Whitney and categorical variables using chi-square test or fisher exact test. All reported P-values

were two-sided and statistical significance was defined at the 5% level for all statistical tests. Missing data ≤ 5% were imputed to the median after stratifying by gender, age and BMI.

Dietary intake assessment was analyzed using the NutriPro Software to determine average daily energy and macronutrient intake based on different food groups. To improve the quality of the dietary data in this study, median intake of macronutrients and different food groups (fruits, vegetables, grains, protein foods, and low fat or fat-free dairy products) as well as the percentage from energy intake were computed after exclusion of outliers (>6000 or <500 Kcalories/day), yielding a sample size of 129 subjects. Higher adherence to the AHA recommendations was defined for a score equal or above 5 (≥ median) and lower adherence for a score below 5 (< median). Also, adherence to the TLC recommendations was defined for a score equal or above 3 (≥ median) and lower adherence for a score below 3 (< median) for the percentage of energy intake from total fat, SFAs, monounsaturated fat, polyunsaturated fats, proteins and carbohydrates as well as cholesterol, sodium, and fiber.

The IPAQ is an internationally accepted and validated questionnaire used to assess the level of PA undertaken across four specific domains. These domains include: leisure time PA, domestical activities, work, and transportation related PA (Sjostram et al., 2009). Categorical indicators of PA were measured, and patients were categorized into low, moderate or high PA level. The metabolic equivalents of tasks (METs), defined as the ratio of energy expenditure during an activity on the energy expenditure of an individual at rest was used to enable the categorization of patients (Jetté, Sidney, & Blümchen, 1990).

In the IPAQ, high PA was defined based on the following criteria: vigorous activity for at least three days achieving at least 1500 MET-min/week, or at least seven days of any combination of walking, moderate or vigorous activity achieving a minimum of 300 MET-min/week. Moderate activity was defined for at least three days of vigorous activity of at least 20 min/day, or at least five days of moderate activity and/or walking for at least 30 min/day, or at least 5 days of any combination of walking, moderate and vigorous activity achieving at least 600MET-min/week. Patients who were not classified in the vigorous or moderate PA level were assigned to the "low" category (Sjostram et al., 2009). Depending on the frequency distribution, PA was dichotomized into two-category variables: low to moderate level versus high level. Participants with missing data on the frequency or duration of any domain were considered non active for that specific domain.

Multiple logistic regression analyses were performed with each of the drug adherence (low/moderate versus high drug adherence), dietary adherence (low versus high), physical activity level (low/moderate versus high) as dependent variables and sociodemographic, lifestyle and psychosocial characteristics as independent variables. The independent variables included as covariates were taken from the literature on known associations with the dependent variables. Statistically significant covariates were taken as explanatory variables for the multiple logistic regression analysis where the odd ratio, and the corresponding 95% CI were used to describe the strength of these associations. Only significant results ($p<0.05$) were displayed in the tables.

Confounder variables such as crowding index, educational status, working status, housing status, income level and marital status were carefully examined in the models in order to avoid multicollinearity. The model with the lowest value of the -2

Log likelihood indicated a better fit of the data, and accordingly, the variable was either included or excluded from the model. To confirm the exclusion of the right confounders, another method was used to calculate the difference in the -2 Log likelihood between the models with and without the aforementioned variables, and the p-value of the difference was calculated. Covariates with p-value<0.05, showing a significant contribution of the covariate in explaining the total variation of the dependent variable were included in the model. A similar approach was used for the covariates governorate and site of recruitment.

CHAPTER IV

RESULTS

A. Characteristics of CVD Patients Admitted for Hospitalization in Lebanon

1. Demographic and Socioeconomic Characteristics of the Study Sample

Baseline socio-demographic characteristics are shown in Table 3 for the total study sample, as well as by gender. The sample included 367 participants of which 67.8% were males (*n*=192) and 32.2% were females (*n*=91), with a median age of 67 years ± (57-74). Patients enrolled in the study were predominantly recruited from AUBMC hospital (52.6%), resided in the North of Lebanon (43.1%) and were married (83.1%). The majority of patients were admitted for chest pain (76%) and diagnosed with ACS (52.1%). Also, the majority reported owning their house (79.8%), having enough income (82.8%), and having a crowding index ≤ 1 person/room (78.7%) reflecting a high SES. Significant differences between gender were noted in marital status, educational level and employment. The median number of children was significantly higher among female patients (median= 4, IQR of 3-6) as compared to males 3 (2-4), while the length of stay in the hospital was similar for both gender groups with a median of 2 (1-3) days.

Table 3: Sociodemographic characteristics and reason for admission of CVD patients admitted for hospitalization in Lebanon [a] (n= 367)

	Total (n=367)	**Males (n=260)**	**Females (n=107)**	**Significance [b]**
Categorical variables n (%)				
Demographic characteristics				
Marital status				
Married	305 (83.1)	235 (90.4)	70 (65.4)	**0.000**
Not married [c]	62 (16.9)	25 (9.6)	37 (34.6)	

Site of recruitment				
AUBMC	193 (52.6)	153 (58.8)	40 (37.4)	**0.000**
CHN	150 (40.9)	88 (33.8)	62 (57.9)	
Others [d]	24 (6.5)	19 (7.3)	5 (4.7)	
Governorate of residence				
Beirut	111 (30.2)	86 (33.1)	25 (23.4)	
North	158 (43.1)	96 (36.9)	62 (57.9)	**0.002**
Mount of Lebanon	76 (20.7)	62 (23.8)	14 (13.1)	
Others [e]	22 (6)	16 (6.2)	6 (5.6)	
Reason for admission [f]				
Chest pain	146 (76)	114 (74.5)	32 (82.1)	0.245
Other complaints [g]	46 (24)	39 (25.5)	7 (17.9)	
Diagnosis at discharge				
ACS	100 (52.1)	80 (52.3)	20 (51.3)	
CAD	29 (15.1)	22 (14.4)	7 (17.9)	0.848
Others [h]	63 (32.8)	51 (33.3)	12 (30.8)	
Socioeconomic characteristics				
Educational level				
Illiterate & elementary	105 (28.6)	68 (26.2)	37 (34.6)	**0.014**
Intermediate	95 (25.9)	61 (23.5)	34 (31.8)	
Secondary & university	167 (45.5)	131 (50.4)	36 (33.6)	
Employment status				
Full time employment	148 (40.3)	133 (51.2)	15 (14)	**0.000**
Part time employment	19 (5.2)	17 (6.5)	2 (1.9)	
Retired/ unemployed	200 (54.5)	110 (42.3)	90 (84.1)	
Housing status				
Owned	293 (79.8)	213 (81.9)	80 (74.8)	0.120
Not owned	74 (20.2)	47 (18.1)	27 (25.2)	
Crowing index [i]				
≤ 1 person/room	289 (78.7)	199 (76.5)	90 (84.1)	0.107
>1 person/room	78 (21.3)	61 (23.5)	17 (15.9)	
Perceived adequacy of income				0.911
Enough	304 (82.8)	215 (82.7)	89 (83.2)	
Not enough [j]	63 (17.2)	45 (17.3)	18 (16.8)	
Continuous variable, median (IQR)				
Age (years)	67 (57-74)	66 (56-74)	69 (60-76)	0.064
Number of children	3 (2-5)	3 (2-4)	4 (3-6)	**0.002**
Length of stay in the hospital (day)	2 (1-3)	2 (1-3)	2 (1-3)	0.815

Bold values indicate significant at $p < 0.05$

[a] Categorical variable are expressed as n (%), continuous variables are expressed as median ± IQR (Q1-Q3). IQR, Interquartile Range; CVD, Cardiovascular Diseases; AUBMC, American University of Beirut Medical Center; CHN, Centre Hospitalier du Nord; ACS, Acute Coronary Syndrome, CAD; Coronary Artery Disease.

[b] Significance is derived from Man-Whitney test for continuous variables and chi-square test (χ^2) for categorical variables.

[c] Not married include never married, divorced, separated, or widowed

[d] Others include Ain Wazein Hopsital (AWH) and Labib Medical Center (LMC)

[e] Others include Beqaa, Nabatiyeh and South

[f] Reason for admission were ascertained from patient's medical charts and include patients admitted for cardiac reasons to AUBMC only (n=192)

[g] Other complaints include high blood pressure, chemotherapy, stenosis, catheterization, angiography, coronary artery disease and stroke

[h] Others include high blood pressure, chest pain, stable angina, chemotherapy, catheterization, stroke and angiography.

[i] Crowding Index was calculated based on the total number of co-residents per household/ total number of rooms, excluding the kitchen, bathrooms, garage, and open balconies

[j] Not enough include 4 participants (1.1%) who declined to answer

2. Anthropometric Characteristics and Knowledge Related to Overweight and Obesity

Anthropometric characteristics are shown in Table 4 for the total study sample (*n*=367), as well as by gender. As expected, current body weight, weight one year ago, weight at 21 years, and height, were all significantly higher among males as compared to females, while no significant differences were observed for median BMI or BMI classification between genders. Overall, almost 74% of the study sample were overweight or obese. More specifically, 42.8% were overweight and close to a third (31.1%) were obese. Median WC for the total sample was of 100 (91-108) cm with 82.8% having an elevated WC according to the sex-specific Europids cut-offs. A significantly higher proportion of female patients had elevated WC (97.4%) compared to male patients (74.8%).

Table 4: Anthropometric characteristics of CVD patients admitted for hospitalization in Lebanon [a] (n= 367)

	Total [b] (n=367)	**Males (n=260)**	**Females (n=107)**	**Significance [c]**
Anthropometric characteristics, median (IQR)				
Current weight (kg)	78 (69-89)	82 (72-92)	69 (63-77)	**0.000**
Weight history (kg)				
Weight one year ago	80 (70-90)	82 (74-92)	72 (62-80)	**0.000**
Weight at 21 years old	70 (65-80)	75 (69-80)	64 (55-70)	**0.000**
Height (cm)	168 (161-173)	170 (167-175)	160 (156-165)	**0.000**
Current BMI (kg/m^2)	27.5 (25-31.1)	27.7 (25.1-31.2)	27.3 (24.6-30.1)	0.221
WC (cm)	100 (91-108)	101 (92-111)	94.5 (90-105)	**0.003**
BMI classification [d] (kg/m^2), n (%)				0.236
Normal [e]	95 (25.9)	63 (24.2)	32 (29.9)	
Overweight	157 (42.8)	109 (41.9)	48 (44.9)	
Obese	115 (31.3)	88 (33.8)	27 (25.2)	
WC classification [f] (cm), n (%)				**0.000**
Normal	37 (17.2)	35 (25.2)	2 (2.6)	
Elevated	178 (82.8)	104 (74.8)	74 (97.4)	

Bold values indicate significant at $p < 0.05$

[a] Categorical variable are expressed as n (%), continuous variables are expressed as median ± IQR (Q1-Q3). IQR, Interquartile Range. CVD, Cardiovascular diseases; Kg; Kilograms; kg/m^2, Kilograms square Meter; cm, centimeters; WC, Waist Circumference; BMI, Body Mass Index.

[b] Values may not add up to the original sample size because of missing values.

[c] Significance is derived from Man-Whitney test for continuous variables and chi-square test (χ^2) for categorical variables.

[d] Underweight is defined for a BMI <18.5kg/m^2, normal weight is defined for a BMI 18.5-24.9kg/m^2, overweight for a BMI 25-29.9kg/m^2 and obese for a BMI ≥30kg/m^2 according to the World Health Organization recommendation for adult population (WHO, 2000).

[e] Normal weight include 2 participants (0.5%) who were underweight.

[f] Elevated WC is defined by a circumference ≥ 94 cm for males and ≥80 cm for females according to the Europids cut-off (Zimmet, 2005).

Knowledge related to overweight and obesity prevention are shown in Table 5 for the total study sample (*n*=367), as well as by gender. The proportions of patients

who reported avoiding sweet drinks, avoiding fatty foods, eating smaller portions, or increasing physical activity level as ways to prevent overweight and obesity were low, being estimated at 8.4%, 15.8%, 16.3%, and 7.9%, respectively. The proportion of males who reported eating smaller portions to prevent overweight and obesity was significantly higher (19.2%) compared to females (9.3%). Overall, 13.4% mentioned that it is normal to gain weight with age, while 27.6% mentioned otherwise, and more than half (59%) did not know whether it is normal to gain weight with age. While most of the patients (66%) perceive themselves as normal weight, almost 11% perceive themselves as obese and 24% as overweight. However, 24% of the patients who perceived themselves as overweight were males and 14% who perceived themselves as obese were females.

Table 5: Knowledge related to overweight and obesity prevention among CVD participants [a] (n=367)

	Total (n= 367)	**Males (n= 260)**	**Females (n=107)**	**Significance [b]**
Best way to prevent obesity, n (%)				
Avoid sweet drinks				
Yes	31 (8.4)	25 (9.6)	6 (5.6)	0.21
No	336 (91.6)	235 (90.4)	101 (94.4)	
Avoid fatty food				
Yes	58 (15.8)	47 (18.1)	11 (10.3)	0.063
No	309 (84.2)	213 (81.9)	96 (89.7)	
Eat smaller portions				
Yes	60 (16.3)	50 (19.2)	10 (9.3)	**0.020**
No	307 (83.7)	210 (80.8)	97 (90.7)	
Increase PA level				
Yes	29 (7.9)	25 (9.6)	4 (3.7)	0.058
No	338 (92.1)	235 (90.4)	103 (96.3)	
Normal to gain weight with age [c]				

Yes	38 (13.4)	24 (12.5)	14 (15.4)	0.793
No	78 (27.6)	54 (28.1)	24 (26.4)	
I Don't know	167 (59)	114 (59.4)	53 (58.2)	

Bold values indicate significant at $p < 0.05$

[a] Categorical variable are expressed as n (%); CVD, Cardiovascular Diseases; PA, Physical Activity

[b] Significance is derived from chi-square test (χ^2).

[c] Number of patients included in this variable is 283, only patients who were asked the amended questionnaire

3. Medical History and Biochemical Characteristics of the Study Sample

The medical history of the patients is shown in **Error! Reference source not found.**, for the total sample (*n*=367), and by gender. The proportions of patients who reported a family history of CVD was estimated at 14.2% with no significant differences between genders. Overall, almost 34% of the sample had a previous diagnosis of DMT2 and 48% had a previous diagnosis of elevated cholesterol levels. Gender differentials were observed for HBP with a significantly higher proportion among females (72%) than males (56.5%).

Table 6: Medical history of CVD patients admitted for hospitalization in Lebanon [a] (n=367)

	Total (n= 367)	**Males (n=260)**	**Females (n=107)**	**Significance [b]**
n (%)				
Family history of CVD				
Yes	52 (14.2)	39 (15)	13 (12.1)	0.477
No	315 (85.8)	221 (85)	94 (87.9)	
Previous diagnosis of DT2M				0.178
Yes	125 (34.1)	83 (31.9)	42 (39.3)	
No	242 (65.9)	177 (68.1)	65 (60.7)	
Previous diagnosis of Elevated cholesterol				0.602
Yes	174 (47.4)	121 (46.5)	53 (49.5)	
No	193 (52.6)	139 (53.5)	54 (50.5)	

Previous diagnosis of HBP				**0.006**
Yes	224 (61)	147 (56.5)	77 (72)	
No	143 (39)	113 (43.5)	30 (28)	

Bold values indicate significant at $p < 0.05$

[a] Categorical variable are expressed as n (%). CVD, Cardiovascular Diseases; DT2M: Diabetes Mellitus Type 2; HBG, High Blood Glucose; HBP, High Blood Pressure.

[b] Significance is derived from chi-square test (χ^2).

[c] Significance is derived from fisher exact test.

Biochemical data was collected from a total of 193 patients (153 males and 40 females) who were admitted for hospitalization at AUBMC (Table 7). Median values for BUN, eGFR at admission and discharge, as well as glucose, HbA1c, and SBG were almost equal between males and females with no statistical difference found between genders. However, median creatinine levels at admission and discharge, and median DBP were significantly higher among males compared to females. Additionally, median values for HDL-C were significantly higher among females 48.5 ± (38-53) mg/dl than males 38 ± (30-47) mg/dl.

Table 7: Biochemical characteristics of CVD patients admitted for hospitalization at AUBMC [a] (n=193)

	Total (n= 193)	**Males (n=153)**	**Females (n=40)**	**Significance [b]**
Biomarkers collected [c, d] median (IQR)				
At hospital admission				
Glucose (mg/dL)	121 (101-152)	121 (100.5-152)	119 (102-165.7)	0.937
Creatinine (mg/dL)	0.9 (0.8-1.2)	0.95 (0.8-1.2)	0.7 (0.6-1)	**0.000**
eGFR (mL/min)	84 (60-95)	84 (61-95)	83 (54-98)	0.837
BUN (mg/dL)	17 (14-23)	17 (14-23)	16 (13-25)	0.896
SBP (mmHg)	130 (119-141)	129 (119-141)	131 (119-143)	0.488
DBP (mmHg)	71 (62-80)	71 (64.5-80.5)	67 (57-76.5)	**0.014**
During hospital stay/ discharge				
Creatinine (mg/dL)	0.9 (0.8-1.1)	1 (0.9-1.1)	0.8 (0.6-1)	**0.000**
eGFR (mL/min)	82 (64-94)	84 (65-94)	78 (51-100)	0.422

BUN (mg/dL)	16 (13-21)	17 (13-21)	15 (13-22)	0.739
HbA1c (%)	6 (5.5-7)	6 (5.5-7)	6 (5.4-6.8)	0.736
Lipid profile (mg/dl)				
HDL-C	38.5 (31-49)	38 (30-47)	48.5 (38-53)	**0.002**
LDL- C	105 (83-138)	104 (83-140)	115 (83-134)	0.718
TC	167.5 (143-204)	161 (140-202)	178 (155-213)	0.168
Chol/HDL	4.3 (3.4-5.6)	4.4 (3.5-6)	3.9 (3.1-5.1)	0.178
TG	145 (100-221)	147 (99-220)	140 (116.5-227)	0.837

Bold values indicate significant at $p < 0.05$

[a] Continuous variable are expressed as median ± IQR (Q1-Q3). IQR, Interquartile Range; AUBMC, American University of Beirut

[b] Significance is derived from Man-Whitney test.

[c] Values may not add up to the original sample size because of missing values.

[d] HbA1c, Glycated Hemoglobin; eGFR, Estimated Glomerular Filtration Rate; BUN, Blood Urea Nitrogen; SBP, Systolic Blood Pressure; DBP, Diastolic Blood Pressure; HDL-C, High Density Lipoproteins Cholesterol; LDL-C, Low Density Lipoproteins Cholesterol; TC, Total Cholesterol; Chol/HDL, Cholesterol Ratio; TG, Triglyceride; mg, milligrams; min, minutes; dl; deciliter; mL, milliliter; mmHg, millimeter of mercury.

4. Psychosocial Characteristics of the Study Sample

The psychometric properties of the Three-Item Loneliness Scale are shown in Table 8 for the total sample (n=367), as well as by gender. Overall, more than half of the study participants reported hardly ever or never lacking companionship (61%) or feeling lonely (62.1%) while 42.8% reported to have people they can talk to, with significant differences found between genders. The score of the three-item loneliness scale revealed that 34.3% of the patients were classified as “lonely”, with a significantly greater proportion of females (45.8%) compared to males (29.6%). In comparison to males, females also reported having a close relationship with a significantly smaller number of friends and family members.

Table 8: Psychosocial characteristics of the study subjects as assessed by the three-items loneliness scale [a] (n=367).

	Total (n=367)	**Males (n=260)**	**Females (n=107)**	**Significance [b]**
Psychosocial characteristics				
Categorical variable, n (%)				
Lack companionship				
Often	19 (5.2)	16 (6.2)	3 (2.8)	**0.000**
Some of the time	124 (33.8)	70 (26.9)	54 (50.5)	
Hardly ever or never	224 (61)	174 (66.9)	50 (46.7)	
Feeling lonely				
Often	17 (4.6)	14 (5.4)	3 (2.8)	**0.004**
Some of the time	122 (33.2)	73 (28.1)	49 (45.8)	
Hardly ever or never	228 (62.1)	173 (66.5)	55 (51.4)	
Feel there are people you can talk to				**0.000**
Often	157 (42.8)	131 (50.4)	26 (24.3)	
Some of the time	105 (28.6)	62 (23.8)	43 (40.2)	
Hardly ever or never	105 (28.6)	67 (25.8)	38 (35.5)	
Loneliness scale [c]				
Lonely	126 (34.3)	77 (29.6)	49 (45.8)	**0.003**
Not lonely	241 (65.7)	183 (70.4)	58 (54.2)	
Continuous variable, median (IQR)				
Number of children with close relationship [d]	3 (2-3)	3 (2-3)	2 (2-3)	0.153
Number of family members with close relationship	2 (1-6)	3 (1-7)	2 (1-5)	**0.000**
Number of friends with close relationship	2 (1-5)	2 (1-5)	1 (1-2)	**0.000**

Bold values indicate significant at $p < 0.05$

[a] Categorical variable are expressed as n (%), continuous variables are expressed as median ± IQR (Q1-Q3). IQR, Interquartile Range

[b] Significance is derived from Man-Whitney test for continuous variables and chi-square test (χ^2) for categorical variables.

[c] Loneliness was assessed using the three-item loneliness scale. The questions were retrieved from the long scale version of the UCLA loneliness scale. Lonely is defined for a score of 6 to 9 points and not lonely is defined for a score of 3 to 5 points (D. W. Russell, 1996).

[d] 32 participants (8.7%) were excluded for not having children

The results of the WHO-5 items questionnaire to detect depressive symptoms are shown in Table 9 for the total sample (n=283 who received the amended questionnaire), and by gender. Overall, less than a third of subjects reported to be happy (25.1%), calm and peaceful (32.1%) for most or all of the time, with significant differences between genders. In the study sample, almost one in four subjects was found to be at a high risk of mental health problems with no significant differences between males and females.

Table 9: Assessment of mental health status amongst CVD patients based on the WHO five items questionnaire [a] (n=283)

WHO-5 items n (%)	**Total (n= 283)**	**Males (n= 192)**	**Females (n= 91)**	**Significance [b]**
Been a happy person				
None of the time	18 (6.4)	15 (7.8)	3 (3.3)	**0.012**
A little of the time	43 (15.2)	35 (18.2)	8 (8.8)	
Some of the time	49 (17.3)	38 (19.8)	11 (12.1)	
Good bit of the time	102 (36)	64 (33.3)	38 (41.8)	
Most of the time	63 (22.3)	34 (17.7)	29 (31.9)	
All of the time	8 (2.8)	6 (3.1)	2 (2.2)	
Felt calm and peaceful				
None of the time	18 (6.4)	14 (7.3)	4 (4.4)	**0.008**
A little of the time	41 (14.5)	35 (18.2)	6 (6.6)	
Some of the time	50 (17.7)	39 (20.3)	11 (12.1)	
Good bit of the time	83 (29.3)	46 (24)	37 (40.7)	
Most of the time	83 (29.3)	53 (27.6)	30 (33)	
All of the time	8 (2.8)	5 (2.6)	3 (3.3)	
Been very nervous				
None of the time	22 (7.8)	15 (7.8)	7 (7.7)	0.457
A little of the time	70 (24.7)	43 (22.4)	27 (29.7)	
Some of the time	85 (30)	55 (28.6)	30 (33)	
Good bit of the time	39 (13.8)	27 (14.1)	12 (13.2)	
Most of the time	45 (15.9)	35 (18.2)	10 (11)	
All of the time	22 (7.8)	17 (8.9)	5 (5.5)	
Felt downhearted and blue				
None of the time	75 (26.5)	58 (30.2)	17 (18.7)	0.207
A little of the time	109 (38.5)	68 (35.4)	41 (45.1)	
Some of the time	31 (11)	18 (9.4)	13 (14.3)	

Good bit of the time	30 (10.6)	22 (11.5)	8 (8.8)	
Most of the time	26 (9.2)	19 (9.9)	7 (7.7)	
All of the time	12 (4.2)	7 (3.6)	5 (5.5)	
Felt so down that nothing cheers you up				
None of the time	139 (49.1)	106 (55.2)	33 (36.3)	
A little of the time	63 (22.3)	33 (17.2)	30 (33)	
Some of the time	20 (7.1)	9 (4.7)	11 (12.1)	**0.001**
Good bit of the time	24 (8.5)	19 (9.9)	5 (5.5)	
Most of the time	28 (9.9)	21 (10.9)	7 (7.7)	
All of the time	9 (3.2)	4 (2.1)	5 (5.5)	
Risk of mental health problems [c]				0.261
High risk	71 (25.1)	52 (27.1)	19 (20.9)	
Low risk	212 (74.9)	140 (72.9)	72 (79.1)	

Bold values indicate significant at $p < 0.05$

[a] Categorical variable are expressed as n (%). Values from participants who received the amended questionnaire.

[b] Significance is derived from chi-square test (χ^2).

[c] Mental health status was assessed using the WHO-5 item validated questionnaire that includes 5 items to detect depressive symptoms among Lebanese older adults (Abla Sibai, 2009). A decreased sense of well-being was defined for any score < 13 points and an increased sense of well-being is was defined for any score ≥ 13 points.

5. Lifestyle Characteristics

Lifestyle characteristics of the study sample are presented in Table 10 for the total sample (n=367), and by gender. Overall, the majority of the study sample were current (32.4%) or former (29.7%) cigarette smokers, with a significant difference between genders. Among those who were current cigarette smokers, more than forty percent (43.3%) reported smoking at least 25 cigarettes per day. Conversely, only 8.2% reported being current waterpipe smokers, from which 30% were daily smokers. Over half of the study population reported to eat in front of the TV or in a restaurant at least once in a week. Additionally, almost forty percent (39.6%) of the patients with a current job reported to eat on the desk at work for at least once a week and 22.7% reported eating on the go with a statistically significant difference between genders. Besides,

more than half of the study participants (52%) had a low level of PA while 18.3% had a high level, with significant difference found between males and females.

Table 10: Lifestyle characteristics of CVD patients admitted for hospitalization in Lebanon [a] (n=367)

	Total [b] (n=367)	**Males (n=260)**	**Females (n=107)**	**Significance [c]**
Lifestyle characteristics, n (%)				
Cigarette smoking status				**0.000**
Current smoker	119 (32.4)	95 (36.5)	24 (22.4)	
Former smoker	109 (29.7)	87 (33.5)	22 (20.6)	
Never smoked	139 (37.9)	78 (30)	61 (57)	
Number of cigarette smoked/day for current smokers				0.201
1-14	22 (18.3)	19 (19.8)	3 (12.5)	
15-24	46 (38.3)	33 (34.4)	13 (54.2)	
25+	52 (43.3)	44 (45.8)	8 (33.3)	
Waterpipe smoking status				
Current smoker	30 (8.2)	24 (9.2)	6 (5.6)	0.466
Former smoker	16 (4.4)	12 (4.6)	4 (3.7)	
Never smoked	321 (87.5)	224 (86.2)	97 (90.7)	
Number of times smoking waterpipe/week for current smokers				0.541[d]
≤ 2 times	14 (46.7)	10 (41.7)	4 (66.7)	
3-6 times	7 (23.3)	6 (25)	1 (16.7)	
Daily	9 (30)	8 (33.3)	1 (16.7)	
Eat in front of the TV (times/week)				
Never	146 (40.6)	108 (42.7)	38 (35.5)	0.414
1-4	164 (45.6)	110 (43.5)	54 (50.5)	
5+	50 (13.9)	35 (13.8)	15 (14)	
Eat at work, on the desk [e] (times/week)				
Never	98 (60.5)	92 (64.3)	6 (31.6)	**0.015[d]**
1-4	61 (37.7)	49 (34.3)	12 (63.2)	
5+	3 (1.9)	2 (1.4)	1 (5.3)	
Eat in a restaurant [f] (times/week)				0.208[d]
Never	39 (45.3)	30 (42.9)	9 (56.3)	

1-4	43 (50)	38 (54.3)	5 (31.3)	
5+	4 (4.7)	2 (2.9)	2 (12.5)	
Eat on the go (times/week)				
Never	263 (77.4)	173 (73)	90 (87.4)	**0.022[d]**
1-4	73 (21.5)	61 (25.7)	12 (11.7)	
5+	4 (1.2)	3 (1.3)	1 (1)	
Eat fast food [f] (times/week)				
Never	69 (80.2)	56 (80)	13 (81.3)	0.813[d]
1-4	17 (19.8)	14 (20)	3 (18.8)	
5+	0	0	0	
Physical activity levels [g]				
Low	191 (52)	118 (45.4)	73 (68.2)	**0.000**
Moderate	109 (29.7)	84 (32.3)	25 (23.4)	
High	67 (18.3)	58 (22.3)	9 (8.4)	

Bold values indicate significant at $p < 0.05$

[a] Categorical variable are expressed as n (%). CVD, Cardiovascular Diseases.

[b] Values may not add up to the original sample size because of missing data.

[c] Significance is derived from chi-square test (χ^2) for categorical variables.

[d] Significance is derived from fisher exact test.

[e] Results from participants who reported to have a full time or a part-time job.

[f] Results from participants who were asked the original questionnaire only.

[g] Physical activity levels were assessed using the short and long form of the International Physical Activity Questionnaire (IPAQ) (Committee, 2016).

6. Drug Adherence Amongst the Study Sample

Drug adherence levels of the study sample are shown in table 11 for the total sample (n=271 who received the amended questionnaire), and by gender. Overall, the majority of the patients were adherent to their prescribed drugs as assessed by the eight-item medication adherence scale, with no significant difference between genders. From the total sample, 27.3% were classified as having low adherence, while 31% were classified as having high adherence to their prescribed medications, with no significant difference between genders.

Table 8: Assessment of drug adherence amongst CVD patients based on the 8-item medication adherence scale [a] (n= 271).

	Total (n= 271)	Males (n= 181)	Females (n= 90)	Significance [b]
Drug adherence, n (%)				
Forget to take pill in the past two weeks				0.976
Yes	90 (33.2)	60 (33.1)	30 (33.3)	
No	181 (66.8)	121 (66.9)	60 (66.7)	
Did not take the pill in the past two weeks for other reasons				0.260
Yes	46 (17)	34 (18.8)	12 (13.3)	
No	225 (83)	147 (81.2)	78 (86.7)	
Stopped medication on your own				0.070
Yes	16 (5.9)	14 (7.7)	2 (2.2)	
No	255 (94.1)	167 (92.3)	88 (97.8)	
Forget your medicine when you leave home or travel				0.267
Yes	106 (39.1)	75 (41.4)	31 (34.4)	
No	165 (60.9)	106 (58.6)	59 (65.6)	
Took all medicines yesterday				0.374
Yes	224 (82.7)	147 (81.2)	77 (85.6)	
No	47 (17.3)	34 (18.8)	13 (14.4)	
Stop taking medication if the symptoms are under control				0.420
Yes	30 (11.1)	22 (12.2)	8 (8.9)	
No	241 (88.9)	159 (87.8)	82 (91.1)	
Feel hassled about sticking to the treatment plan				0.243
Yes	33(12.2)	25 (13.8)	8 (8.9)	
No	238 (87.8)	156 (86.2)	82 (91.1)	
Have difficulties remembering to take all your medicine				0.136[c]
Never/rarely	174 (64.2)	116 (64.1)	58 (64.4)	
Once in a while	44 (16.2)	26 (14.4)	18 (20)	

Sometimes	48 (17.7)	34 (18.8)	14 (15.6)	
Usually	5 (1.8)	5 (2.8)	0 (0)	
All the time	0 (0)	0 (0)	0 (0)	
Drug adherence levels [d]				
Low adherence	74 (27.3)	54 (29.8)	20 (22.2)	
Moderate adherence	113 (41.7)	77 (42.5)	36 (40)	0.186
High adherence	84 (31)	50 (27.6)	34 (37.8)	

[a] Categorical variable are expressed as n (%); CVD, Cardiovascular Diseases. Results based on participants who were asked the amended questionnaire and reported to take at least one medication.
[b] Significance is derived from chi-square test (χ^2).
[c] Significance is derived from fisher exact test.
[d] Drug adherence was assessed using the validated Morisky Medication Adherence Scale- 8 (MMAS-8). Low adherence is defined as sum score <6 points, moderate adherence for a score of 6 or 7 points and high adherence for a score of 8 (Morisky et al., 2008).

7. Diet Adherence Amongst the Study Sample

Usual macronutrients and food groups intakes of the study sample are listed in Table 12, for patients admitted for hospitalization at AUBMC (n=129). The table was not segregated by gender since only one woman completed the FFQ. Median energy intake was estimated at 3342 Kcal. Overall, participants consumed 43.5% of their energy intake from total fats, with a higher percentage of monounsaturated (18.8%) and saturated fats (10.96%), compared to PUFAs (8%). The percentage of energy intake from carbohydrates was estimated at 42.2%, while that of protein was estimated at 13.5%.

On average, participants consume 1.5 cups of fruits and 1.3 cups of vegetables per day. For the subtypes of vegetables, the lowest consumption was observed for dark green vegetables (0.11 cups/week). Amongst the grain food groups, the overall consumption of whole grains was almost six-fold lower than that of "other" grains. For the protein food groups, the consumption of lean meat, poultry, and eggs was the highest (30.3 oz/week) while the intake of fish was the lowest (2.3 oz/week). A weekly

intake of 22.1 oz was observed for nuts, seeds, and legumes. The participants consumed on average less than half a cup of fat-free or low-fat milk per day and had a high sodium intake.

Table 12: Usual macronutrient and food groups intake amongst CVD patients admitted for hospitalization at AUBMC [a] (n=129)

Variables	**Total (n= 129)**	
Macronutrients	Median (IQR)	Median percent from EI
Energy (Kcal/d)	3342 (2713-3983)	-
Proteins (g/d)	110.6 (90.6-137.4)	13.5 (12.2-15.1)
Carbohydrate (g/d)	337.5 (261.8-427.2)	42.2 (36.7-46.6)
Total fats (g/d)	162.2 (133-190.5)	43.5 (38.7-48.4)
Saturated fat (g)	40 (29-53.2)	10.96 (9-12.9)
Polyunsaturated fat (g)	32 (23.6-41.5)	8 (6.2-11.2)
Monounsaturated fat (g)	70.3 (56.4-86.8)	18.8 (15.9-21.5)
Cholesterol (mg/d)	274.6 (193-388)	-
Sodium (mg/d)	2765 (2107-3382)	-
Total dietary fiber (g/d)	34.1 (25.5-44.2)	-
Total sugar (g/d)	103.7 (75-134)	-
Food groups		
Fruits (cups/d)	1.5 (1-2)	
Vegetables (cups/d)	1.3 (1-2.6)	
Dark green vegetables (cups/w)	0.11 (0.11-0.23)	
Red vegetables (cups/w)	3.1 (2.4-7.7)	
Starchy vegetables (cups/w)	0.53 (0.2-1.6)	
Other vegetables [b] (cups/w)	4.5 (4.1-10.4)	
Grains (oz eq/d)	13.1 (9.3-18.2)	
Whole grains	1.3 (0.4-5.8)	
Other grains [c]	8.33 (5.7-14.5)	
Protein's food (oz eq/d)	8 (6-11.4)	
Lean meat, poultry, eggs (oz eq/w)	30.3 (24.1-39.6)	
Fish (oz eq/w)	2.3 (1-5)	
Nuts, seeds, legumes (oz eq/w)	22.1 (11.7-37)	
Fat-free or low-fat dairy (cups/d)	0.44 (0.2-1.1)	

[a] Continuous variable are expressed as median ± IQR (Q1-Q3). IQR, interquartile range; EI: Energy Intake; CVD; Cardiovascular Diseases; AUBMC, American University of Beirut; Kcal, Kilocalories; g, gramme; mg, milligrams; d, day; w, week; Oz eq, Ounce equivalent.
[b] Other vegetables include cauliflower, green salad, canned vegetables, vegetable juices and zucchini eggplant

[c] Other grains include biscuits, white breads, kaak, kishek, manaeesh, pasta, pizza, white rice and toast

Adherence to the AHA dietary recommendations for food groups, subgroups, and nutrients are presented in Table 13. The results showed that most of the patients were not adherent to the recommendations of fruits, vegetables, dark green vegetables, red vegetables, starchy vegetables, other vegetables, whole grains, lean meat, poultry and eggs, fish, and low-fat or fat-free dairy. However, the majority of the participants were adherent to recommendations pertinent to other grains, protein foods, and nuts. For nutrient intake, only 22.5% and 31.8% were adherent to dietary fibers and sodium, respectively. Overall, 57.4% were adherent to the AHA dietary recommendations for achieving a score ≥ 5 (median), while 42.6% were classified otherwise.

Table 9: Adherence to food groups and nutrient recommendation as specified by the American Heart Association [a] (n=129)

Food groups, subgroups and nutrients, n (%)	**Total (n= 129)**	**Food groups, subgroups and nutrients, n (%)**	**Total (n=129)**
Fruits		**Other grains**	
Adherent	25 (19.4)	Adherent	110 (85.3)
Non-adherent	104 (80.6)	Non-adherent	19 (14.7)
Vegetables		**Protein foods**	
Adherent	5 (3.9)	Adherent	90 (69.8)
Non-adherent	124 (96.1)	Non-adherent	39 (30.2)
Dark green vegetables		**Lean meat, poultry, eggs**	
Adherent	1 (0.8)	Adherent	62 (48.1)
Non-adherent	128 (99.2)	Non-adherent	67 (51.9)
Red vegetables		**Fish**	
Adherent	49 (38)	Adherent	19 (14.7)
Non-adherent	80 (62)	Non-adherent	110 (85.3)
Starchy vegetables		**Nuts, seeds, legumes**	
Adherent	0	Adherent	121 (93.8)
Non-adherent	129 (100)	Non-adherent	8 (6.2)
Other vegetables		**Low-fat or fat-free dairy**	
Adherent	55 (42.6)	Adherent	4 (3.1)

Non-adherent	74 (57.4)	Non-adherent	125 (96.9)
Grains		**Fiber**	
Adherent	108 (83.7)	Adherent	29 (22.5)
Non-adherent	21 (16.3)	Non-adherent	100 (77.5)
Whole grains		**Sodium**	
Adherent	42 (32.6)	Adherent	41 (31.8)
Non-adherent	87 (67.4)	Non-adherent	88 (68.2)
Adherence to the AHA recommendation [b]			
Adherent (≥ median)	74 (57.4)		
Non-adherent (< median)	55 (42.6)		

[a] Categorical variable are expressed as n (%).
[b] Adherence to food groups, subgroups and nutrient intake were assessed based on the American Heart Association recommendations. Adherence to the recommendations was assessed for any score ≥ 6 points and non-adherence for any score <6 points (Van Horn, Carson, Appel, Burke, Economos, Karmally, Lancaster, Lichtenstein, Johnson, & Thomas, 2016).

Table 14 represents the proportion of patients' adherent to TLC diet and its components amongst the study sample (*n*=129). The results revealed that only 4.7% were adherent to saturated fatty acid recommendations, 34.1% were adherent to polyunsaturated fat, and 39.5% were adherent to monounsaturated fat recommendations. Less than thirty percent of the participants were adherent to the recommendations dietary range for macronutrients (carbohydrates, proteins, and total fat). While less than one third of the patients were adherent to cholesterol and sodium recommendations, more than ninety percent were adherent to dietary fibers. Overall, 55% were adherent to TLC diet for achieving a score of ≥ 3 (≥ median), whereas 45% were classified otherwise.

Table 10: Adherence to TLC diet among participants admitted for hospitalization at AUBMC [a] (n=129)

Adherence to TLC diet and its components	**Total n (%)**
Percentage of energy intake [b]	
Total fat ≤ 35%	16 (12.4)

Saturated fat ≤ 7%	6 (4.7)
Polyunsaturated fat ≥ 10%	44 (34.1)
Monounsaturated fat ≥ 20%	51 (39.5)
Carbohydrate ≥ 50% and ≤ 60%	13 (10.1)
Proteins ≥ 15 and ≤ 25%	34 (26.4)
Micronutrients	
Cholesterol < 200mg/d	35 (27.1)
Sodium< 2300mg/d	39 (30.2)
Fiber ≥ 20 g/d	118 (91.5)
Adherence to TLC diet	
Adherent (≥ median)	71 (55)
Non-adherent (< median)	58 (45)

[a] Categorical variable are expressed as n (%); TLC, Therapeutic Lifestyle Change; AUBMC, American University of Beirut; mg, milligrams; d, day; g, grams.
[b] Normal range of macronutrients and micronutrients were based on the TLC classification. The normal range for total fat is 25-35%; saturated fat <7%; polyunsaturated fat ≥ 10%; monounsaturated fat ≥ 20%; carbohydrate 50-60% protein 15-25%; cholesterol <2000mg/d; sodium <2300mg/d; fiber 20-30g/d (Expert Panel on Detection, 2001).
[c] Adherent to TLC diet was defined for any score ≥ 3 points and non-adherence was defined for any score < 3 points.

B. Associations of Sociodemographic, Psychosocial and Lifestyle Characteristics with Drug Adherence, Diet Adherence and Physical Activity Level with

1. Sociodemographic, Lifestyle, and Psychosocial Characteristics in relation with Drug Adherence

Socio-demographic, lifestyle and psychosocial characteristics are presented in Table 15, stratified by levels of drug adherence. The results showed that the majority of patients who were adherent to drugs were recruited from hospitals other than AUBMC and were not Beirut residents. Also, high drug adherence was predominant amongst patients with low risk of mental health problems, who reported to own their house and perceived that they had an adequate household income. However, smokers were significantly less likely to be adherent to their prescribed drugs.

Table 16 shows the association between drug adherence with sociodemographic, lifestyle and psychosocial characteristics using the multiple logistic regression model. The odd ratio and its corresponding 95% CI were used to assess the strength of the association. In the multivariate model, patients admitted to hospitals other than AUBMC had 40 times higher odds of being adherent to their prescribed medication when compared to patients admitted to AUBMC (OR= 40.7; 95% CI 11.35-146). Also, patients who perceived that they had an adequate household income were significantly more likely to have high drug adherence (OR= 3.08; 95% CI 1.1-8.7), while subjects with loneliness were significantly less likely to have high adherence (OR= 0.4; 95% CI 0.21-0.8). However, smoking status, governorate of residence, risk of mental health and housing status were no longer significant predictors for drug adherence after the adjustment for potential confounders.

Table 11: Drug adherence among CVD patients admitted for hospitalization in Lebanon, across various sociodemographic and lifestyle, and psychosocial characteristics [ab] (n=271)

Variables, n (%)	**Low to moderate drug adherence (n=187)**	**High drug adherence (n=84)**	**Significance [c]**
Site of recruitment			
AUBMC	100 (53.5)	4 (4.8)	**P= 0.000**
Others [e]	87 (46.5)	80 (95.2)	
Age			
<60	54 (28.9)	25 (29.8)	P= 0.882
≥ 60	133 (71.1)	59 (70.2)	
Gender			
Male	131 (70.1)	50 (59.5)	P= 0.089
Female	56 (29.9)	34 (40.5)	
BMI			
Normal	45 (24.1)	27 (32.1)	P= 0.164
O/O	142 (75.9)	57 (67.9)	
Perceived Income status			
Enough	157 (84)	78 (92.9)	**P= 0.046**

Not enough	30 (16)	6 (7.1)	
Employment status			
Full time	78 (41.7)	26 (31)	P= 0.092
Part time/ unemployed	109 (58.3)	58 (69)	
Educational level			
Intermediate or less	105 (56.1)	57 (67.9)	P= 0.069
Secondary or university	82 (43.9)	27 (32.1)	
Marital status			
Married	153 (81.8)	70 (83.3)	P= 0.763
No married	34 (18.2)	14 (16.7)	
Governorate			
Beirut	57 (30.5)	5 (6)	**P= 0.000**
Others [f]	130 (69.5)	79 (94)	
House status			
Owned	144 (77)	75 (89.3)	**P= 0.018**
Not owned	43 (23)	9 (10.7)	
Smoking status			
Smokers [g]	131 (70.1)	48 (57.1)	**P= 0.038**
Nonsmokers	56 (29.9)	36 (42.9)	
Loneliness scale			
Lonely	74 (39.6)	36 (43.9)	P= 0.506
Not lonely	113 (60.4)	46 (56.1)	
Crowding index			
≤ 1 person	152 (81.3)	62 (73.8)	P= 0.163
>1 person	35 (18.7)	22 (26.2)	
Physical Activity level			
Low/moderate	97 (51.9)	47 (56)	P= 0.534
High	90 (48.1)	37 (44)	
Mental health level			
High risk	60 (32.1)	8 (9.5)	**P= 0.000**
Low risk	127 (67.9)	76 (90.5)	
Adherence to AHA recommendations			P= 0.281[d]
Adherent	48 (64)	1 (33.3)	
Non-adherent	27 (36)	2 (66.7)	
Adherence to TLC diet			
Adherent	52 (69.3)	2 (66.7)	P= 0.922[d]
Non-adherent	23 (30.7)	1 (33.3)	

Bold values indicate significant at $p < 0.05$

[a] Categorical variable are expressed as n (%): frequency and percentage within column. Results from patients who received the amended questionnaire. CVD, Cardiovascular Diseases; O/O, Overweight/Obese; AHA, American Heart Association; TLC, Therapeutic Lifestyle Change.

[b] Drug adherence was assessed based on the eight-item Morisky Medication Adherence Scale

(Morisky et al., 2008).
[c] Significance is derived from chi-square test (χ^2).
[d] Significance is derived from fisher exact test and based on a total n=78
[e] Others include Ain Wazein hospital (AWZ), Labib Medical Center (LMC), Centre Hospitalier du Nord (CHN)
[f] Others include North, Mount of Lebanon, Beqaa, Nabatiyeh and South
[g] Smokers include current and former smokers

Table 12: Association of sociodemographic, lifestyle, and psychosocial characteristics with drug adherence among CVD patients as assessed by multiple logistic regression * (n=271)

	Adherence to drug (low/moderate vs high)		
Variables	**OR**	**95% CI**	**Significance [a]**
Site of recruitment			0.000
AUBMC	1 [ref]		
Others [b]	40.7	11.35-146	
Loneliness level			0.008
Not lonely	1 [ref]		
Lonely	0.4	0.21-0.8	
Perceived Income status			0.034
Not enough	1 [ref]		
Enough	3.08	1.1-8.7	

All the sociodemographic, lifestyle and psychosocial variables were run in one multivariate logistic model. Crude logistic regression was conducted with the outcome variable being "moderate" and "low" combined. OR, odds ratio for high drug adherence vs low/moderate drug adherence; CI, Confidence Intervals; Ref, referent values
*This model included site of recruitment, marital status, age, gender, smoking status, BMI, income status, housing condition, mental health status and loneliness scale, and physical activity level.
[a] Only significant results are shown in the table.
[b] Others include Centre Hospitalier du Nord (CHN), Ain Wazein Hospital (AWZ) and Labib Medical Center (LMC).

2. *Sociodemographic, Lifestyle, and Psychosocial Characteristics in relation with Dietary Adherence*

a. Adherence to AHA Dietary Recommendations:

Socio-demographic, lifestyle and psychosocial characteristics are presented in Table 17, stratified by levels of diet adherence to the AHA dietary recommendations

(*n*=129 who were admitted to AUBMC hospital). The results showed that most patients with high risk of mental health were not adherent to the AHA dietary recommendations. Surprisingly, overweight, and obese patients were significantly more adherent to diet recommendations. These associations remained significant with diet adherence even after adjusting for potential confounders (table 18).

Table 13: Adherence to AHA recommendations among CVD patients admitted for hospitalization at AUBMC, across various sociodemographic, lifestyle and psychosocial characteristics [ab] (n=129)

Variables	**Low adherence to AHA (n=55)**	**High adherence to AHA (n=74)**	**Significance [c]**
Age			
<60	18 (32.7)	24 (32.4)	P= 0.97
≥ 60	37 (67.3)	50 (67.6)	
BMI			
Normal	16 (29.1)	9 (12.2)	**P= 0.016**
O/O	39 (70.9)	65 (87.8)	
Income statement			
Enough	42 (76.4)	66 (89.2)	P= 0.051
Not enough	13 (23.6)	8 (10.8)	
Employment status			
Employed	30 (54.5)	37 (50)	P= 0.609
Part-time or unemployed	25 (45.5)	37 (50)	
Educational level			
Intermediate or less	13 (23.6)	20 (27)	P= 0.66
Secondary or university	42 (76.4)	54 (73)	
Marital status			
Married	46 (83.6)	65 (87.8)	P= 0.49
No married	9 (16.4)	9 (12.2)	
Housing status			
Owned	44 (80)	59 (79.7)	P= 0.97
Not owned	11 (20)	15 (20.3)	
Governorate			
Beirut	32 (58.2)	40 (54.1)	P= 0.64
Others [e]	23 (41.8)	34 (45.9)	
Smoking status			
Smokers [f]	46 (83.6)	57 (77)	P= 0.35
Nonsmokers	9 (16.4)	17 (23)	

Loneliness scale			
Lonely	11 (20)	9 (12.2)	P= 0.22
Not lonely	44 (80)	65 (87.8)	
Mental health risk			
High risk	22 (71)	21 (42)	**P= 0.011**
Low risk	9 (29)	29 (58)	
Crowding index			
≤ 1 person	47 (85.5)	68 (91.9)	P= 0.24
>1 person	8 (14.5)	6 (8.1)	
Physical Activity level			
Low/moderate	29 (52.7)	30 (40.5)	P= 0.169
High	26 (47.3)	44 (59.5)	
Drug adherence			
Low/moderate	27 (93.1)	48 (98)	P= 0.291[d]
High	2 (6.9)	1 (2)	
Adherent to TLC diet			
Adherent	27 (49.1)	44 (59.5)	P= 0.24
Non-adherent	28 (50.9)	30 (40.5)	

Bold values indicate significant at $p < 0.05$.

[a] Categorical variable are expressed as n (%): frequency and percentage within column. CVD; Cardiovascular Diseases; AHA, American Heart Association; AUMBC, American University of Beirut Medical Center; O/O, Overweight/Obese; TLC, Therapeutic Lifestyle Change

[b] Adherence to the AHA recommendations was defined according to the Dietary Pattern to Achieve Adherence to the AHA/ACC Guidelines (Goff et al., 2014).

[c] Significance is derived from chi-square test (χ^2).

[d] Significance is derived from fisher exact test and based on a total n=78.

[e] Others include North, Mount of Lebanon, Beqaa, Nabatiyeh and South

[f] Smokers include current and former smokers

Table 14: Association of sociodemographic, lifestyle and psychosocial characteristics with adherence to the AHA dietary recommendations among CVD patients as assessed by multiple logistic regression* (n=81).

	Adherence to AHA recommendations (high vs low)		
Variable	**OR**	**95% CI**	**Significance [a]**
Mental health risk			
low risk	1 [ref]		0.01
High risk	0.2	0.067-0.69	
BMI			0.017
Normal	1 [ref]		
O/O	5.9	1.4-25.9	

All the sociodemographic, lifestyle and psychosocial variables were run in one multivariate logistic model. CVD, Cardiovascular disease; AHA, American Heart Association; OR, odds ratio for high drug adherence vs normal drug adherence; CI, Confidence Intervals; Ref: referent values.
*This model included age, marital status, smoking status, BMI, income status, housing condition, mental health status, loneliness scale, and physical activity levels.
[a] Only significant results are shown in the table.

b. Adherence to TLC Dietary Recommendations

Socio-demographic, lifestyle and psychosocial characteristics are presented in Table 19, stratified by levels of diet adherence to the TLC diet (*n*=129 who were admitted to AUBMC hospital). Patients who reported to own their house were significantly more likely to adhere to the TLC diet recommendations compared to those who live in a rented house. This association remained significant even after adjusting for other variables (Table 20).

Table 19: Adherence to TLC dietary recommendations among CVD patients admitted for hospitalization at AUBMC, across various sociodemographic, psychosocial and lifestyle characteristics [a] (n=129)

Variables	**Low adherence to TLC (n=58)**	**High adherence to TLC (n=71)**	**Significance [b]**
Age			
<60	23 (39.7)	19 (26.8)	P= 0.120
≥ 60	35 (60.3)	52 (73.2)	
BMI			
Normal	10 (17.2)	15 (21.1)	P= 0.579
O/O	48 (82.8)	56 (78.9)	
Income statement			
Enough	45 (77.6)	63 (88.7)	P= 0.088
Not enough	13 (22.4)	8 (11.3)	
Housing status			
Owned	41 (70.7)	62 (87.3)	**P= 0.019**
Not owned	17 (29.3)	9 (12.7)	
Employment status			
Employed	32 (55.2)	35 (49.3)	P= 0.506

Part-time/ unemployed	26 (44.8)	36 (50.7)	
Educational level			
Intermediate or less	18 (31)	15 (21.1)	P= 0.19
Secondary/university	40 (69)	56 (78.9)	
Marital status			
Married	51 (87.9)	60 (84.5)	P= 0.577
No married	7 (12.1)	11 (15.5)	
Governorate			
Beirut	34 (58.6)	38 (53.5)	P= 0.562
Others [d]	24 (41.4)	33 (46.5)	
Smoking status			
Smokers [e]	48 (82.8)	55 (77.5)	P= 0.456
Nonsmokers	10 (17.2)	16 (22.5)	
Loneliness scale			
Lonely	7 (12.1)	13 (18.3)	P= 0.330
Not lonely	51 (87.9)	58 (81.7)	
Crowding index			
≤ 1 person	51 (87.9)	64 (90.1)	P=0.688
>1 person	7 (12.1)	7 (9.9)	
PA level			
Low/moderate	29 (50)	30 (42.3)	P= 0.380
High	29 (50)	41 (57.7)	
Mental health level			
Low risk	10 (40)	28 (50)	P= 0.4
High risk	15 (60)	28 (50)	
Drug adherence			
Low/moderate	23 (95.8)	52 (96.3)	P=0.922[c]
High	1 (4.2)	2 (3.7)	
Adherence to AHA recommendations			P= 0.24
Adherent	30 (51.7)	44 (62)	
Non-adherent	28 (48.3)	27 (38)	

Bold values indicate significant at $p < 0.05$.

[a] Categorical variable are expressed as n (%): frequency and percentage within column. CVD; Cardiovascular Diseases; TLC, Therapeutic Lifestyle Change; AUMBC, American University of Beirut Medical Center; O/O, Overweight/Obesity; AHA, American Heart Association.

[b] Significance is derived from chi-square test (χ^2).

[c] Significance is derived from fisher exact test and based on a total n=78.

[d] Others include North, Mount of Lebanon, Beqaa, Nabatiyeh and South

[e] Smokers include current and former smokers

Table 15: Association of sociodemographic, lifestyle and psychosocial characteristics with adherence to TLC dietary recommendations among CVD patients as assessed by multiple logistic regression* (n=129).

	Adherence to TLC diet (high vs low)		
Variable	**OR**	**95% CI**	**Significance [a]**
Housing status			
Not owned	1 [ref]		0.033
Owned	2.86	1.1-7.48	
All the sociodemographic, lifestyle and psychosocial variables were run in one multivariate logistic model. CVD, Cardiovascular disease; TLC, Therapeutic Lifestyle Change; OR, odds ratio for high drug adherence vs normal drug adherence; CI, Confidence Intervals; Ref: referent values. *This model included age, marital status, smoking status, BMI, income status, housing condition, loneliness scale, and physical activity levels. [a] Only significant results are shown in the table.			

3. High Physical Activity and its Association with Sociodemographic, Lifestyle, and Psychosocial Characteristics

Low/moderate versus high PA levels are shown according to baseline socio-demographic, lifestyle and psychosocial characteristics in table 21. High level of PA was significantly associated with male gender and the least lonely patients, while low PA level was more likely amongst the unemployed and the least educated. After adjusting for potential confounders, loneliness and female gender remained significantly associated with lower odds of high PA level, as shown in Table 22.

Table 16: Physical activity level among CVD patients admitted for hospitalization in Lebanon, across various sociodemographic and lifestyle characteristics [ab] (n=367)

Variables, n (%)	**Low/moderate PA (n=191)**	**High PA (n=67)**	**Significance [c]**
Site of recruitment			
Hospital A [d]	94 (49.2)	99 (56.2)	P= 0.178
Others [e]	97 (50.8)	77 (43.8)	

Age			
<60	52 (27.2)	60 (34.1)	P= 0.154
≥ 60	139 (72.8)	116 (65.9)	
Gender			
Male	118 (61.8)	142 (80.7)	**P= 0.000**
Female	73 (38.2)	34 (19.3)	
BMI			
Normal	46 (24.1)	49 (27.8)	P= 0.412
O/O	145 (75.9)	127 (72.2)	
Income statement			
Enough	163 (85.3)	141 (80.1)	P= 0.185
Not enough	28 (14.7)	35 (19.9)	
Employment status			
Full time	56 (29.3)	92 (52.3)	**P= 0.000**
Part-time/ unemployed	135 (70.7)	84 (47.7)	
Educational level			
Intermediate or less	114 (59.7)	86 (48.9)	**P= 0.038**
Secondary or university	77 (40.3)	90 (51.1)	
Marital status			
Married	155 (81.2)	150 (85.2)	P= 0.298
No married	36 (18.8)	26 (14.8)	
Governorate			
Beirut	55 (28.8)	56 (31.8)	P= 0.529
Others [f]	136 (71.2)	120 (68.2)	
Housing status			
Owned	148 (77.5)	145 (82.4)	P= 0.243
Not owned	43 (22.5)	31 (17.6)	
Smoking status			
Smokers [g]	124 (66.7)	126 (71.6)	P= 0.311
Nonsmokers	62 (33.3)	50 (28.4)	
Loneliness scale			
Lonely	79 (42.9)	46 (26.4)	**P= 0.002**
Not lonely	105 (57.1)	128 (73.6)	
Crowding index			
≤ 1 person	152 (79.6)	137 (77.8)	P= 0.684
>1 person	39 (20.4)	39 (22.2)	
Drug adherence			
Low/moderate	97 (67.4)	90 (70.9)	P= 0.534
High	47 (32.6)	37 (29.1)	
Mental health level			
High risk	40 (27.2)	31 (22.8)	P= 0.392
Low risk	107 (72.8)	105 (77.2)	
Adherent to AHA recommendations			

Adherent	30 (50.8)	44 (62.9)	P= 0.169
Non-adherent	29 (49.2)	26 (37.1)	
Adherent to TLC diet			
Adherent	30 (50.8)	41 (58.6)	P= 0.38
Non-adherent	29 (49.2)	29 (41.4)	

Bold values indicate significant at $p < 0.05$.

[a] Categorical variable are expressed as n (%): frequency and percentage within column. CVD; Cardiovascular Diseases; PA; Physical Activity; O/O, Overweight/Obesity; TLC, Therapeutic Lifestyle Change; AHA, American Heart Association.

[b] The levels of physical activity were defined according to the guidelines established by the International physical Activity Questionnaire (IPAQ) for the short and long forms (Sjostram et al., 2009).

[c] Significance is derived from chi-square test (χ^2).

[d] Hospital A: American University of Beirut Medical Center (AUBMC)

[e] Others include Ain Wazein hospital (AWZ), Labib Medical Center (LMC), Centre Hospitalier du Nord (CHN)

[f] Others include North, Mount of Lebanon, Beqaa, Nabatiyeh and South

[g] Smokers include current and former smokers

Table 17: Association of sociodemographic, lifestyle, and psychosocial characteristics with PA levels in the study population as assessed by multiple logistic regression * (n=367)

	PA levels (high vs moderate/low)		
Variables	**OR**	**95% CI**	**Significance [a]**
Gender			
Males	1 [ref]		0.000
Females	0.38	0.23-0.66	
Loneliness level			
Not lonely	1 [ref]		0.004
Lonely	0.5	0.31-0.8	

All the sociodemographic, lifestyle and psychosocial were run in one multivariate logistic model. Crude logistic regression was conducted with the outcome variable being "moderate" and "low" combined. PA, Physical Activity; OR, odds ratio for high drug adherence vs normal drug adherence; CI, Confidence Intervals; Ref, referent values.

*This model included age, marital status, gender, smoking status, BMI, income status, housing condition, loneliness scale.

[a] Only significant results are shown in the table.

CHAPTER V

DISCUSSION

This study has assessed adherence to dietary guidelines, drug prescriptions and PA recommendations in a sample of CVD patients admitted for hospitalization. It showed that dietary and drug adherence rates were low in this patient population and that close to half did not follow the PA recommendations. Importantly the study identified several demographics, socioeconomic, and psychosocial characteristics that may affect the patients' adherence to diet, drug, and PA recommendations, which may serve as a basis for future interventions. This study has also characterized the nonclinical socio-demographic, lifestyle, and psychosocial characteristics of CVD patients, and thus provided data that are generally scarce at the local, national, and international levels.

Several previous studies have provided direct evidence on the clinical characteristics of patients with CVD, but very few have extended their investigation to broader socioeconomic and psychosocial factors. In 2015, the AHA published a scientific statement calling for greater attention to the social and behavioral determinants of CVD (Havranek et al., 2015). This study therefore responds to this call by contributing to a broader characterization of CVD patients.

The rates of overweight and obesity, physical inactivity, low educational attainment, unemployment, and smoking were higher in our study sample compared to those reported for the general Lebanese population (Abla Mehio Sibai et al., 2010). Our study participants had also a higher median of fasting glycemia, SBP, and TG and a lower median of HDL and DBP compared to the general population (Abla Mehio Sibai

et al., 2010). While a higher proportion of the Lebanese population reported having a family history of high blood glucose and raised blood pressure, a family history of diabetes and hypertension was predominantly reported by our study sample (Abla Mehio Sibai et al., 2010).

In our study, the overall percentage of drug non-adherence amongst cardiac patients was estimated at 69%, which is higher than that reported from several developed and developing countries such as Tunisia (59.8%), Sudan (51%), Saudi Arabia (47%), China (34.9%), United States (29%), and Pakistan (23.5%), while being lower than estimates reported from Qatar (74%) and Gambia (73%) (Awad, Osman, & Altayib, 2017; Fathia et al., 2019; Hyre, Krousel-Wood, Muntner, Kawasaki, & DeSalvo, 2007; Jaam, 2017; Khalil & Elzubier, 1997; Lee et al., 2013; Rehman et al., 2019; Van der Sande et al., 2000). A meta-analysis including 76 studies from developing countries, showed that the pooled percentage of drug non-adherence amongst CVD patients was of 42.5% (95% CI: 50-64%), a value that is lower than the estimate obtained in our study (Naderi, Bestwick, & Wald, 2012). The disparities found between countries could be explained by differences in cultural factors, types of CVD studied, sampling design, patient's socioeconomic characteristics, and the instrument used to measure drug adherence. Unlike our study, several studies have used self-reported methods to assess adherence levels, which could potentially overestimate drug adherence (Burke, Dunbar-Jacob, & Hill, 1997; Kilbourne et al., 2005). The level of drug non-adherence amongst cardiac patients in this study was considerably higher than that reported by a prior study conducted in Lebanon (22.4%) (Yassine et al., 2016). Although both studies have used the same MMAS-8 to assess drug adherence level, the aforementioned study assessed the level of drug adherence amongst hypertensive

outpatients, thus, representing the least severe cases with a less complex drug regimen when compared to our study participants.

In the multivariate analyses model, loneliness and low income were found to be significant predictors of non-adherence in CVD patients, similar to the findings reported by the AHA, the CARDIA, and the Medical Outcomes Study (Havranek et al., 2015; D. Kim, Diez Roux, Kiefe, Kawachi, & Liu, 2010; Rasmussen et al., 2020; J.-R. Wu, Moser, Chung, & Lennie, 2008). A recent study conducted in the US found that family support significantly increased adherence to drug regimens amongst cardiac patients (Kusaslan Avci, 2018) . In our study, admission to AUBMC hospital was an independent factor influencing drug non-adherence. These findings are consistent with previous studies showing high rates of drug non-adherence amongst cardiac patients admitted to Beirut hospitals (Al-Hajje et al., 2015; Yassine et al., 2016). Considering the substantial burden of drug non-adherence on the healthcare system (Cutler, Fernandez-Llimos, Frommer, Benrimoj, & Garcia-Cardenas, 2018), further research is needed to explore the determinants of drug non-adherence amongst cardiac patients in urban hospitals. Surprisingly, medication non-adherence was not significantly associated with lifestyle and behavioral adherence. These findings are consistent with studies conducted in China and Lebanon (Lee et al., 2013; Yassine et al., 2016) but not with studies undertaken in France (Korb-Savoldelli et al., 2012).

In the present study, the diet of the study participants was assessed using a previously validated FFQ, and median caloric intake (3342Kcal) was similar to that reported by a recent study conducted in Lebanon (Cordahi, 2015). The percentage of energy intake from total fats (43.5%) and saturated fats (11%) were considerably high, exceeding the dietary guidelines for a heart-healthy diet (Van Horn, Carson, Appel,

Burke, Economos, Karmally, Lancaster, Lichtenstein, Johnson, & Thomas, 2016). Additionally, adherence to fruits (19.4%), vegetables (3.9%), whole grains (32.6%), fish (14.7%), low-fat or fat-free dairy (3.1%), and fibers (22.5%) intake recommendations were dramatically low, far below the international recommendations (Stone & Van Horn, 2002; Van Horn, Carson, Appel, Burke, Economos, Karmally, Lancaster, Lichtenstein, Johnson, & Thomas, 2016). In Lebanon, the consistent rise in daily energy and fat intakes coupled with a decrease in fruits and vegetable intake was attributed to the nutrition transition and the increased adoption of the western diet and lifestyle (Naja et al., 2011; Abla Mehio Sibai et al., 2010).

In this study, comparable rates of diet adherence were found when using both the TLC guidelines and the AHA recommendations. Indeed, almost 57% of cardiac patients were found to be adherent to the AHA dietary recommendations, and 55% to the TLC guidelines. The estimate of AHA diet adherence (57%) is lower than that reported by previous studies conducted in Puerto Rico (97%) and the US (63.6%) (Bhupathiraju et al., 2011; Virani et al., 2021). Although studies have used the AHA dietary components to assess diet adherence levels, our study was conducted among the general Puerto Ricans and the US population, which have potentially overestimated diet adherence.

A higher sense of well-being was found to be a significant predictor of higher diet adherence in our study. These results are consistent with a recent cross-sectional study showing a negative correlation between depression and diet adherence amongst CVD patients (H.-C. Park & Oh, 2021). Therefore, it is important to consider psychosocial factors and their potential impact on CVD risk factors to delay disease progression, and improve treatment response and patient's quality of life (H.-C. Park &

Oh, 2021). Surprisingly, the results of this study showed that higher BMI was associated with higher diet adherence. These observations do not support the findings of previous studies, which have suggested that low adherence to AHA dietary recommendations is associated with overweight and obesity (Guo, Warden, Paeratakul, & Bray, 2004; Mertens et al., 2015). In the present study, the possibility of reverse causality bias may have affected our results. Patients who were overweight or obese could have recently improved their adherence to a healthy diet as a result of CVD risk factors or symptoms. Yet, a longer period of time is needed to observe the impact of diet adherence on anthropometric measurements.

In our study, 55% of the participants were adherent to the TLC diet, similar to other studies conducted amongst cardiac patients in Pakistan (53%) and Kuwait (63%) (Ali et al., 2017; Serour, Alqhenaei, Al-Saqabi, Mustafa, & Ben-Nakhi, 2007). Although adherence to the TLC diet is complex and multifaceted, several studies suggested the incorporation of the TLC components into cardiac rehabilitation programs, yielding promising results in improving CVD risk factors and outcomes (Lin et al., 2010; Mampuya, 2012). In the present study, owning a house was a significant predictor of TLC diet adherence amongst cardiac patients, consistent with the findings of a study conducted in Morocco (Mohtadi et al., 2020). Conversely, another cross-sectional study conducted in Morocco showed an inverse association between owning a house and diet adherence (El Rhazi et al., 2012). In support to our findings, and according to the AHA, housing status is recognized as an important social determinant of health (Sims, Kershaw, et al., 2020). In fact, owning a house reflects a high socioeconomic position, and thus, patients may have a higher ability to meet their nutritional needs without being concerned about food affordability (Galobardes et al.,

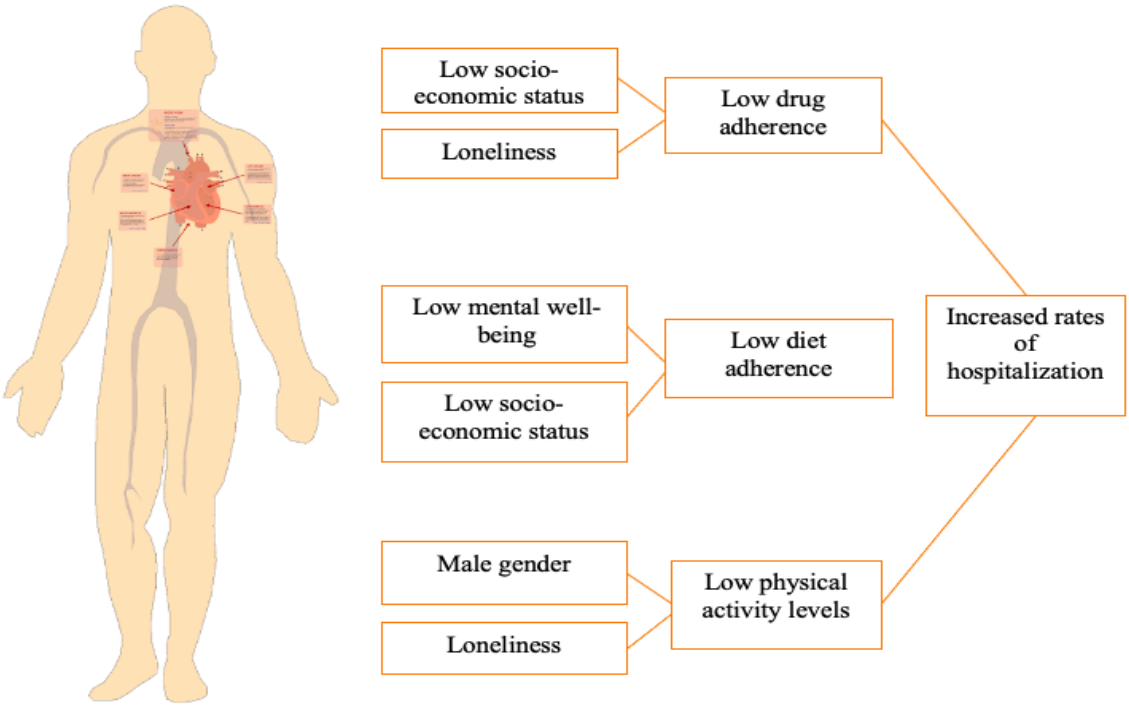
2006). It is therefore important to consider housing status as a socioeconomic measure to predict diet adherence amongst cardiac patients in developing countries (Monteiro Dos Santos, Crispim, Murphy, & de Camargo Cancela, 2021).

In the current study, the rates of physical inactivity (52%) were lower than estimates reported from other countries such as Kuwait (62.6%) and Saudi Arabia (67.6%) but higher than Syria (39.6%) and Sweden (32%) (Maziak et al., 2007; Sharara, Akik, Ghattas, & Obermeyer, 2018). The discrepancies in the results could be due to differences in the sampling design as well as the instruments and scoring methods used to assess PA levels. Unlike our study, the majority of the above-mentioned studies were conducted among patients with heart failure, thus, representing severe cardiac cases with a lower ability to engage in high-intensity PA (Yates, Pozehl, Kupzyk, Epstein, & Deka, 2016). The proportion of patients with high level of PA was estimated at 18.3%, in our study sample which is comparable to the figures previously reported by Sibai et al. and Isma'eel et al., where almost 18% and 21% of cardiac patients were engaged in high PA levels, respectively (Isma'eel et al., 2018; A. Sibai, Tohme, Mahfoud, Chaaya, & Hwalla, 2009) . The predictors of high PA included loneliness level and gender. The least lonely patients had in fact higher PA levels, similar to the findings reported by Darden et al., where loneliness was significantly and inversely associated with the frequency and duration of PA (Darden, Richardson, & Jackson, 2013). As expected, male gender was also a strong predictor of high PA level, which is consistent with findings reported from several studies conducted in neighborhood countries such as Egypt, KSA, and Qatar, whereas studies undertaken in Sweden did not report such observations (Bauman et al., 2009; Sharara et al., 2018). In some countries of the EMR,

the low levels of PA amongst females reflect the cultural and religious factors discouraging women from engaging in physical activity (Kahan, 2015).

Overall, our study has shown that CVD patients in Lebanon have poor dietary and drug adherence and less than half engage in PA as per the recommendations. These findings are in agreement with reports from the WHO, according to which almost 50% of patients with chronic diseases are not adherent to their treatment regimen that includes diet, drugs, and physical activity (Amaltinga, 2017). This study brings attention to the determinants of physical inactivity, poor dietary and drug adherence that should be addressed in patients with CVD through lifestyle interventions to delay cardiovascular events and ultimately decrease cardiovascular mortality in the country. More importantly, this study reveals that loneliness and low mental well-being could be potential root causes of low drug and diet adherence amongst cardiac patients (Figure 2)

Figure 2: Risk Factors that increase the risk of non-adherence to dietary and physical activity recommendations and to prescribed medications amongst cardiac patients in Lebanon, and hence increase risk of hospitalization



A major strength of the present study was the recruitment of subjects from four hospitals located in different areas across Lebanon to reflect different socioeconomic and cultural background. Second, this study examined the importance of psychosocial characteristics amongst cardiac patients in addition to other clinical and non-clinical attributes such as the patient's sociodemographic, lifestyle, behavioral, and psychosocial characteristics. This study emphasized the importance of psychosocial characteristics of cardiac patients. The wide range of factors provides a greater understanding of the "real world" profile of patients hospitalized with CVD in a country that is undergoing the nutrition transition.

The results of this study should be considered in light of the following limitations. First, this is a cross-sectional study that allows us to assess the association rather than any causal relationship. Second, this is a hospital-based study where the generalizability of the results is limited to hospitalized patients. Third, this study relied on the use of semi-quantitative FFQ to collect dietary data, which may be limited by the possibility of recall bias, social desirability bias, and accurate estimation of the portion size. Despite these limitations, the FFQ was validated in the Lebanese population and is considered the most suitable dietary assessment tool as it provides information on the subject's habitual diet over a longer period of time (El Sayed Ahmad et al., 2020). The FFQ was also administered by experienced dietitians who have been trained to reduce judgmental verbal and non-verbal communication to obtain information about the foods usually consumed by the individual, which should have enhanced the quality of the data collected.

CHAPTER VI

CONCLUSION

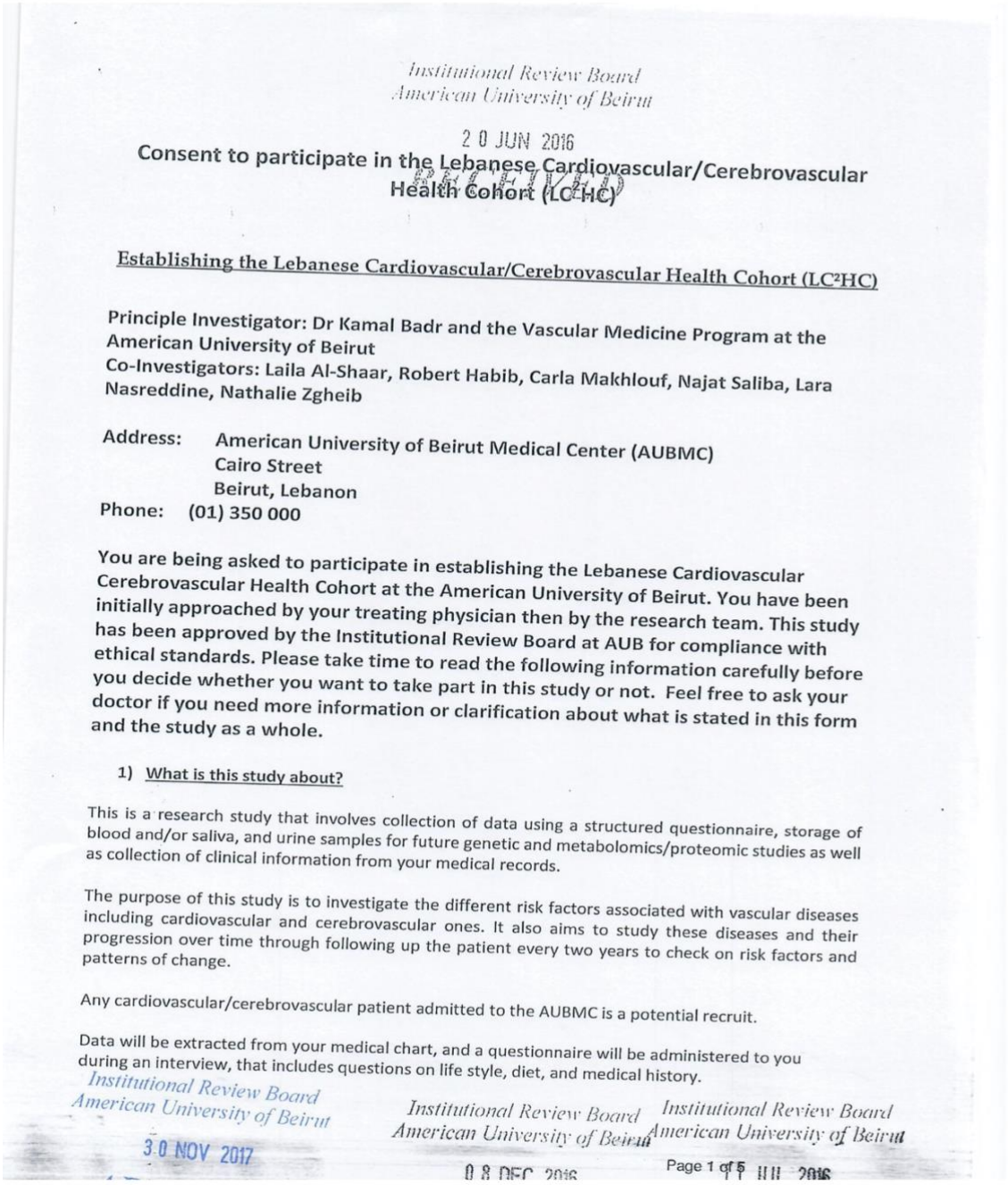
CVD is an important preventable public health problem where many of its risk factors are modifiable. This study is amongst the few in the EMR region and in Lebanon to investigate the determinant of diet adherence, drug adherence and physical activity amongst hospitalized cardiac patients. It presented a descriptive overview of the clinical and nonclinical characteristics of patients hospitalized with CVD in Lebanon, and investigated the socio-demographic, lifestyle, behavioral, and psychosocial determinants of drug adherence, diet adherence, and high physical activity. Important predictors of drug non-adherence were identified, and included loneliness, admission to AUBMC hospital, and the patient's perception of having low-income level. Surprisingly, high BMI was a significant predictor of higher diet adherence in this study sample, which could be due to a potential reverse causality bias. Other significant predictors of diet adherence included a higher sense of well-being and a higher socioeconomic status (i.e. owning a house). Male gender and lower loneliness levels were significantly associated with higher PA levels.

The findings from this study will provide valuable insights into the broader, clinical and non-clinical characteristics of cardiovascular patients in a country that is undergoing the nutrition transition. A greater understanding of the patient's social and lifestyle characteristics and how these may modulate adherence to dietary and lifestyle recommendations will contribute to a better identification of those at risk and would allow for tailored preventive and treatment strategies. The results of this study may thus provide evidence on the importance of identifying nonclinical patient characteristics, and how they potentially constellate, to provide actionable knowledge that may be used

to develop effective approaches to enhance the quality of diets in CVD patients and thus decrease morbid complications and disease progression. Therefore, the study may serve as basis for the development of interventions tailored to modify patient's behavioral, lifestyle and psychosocial factors to increase patients' adherence and therefore, reduce CVD mortality and morbidity. The study findings may lay the groundwork for further studies that have the potential to assist decision-makers in developing preventive and care guidelines to decrease the risk of CVD and improve the lives of those who have it.

APPENDIX A

CONSENT FORMS



Institutional Review Board
American University of Beirut

20 JUN 2016

Consent to participate in the Lebanese Cardiovascular/Cerebrovascular Health Cohort (LC²HC)

EFFECTIVE

Establishing the Lebanese Cardiovascular/Cerebrovascular Health Cohort (LC²HC)

Principle Investigator: Dr Kamal Badr and the Vascular Medicine Program at the American University of Beirut
Co-Investigators: Laila Al-Shaar, Robert Habib, Carla Makhlouf, Najat Saliba, Lara Nasreddine, Nathalie Zgheib

Address: American University of Beirut Medical Center (AUBMC)
Cairo Street
Beirut, Lebanon
Phone: (01) 350 000

You are being asked to participate in establishing the Lebanese Cardiovascular Cerebrovascular Health Cohort at the American University of Beirut. You have been initially approached by your treating physician then by the research team. This study has been approved by the Institutional Review Board at AUB for compliance with ethical standards. Please take time to read the following information carefully before you decide whether you want to take part in this study or not. Feel free to ask your doctor if you need more information or clarification about what is stated in this form and the study as a whole.

1) **What is this study about?**

This is a research study that involves collection of data using a structured questionnaire, storage of blood and/or saliva, and urine samples for future genetic and metabolomics/proteomic studies as well as collection of clinical information from your medical records.

The purpose of this study is to investigate the different risk factors associated with vascular diseases including cardiovascular and cerebrovascular ones. It also aims to study these diseases and their progression over time through following up the patient every two years to check on risk factors and patterns of change.

Any cardiovascular/cerebrovascular patient admitted to the AUBMC is a potential recruit.

Data will be extracted from your medical chart, and a questionnaire will be administered to you during an interview, that includes questions on life style, diet, and medical history.

Institutional Review Board
American University of Beirut
30 NOV 2017

Institutional Review Board
American University of Beirut
08 DEC 2016

Institutional Review Board
American University of Beirut

Page 1 of 5

You will be also asked if you would like to provide blood, saliva, and/or urine samples. The blood and urine samples will be stored for later genetic testing. These samples shall be stored in Dr Zgheib's laboratory, for an indefinite period of time.

The interview shall take around 40 -45 minutes. You have the flexibility to do this interview either while in the hospital or at your home, whichever is the more convenient for you.

In case you already consented but the interview wasn't completed before you left the hospital, you will be contacted by the team to complete the remaining part of the questionnaire over the phone, at a time convenient to you.

The total volume of blood required is 8 cc which is less than 1 tablespoon. The total amount of urine needed is 20 cc.

2) Any risks as a result of participating in the study?

Although any study may be associated with any unforeseeable risk, this proposal has minimal risk.

None of the data collection measures bare any long term hazards, and the blood withdrawn will be done under sterile hygienic conditions. Possible side effects include mild pain, bleeding, bruising at the site of the needle insertion. Fainting or light-headedness can sometimes occur, but usually last only a few minutes. We will first attempt to get blood while you are pricked in the vein or artery prior to the procedure. If this fails and if you refuse to be pricked again, then we will try to access left over blood if available. Note that whether you elect to participate in this repository or not does not affect your medical management at all.

You are free to withdraw this consent and discontinue participation in this project at any time. If you elect to do so, you will be asked to send us a signed request after which your biological samples will be destroyed, and your data will be deleted from the repository under the supervision of the principal investigator.

3) Any benefits as a result of participating in the study?

It is possible that the information that comes out of the results of the study will contribute to the medical general knowledge and will probably be used in the future by Medical Doctors for better assessment of risk factors associated with the development of cardiovascular and cerebrovascular diseases and more personalized treatment.

You will not be reimbursed for participating in the study. You will also not be reimbursed for any parking or transportation cost. The investigators may choose to end your participation. They will convey to you any significant new findings.
However, you will be part of a cohort which will be followed up every two years. You may also benefit from future interventional studies for advancing cardiovascular and cerebrovascular health in Lebanon.

4) Confidentiality

Your blood and urine samples and genetic material will be securely stored in Dr. Zgheib's lab at AUB indefinitely. Your clinical and questionnaire data will be stored at the Vascular Medicine Program at the American University of Beirut indefinitely. Your samples will however be destroyed if you elect to withdraw your consent for the study.

All data collected will be stored in a manner that restricts identifiers to the PIs and the CITI certified Research Assistant. These measures will all be conducted ensuring there is no breach of participants' privacy.

You may ask that we provide you with the genetic results and explain their significance to you. The information will be kept confidential.

Unless required by law, only the study doctors and designee, the ethics committee and inspectors from governmental agencies will have direct access to your research records without violating confidentiality.

Institutional Review Board
American University of Beirut

30 NOV 2017

APPROVED

Institutional Review Board
American University of Beirut

08 DEC 2016

Institutional Review Board
American University of Beirut

11 JUL 2016

5) Agreements

We would like to know if you would be willing to participate in this research repository. You have the right to accept or decline participation.

I agree to participate in this study and the procedures explained above (conducting an interview, access my medical records at AUBMC, and follow me up every two years).

YES ..... NO.....

Future contact:

I agree to be contacted for future studies related to vascular diseases YES..... NO.....

I agree to be contacted for future studies for any type of diseases YES..... NO.....

Unless I chose to be using my sample in a de-identified manner, I would like to be contacted if the genetic test results are significant YES ..... NO.....

Using blood and urine for other future studies

We would like to keep the blood, saliva and urine samples for potential use in other future studies. There will be no extra prick. The stored blood and urine samples will be coded (*"Coded" means identifiable, traceable. Blood* and urine *samples that are unidentified for research purposes but can be linked to their source through the use of codes; however, the principal investigators will be the only ones to have the list linking patients to the codes assigned.)*

I agree to permit the use of my blood, saliva and urine sample for future studies related to vascular diseases YES ..... NO.....

I agree to permit the use of the remaining blood, saliva and urine sample for future studies for any type of diseases YES ..... NO.....

<u>If you chose one of the two above options, select one of the three options below:</u>

I agree to permit the use of the remaining blood, saliva and urine samples in a coded manner after contacting me for permission YES .....

I agree to permit the use of the remaining blood, saliva and urine samples in a coded manner without contacting me for permission YES .....

I agree to permit the use of the remaining blood, saliva and urine samples in a de-identified manner

YES .....

Your coded blood , saliva and urine samples may be shared with other investigators for related studies under the supervision of the principal investigator. These investigators may be from AUBMC, from centers other than AUB, and from centers outside Lebanon. They will not know your identity unless you chose, in this informed consent document, to know your results when significant.

I agree to have my coded blood, saliva and urine samples shared with other investigators for studies related to vascular diseases YES..... NO.....

I agree to have my coded blood and urine samples shared with other investigators for studies not related to vascular diseases YES ..... NO.....

Investigator's Statement:

I have reviewed, in detail, the informed consent document for this research study with _____ _____ (name of patient, legal representative, or parent/guardian) the purpose of the study and its risks and benefits. I have answered to all the patient's questions clearly. I will inform the participant in case of any changes to the research study.

_____ _____
Name of Investigator or designee Signature

_____
Date

Patient's Participation:

I have read and understood all aspects of the research study and all my questions have been answered. I voluntarily agree to be a member of this Lebanese cardiovascular cerebrovascular health cohort and I know that I can contact Dr. Kamal Badr at AUB Faculty of Medicine 01-350000, or any of their designee involved in the study in case of any questions. If I feel that my questions have not been thoroughly answered, I can contact the Institutional Review Board at 5445. I understand that I am free to withdraw this consent and discontinue participation in this project at any time, even after signing this form, and it will not affect my care or benefits. I know that I will receive a copy of this signed informed consent.

_____ _____
Name of Patient or Legal Representative or Parent/Guardian Signature

_____
Date

_____ _____
Witness's Name Witness's Signature
(if patient, representative or parent do not read)

_____ _____
Date Time

Institutional Review Board
American University of Beirut
30 NOV 2017
APPROVED

Institutional Review Board
American University of Beirut
11 JUL 2016
APPROVED

Institutional Review Board
American University of Beirut
08 DEC 2016
APPROVED

موافقة للإشتراك في إنشاء فوج في صحة القلب والأوعية الدموية والدماغية

إنشاء فوج في صحة القلب والأوعية الدموية والدماغية في برنامج الطب الأوعية الدموية في كلية الطب في الجامعة الاميركية في بيروت.

Establishing the Lebanese Cardiovascular/Cerebrovascular Health Cohort (LC²HC)

إسم الباحث: د. كمال بدر و برنامج الطب الأوعية الدموية في كلية الطب في الجامعة الاميركية في بيروت.

مكان إجراء البحث: الجامعة الاميركية في بيروت، كلية الطب.

أنت مدعو(ة) للمشاركة ببحث لانشاء فوج في صحة القلب والأوعية الدموية والدماغية سيجرى في الجامعة الأميريكية في بيروت. لقد تم التواصل معك في البداية من قبل الطبيب المعالج الخاص بك ومن ثم فريق البحث.
الرجاء أن تأخذ(ي) الوقت الكافي لقراءة المعلومات التالية بتأن 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 طبيبك او فريق البحث.

1. ما هو هدف الدراسة؟

إن هذه الدراسة تتضمن تجميع معلومات من خلال استبيان معيّن و تخزين عينات من الدم وا أو الريق و البول لاستخدامهم في بحوث جينية وأيضية/بروتومية ، بالإضافة إلى تجميع معلومات طبية من سجلكم الطبي .

إن هدف هذه الدراسة هو البحث عن عوامل الخطر المرتبطة مباشرةً بالأمراض القلبية والأوعية الدموية ومن ضمنها الدماغية. ونهدف أيضاً إلى دراسة هذه الامراض و تطورها من خلال متابعتكم كل سنتين والتحقق كيف تغيرت عوامل الخطر.

أي مريض بالغ قادم إلى المركز الطبي في الجامعة الأميركية في بيروت قسم الأمراض القلبية القلبية والأوعية الدموية ومن ضمنها الدماغية ، المشاركة في هذه الدراسة.

سيتم الحصول على المعلومات من خلال مقابلة مباشرة معك من قبل مساعد البحوث عن نمط الحياة، والنظام الغذائي، و التاريخ الطبي وسيتم استخراج المعلومات السريرية من السجلات الطبية الخاصة بك. وبالإضافة إلى هذه المعلومات، سوف يطلب منك تقديم الدم والريق / أو عينة البول. سوف يتم تخزين هذه العينات في مختبر الدكتورة ناتالي خويري زغيب ، لفترة غير محددة من الزمن
هذه المقابلة قد تستغرق 40 إلى 45 دقيقة. لديك أيضا خيار لإكمال المقابلة إما بينما انت في المستشفى أو في المنزل الخاص بك ، كل ما هو الأكثر ملاءمة لك.
في حال كنت وافقت(ي) بالفعل ولكن لم يتم إكمال المقابلة قبل أن تغادر(ي) المستشفى ، سيتم الاتصال بك من قبل فريق لاستكمال الجزء المتبقي من الاستبيان عبر الهاتف ، في وقت مناسب لك.

مجموع كمية الدم هو 8 سنتمترات مكعبة أي ما يعادل أقل من ملعقة طعام صغيرة ومجموع كمية البول المطلوب هو 20 سنتمترات مكعبة.

2. هل هناك أية مخاطر ناتجة عن اشتراكك في هذه الدراسة؟

رغم أن كل دراسة لها مخاطر غير متوقعة إلاّ ان ليس لهذه الدراسة إلا خطر ضئيل.

لا تحمل أي من إجراءات جمع البيانات مخاطر في الأمد الطويل، وستتمّ كافة سحوبات الدم ضمن ظروف وقاية صحية صارمة ومن الآثار الجانبية الضئيلة التي من المحتمل أن تصيبكم: ألم معتدل، نزف محدود، رضّة خفيفة في موضع إدخال الإبرة. وقد تحدث في بعض الأحيان حالات إغماء أو دوار خفيف، ولكنّها لا تدوم عادةً أكثر من دقائق قليلة. سوف نحاول أن نأخذ عينة الدّم بينما يتم وخز الوريد أو الشريان للإجراء. إذا فشل ذلك، وإذا رفضت وخزة اضافية، سوف نحاول أن نأخذ الدّم المتبقّي في المختبر إن كان موجودا. مع الأخذ بعين الإعتبار أن قرارك بالمشاركة أو عدم المشاركة بهذه الدراسة لن يؤثر على العناية الطبية بك على الإطلاق.

3. هل هناك فوائد ناتجة عن اشتراكك في هذه الدراسة؟

من الممكن أن تكون هناك فائدة للمشاركة في هذه الدراسة اذ أنّ النتيجة ممكن أن تساعد الأطباء المعالجين مستقبلياً على معرفة إحدى المخاطر اللتي قد تؤدي إلى الأمراض القلبية والأوعية الدموية ومن ضمنها الدماغية ، وعلى تحديد جرعة الدواء بدقة أكثر.

لا مكافأة لاشتراكك في هذه الدراسة ولا دفع لمصاريف تنقلاتك او إجرة موقف سيارتك. لن تدفع أجور إضافية. يجدر الإشارة أنّ الباحثين قد يلغون مشاركتك. سيتم إبلاغك بأية نتائج جديدة ذات أهمية قد تصدر عن هذه الدراسة.
لكنك ستكون جزءا من الفوج الذي سيتبع بشكل منتظم كل سنتين. و قد تستطيع أيضا الاستفادة من الدراسات التدخلية المستقبلية لتعزيز صحة القلب والأوعية الدموية ومن ضمنها الدماغية في لبنان.

4. السريّة

سيتم حفظ عينات دمك والجينات في مختبر الدكتورة نتالي زغيب في الجامعة الأميركية في بيروت ومعلوماتك الصحية في برنامج الطب الأوعية الدموية في كلية الطب في الجامعة الاميركية في بيروت.

وستدمر عيناتك إذا قررت الانسحاب من هذه الدراسة.
سيتمّ تخزين كافة البيانات التي تم تجميعها بطريقة تحصر الوصول إليها بالباحث الرئيسي و مساعده. وستتمّ هذه الإجراءات كلها مع الحرص على عدم انتهاك خصوصية المشاركين. وسيتمّ تزويد المشاركين بنتائج الفحوصات في حال طلب ذلك في هذه الاستمارة.

يمكنك طلب معلومات عن النتائج ويمكننا تأمينها وتفسيرها لك. المعلومات تبقى في سرية تامّة.
لن يكون لأي شخص، ما لم ينص القانون على ذلك، حق الاطلاع على ملفك الطبي باستثناء الطبيب المسؤول ومعاونيه، ولجان الأخلاق المهنية المستقلة، ومفتشين من الإدارات الحكومية المنظمة.

5. الموافقة نودّ أن أعرف إذا كنتم مستعدين للمشاركة في هذه الدراسة. لكم كامل الحق في قبول المشاركة أو رفضها.

أوافق على المشاركة في هذه الدراسة والإجراءات المحدّدة أعلاه (مقابلة مباشرة معي و استخراج المعلومات السريرية من السجلات الطبية الخاصة بي في مستشفى الجامعة الاميركية في بيروت والمتابعة كل سنتين)

نعم..... لا.....

أوافق على أن يتم التواصل معي للدراسات مستقبلية متعلقة بالأمراض الاوعية الدموية

نعم..... لا.....

أوافق على أن يتم التواصل معي لدراسات مستقبلية متعلقة بجميع أنواع الأمراض كافةً

نعم..... لا.....

أوافق على أن يتم التواصل معي للحصول على نتائج الفحوصات في حال قررت إستعمال معلوماتي بطريقة قد تعرّف عني

نعم..... لا.....

استخدام عينات الدم والبول للدراسات المستقبلية

نودّ استخدام عينات الدم والريق والبول في دراسات مستقبلية محتملة. لن يتمّ أي عمليات وخز إضافية. وسيتم "ترميز" عيّنات الدم والبول المخزّنة. (تشير عبارة "ترميز" إلى قابلية التعريف والتعقّب.لا يتمّ تعريف عينات الدم والبول لغايات الأبحاث، ولكن يمكن ربطها بمصدرها عبر استخدام الرموز؛ إلاّ أنّ الباحث المسؤول هو الوحيد الذي يحق له الحصول على اللائحة التي تحدّد الرمز الخاص بكل مريض).

أوافق على استخدام عينات الدم والريق والبول لدراسات مستقبلية متعلقة بالأمراض الاوعية الدموية

نعم..... لا.....

أوافق على استخدام عينات الدم والريق والبول لدراسات مستقبلية متعلقة بجميع أنواع الأمراض كافةً

نعم..... لا.....

إذا اخترت أحد الاحتمالين السابقين، أجيب على واحد من الإحتمالات الثلاث التالية :

أوافق أن يتم إستعمال عينات دمي والريق والبول بطريقة مرمّزة بعد الإتصال بي

نعم.....

أوافق أن يتم إستعمال عينات دمي والريق والبول بطريقة مرمّزة دون الإتصال بي

نعم.....

أوافق أن يتم إستعمال عينات دمي والبول بطريقة لن تعرف عني بأية طريقة

نعم.....

يمكن مشاركة عينات دمكم والبول المرمّزة مع باحثين آخرين, الذين هم من المركز الطبي في الجامعة الأميركية في بيروت أو من مراكز أخرى غير الجامعة الأميركية ومن مراكز خارج لبنان, لدراسات ذات صلة تحت إشراف الباحث الرئيسي. ولن يعرف هؤلاء الباحثون هويتكم إلا اذا رغبت معرفة النتائج التي هي ذات أهمية.

أوافق على مشاركة عيّنات دمي والريق والبول المرمّزة مع باحثين آخرين لإجراء دراسات متعلقة بالأمراض الاوعية الدموية فقط.

نعم..... لا.....

أوافق على مشاركة عيّنات دمي والريق والبول المرمّزة مع باحثين آخرين لإجراء دراسات لدراسات لا تتعلق بالأمراض الاوعية الدموية.

نعم..... لا.....

Institutional Review Board
American University of Beirut
30 NOV 2017
APPROVED

Institutional Review Board
American University of Beirut
08 DEC 2016
APPROVED

Institutional Review Board
American University of Beirut

موافقة الباحث:

لقد شرحت بالتفصيل للمشترك في البحث الطبي ل_____ (اسم المشترك او ممثله القانوني أو وليه الجبري أو وصيه اذا كان المشترك قاصرا أو غير قادر على التوقيع) طبيعته ومجرياته وتأثيراته السلبية. ولقد أجبت على كل أسئلته بوضوح على خير ما أستطيع. وسوف أعلم المشترك بأي تغييرات في مجريات هذا البحث أو تأثيراته السلبية أو فوائده في حال حصولها أثناء البحث.

_____ _____

إسم الباحث او الشخص المولى الحصول على موافقة المشترك

توقيع الباحث او الشخص المولى الحصول على موافقة المشترك

_____

التاريخ و الساعة

موافقة المشترك:

لقد قرأت استمارة القبول هذه وفهمت مضمونها. تمت الأجابة على أسئلتي جميعها. وبناء عليه فأنني، حرا مختارا، أجيز ان اكون عضوا في فوج صحة القلب والأوعية الدموية والدماغية و أوافق على الإشتراك فيه، وإني أعلم ان الباحث الدكتور كمال بدر وزملاءه ومعاونيه سيكونون مستعدين للإجابة على أسئلتي، وأنه باستطاعتي الإتصال بهم على الهاتف _____01350000_____ . واذا شعرت لاحقا ان الأجوبة تحتاج الى مزيد من الإيضاح فسوف أتصل بأحد اعضاء لجنة الأخلاقيات01- 350000 **5445 كما أعرف تمام المعرفة بانني حر في الإنسحاب من هذا البحث متى شئت حتى بعد التوقيع على الموافقة دون ان يؤثر ذلك على العناية الطبية المقدمة لي. أعلم أني سوف أحصل على نسخة طبق الأصل عن هذه الموافقة.

_____ _____

إسم المشترك

توقيع المشترك او ممثله القانوني او وليه الجبري أو وصيه

_____

إسم الممثل القانوني او الولي الجبري أو الوصي

_____

التاريخ و الساعة (بيد المشترك او ممثله القانوني أووليه الجبري أو وصيه)

_____ _____

إسم الشاهد (إذا كان المشترك أو الوصي أميا)

توقيع الشاهد

_____

التاريخ و الساعة

Institutional Review Board
American University of Beirut
30 NOV 2017

Institutional Review Board
American University of Beirut
October 2015
08 DEC 2016

Institutional Review Board
American University of Beirut

Consent to participate in the Lebanese Cardiovascular/Cerebrovascular Health Cohort (LC^2HC)

For Female Family Members

Establishing the Lebanese Cardiovascular/Cerebrovascular Health Cohort (LC^2HC)

Principle Investigator: Dr Kamal Badr and the Vascular Medicine Program at the American University of Beirut
Co-Investigators: Laila Al-Shaar, Robert Habib, Carla Makhlouf, Najat Saliba, , Nathalie Zgheib

Address: American University of Beirut Medical Center (AUBMC)
Cairo Street
Beirut, Lebanon
Phone: (01) 350 000

You are being asked to participate in establishing the Lebanese Cardiovascular Cerebrovascular Health Cohort at the American University of Beirut. This study has been approved by the Institutional Review Board at AUB for compliance with ethical standards. Please take time to read the following information carefully before you decide whether you want to take part in this study or not. Feel free to ask your doctor if you need more information or clarification about what is stated in this form and the study as a whole.

1) What is this study about?

This is a research study that involves collection of data through an interview using a structured questionnaire.

The purpose of this study is to investigate the different risk factors associated with vascular diseases including cardiovascular and cerebrovascular ones. It also aims to study these diseases and their progression over time through following you up every two years to check on risk factors and patterns of change.

You were chosen by your family member who was recently admitted to AUBMC for cardiovascular or cerebrovascular reasons and because you are either the wife, daughter, or someone who has been residing in the same household with this patient for more than 5 years, and you are 30 years old or above.

A questionnaire will be administered to you during an interview that includes questions on life style, diet, and medical history. This interview shall take around 40 to 45 minutes. You also have the option to complete the interview either while you are in the hospital with your family member, or at his/her home, whatever is the more convenient for you.

In case you already consented but the interview wasn't completed before you left the hospital, you will be contacted by the team to complete the remaining part of the questionnaire over the phone, at a time convenient to you.

2) Any risks as a result of participating in the study?

Although any study may be associated with any unforeseeable risk, this proposal has minimal risk.

3) Any benefits as a result of participating in the study?

It is possible that the information that comes out of the results of the study will contribute to the medical general knowledge and will probably be used in the future by Medical Doctors for better assessment of risk factors associated with the development of cardiovascular and cerebrovascular diseases and more personalized treatment.

You will not be reimbursed for participating in the study. You will also not be reimbursed for any parking or transportation cost. The investigators may choose to end your participation. They will convey to you any significant new findings.
However, you will be part of a cohort which will be followed up every two years. You may also benefit from future interventional studies for advancing cardiovascular and cerebrovascular health in Lebanon.

4) Confidentiality

Your data will be stored at the Vascular Medicine Program at the American University of Beirut indefinitely.
All data collected will be stored in a manner that restricts identifiers to the PIs and the CITI certified Research Assistant. These measures will all be conducted ensuring there is no breach of participants' privacy.

Unless required by law, only the study doctors and designee, the ethics committee and inspectors from governmental agencies will have direct access to your research records without violating confidentiality.

Institutional Review Board
American University of Beirut
30 NOV 2017
APPROVED

Institutional Review Board
American University of Beirut
08 DEC 2016
APPROVED

Institutional Review Board
American University of Beirut
11 JUL 2016
APPROVED

5) Agreements

We would like to know if you would be willing to participate in this research repository. You have the right to accept or decline participation.

I agree to participate in this study and the procedures explained above (conducting an interview and following me up every two years).

YES ..... NO.....

Future contact:

I agree to be contacted for future studies related to vascular diseases YES..... NO.....

I agree to be contacted for future studies for any type of diseases YES..... NO.....

I agree to be contacted if there is any need for providing blood, saliva and urine samples YES..... NO.....

Your coded data may be shared with other investigators for related studies under the supervision of the principal investigator. These investigators may be from AUBMC, from centers other than AUB, and from centers outside Lebanon. They will not know your identity .

I agree to have my data with other investigators for studies related to vascular diseases YES ..... NO.....

I agree to have my coded data shared with other investigators for studies not related to vascular diseases YES ..... NO.....

Investigator's Statement:

I have reviewed, in detail, the informed consent document for this research study with _____ _____ (name of patient, legal representative, or parent/guardian) the purpose of the study and its risks and benefits. I have answered to all the patient's questions clearly. I will inform the participant in case of any changes to the research study.

_____ _____

Name of Investigator or designee Signature

_____

Date

Patient's Participation:

I have read and understood all aspects of the research study and all my questions have been answered. I voluntarily agree to be a member of this Lebanese cardiovascular cerebrovascular health cohort and I know that I can contact Dr. Kamal Badr at AUB Faculty of Medicine 01-350000, or any of their designee involved in the study in case of any questions. If I feel that my questions have not been thoroughly answered, I can contact the Institutional Review Board at 5445. I understand that I am free to withdraw this consent and discontinue participation in this project at any time, even after

signing this form, and it will not affect my care or benefits. I know that I will receive a copy of this signed informed consent.

Name of Participant or Legal Representative
or Parent/Guardian

Signature

Date

Witness's Name
(if patient, representative or parent do not read)

Witness's Signature

Date

Time

Institutional Review Board
American University of Beirut

30 NOV 2017

APPROVED

Institutional Review Board
American University of Beirut

08 DEC 2016

APPROVED

Institutional Review Board
American University of Beirut

11 JUL 2016

APPROVED

موافقة للإشتراك فى إنشاء فوج فى صحة القلب والأوعية الدموية والدماغية

إنشاء فوج في صحة القلب والأوعية الدموية والدماغية لبرنامج الطب الأوعية الدموية في كلية الطب في الجامعة الاميركية في بيروت.

Establishing the Lebanese Cardiovascular/Cerebrovascular Health Cohort (LC²HC)

للمشاركات الإناث

إسم الباحث: د. كمال بدر و برنامج الطب الأوعية الدموية في كلية الطب في الجامعة الاميركية في بيروت.

مكان إجراء البحث: الجامعة الاميركية في بيروت، كلية الطب.

أنت مدعوة للمشاركة ببحث لانشاء فوج في صحة القلب والأوعية الدموية والدماغية سيجرى في الجامعة الأميريكية في بيروت. الرجاء أن تأخذي الوقت الكافي لقراءة المعلومات التالية بتأن قبل أن تقرري إذا كنت تريدين المشاركة أم لا. بإمكانك طلب إيضاحات أو معلومات إضافية عن أي شيء مذكور في هذه الإستمارة أو عن هذه الدراسة ككل من طبيبك او فريق البحث.

1. **ما هو هدف الدراسة؟**

إن هذه الدراسة تتضمن تجميع معلومات من خلال استبيان معيّن.

إن هدف هذه الدراسة هو البحث عن عوامل الخطر المرتبطة مباشرةً بأمراض القلب والأوعية الدموية ومن ضمنها الدماغية. ونهدف أيضاً إلى دراسة هذه الامراض و تطورها من خلال متابعتكن كل سنتين والتحقق كيف تغيرت عوامل الخطر.

لقد تم اختيارك من قبل قريبك/ قريبتك الذي ادخل الى مستشفى الجامعة الاميركية في بيروت لأسباب تتصل بالأمراض القلبية اوالأوعية الدموية ومن ضمنها الدماغية ولانك انت إما الزوجة او الابنة أو أنثى مقيمة مع هذا المريض منذ أكثر من 5 سنوات وعمرك 30 سنة او أكثر.

سيتم الحصول على المعلومات من خلال مقابلة مباشرة معك من قبل مساعد البحوث عن نمط الحياة، والنظام الغذائي، و التاريخ الطبي. هذه المقابلة قد تستغرق 40 إلى 45 دقيقة. لديك أيضا خيار لإكمال المقابلة إما بينما انت مع أحد أفراد أسرتك في المستشفى أو في المنزل الخاص به /بها، كل ما هو الأكثر ملاءمة لك.
في حال كنت وافقتي بالفعل ولكن لم يتم إكمال المقابلة قبل أن تغادري المستشفى ، سيتم الاتصال بك من قبل فريق لاستكمال الجزء المتبقي من الاستبيان عبر الهاتف ، في وقت مناسب لك.

2. **هل هناك أية مخاطر ناتجة عن اشتراكك في هذه الدراسة؟**

رغم أن كل دراسة لها مخاطر غير متوقعة إلاّ ان ليس لهذه الدراسة إلا خطر ضئيل.

3. هل هناك فوائد ناتجة عن اشتراكك في هذه الدراسة؟

من الممكن أن تكون هناك فائدة للمشاركة في هذه الدراسة اذ أنّ النتيجة ممكن أن تساعد الأطباء المعالجين مستقبلياً على معرفة إحدى المخاطر اللتي قد تؤدي إلى أمراض القلب والأوعية الدموية ومن ضمنها الدماغية و سبل الوقاية منها.

لا مكافأة لاشتراكك في هذه الدراسة ولا دفع لمصاريف تنقلاتك او إجرة موقف سيارتك. لن تدفع أجور إضافية. يجدر الإشارة أنّ الباحثين قد يلغون مشاركتك. سيتم إبلاغك بأية نتائج جديدة ذات أهمية قد تصدر عن هذه الدراسة.
لكنك ستكون جزءا من الفوج الذي سيتبع بشكل منتظم كل سنتين. و قد تستطيع أيضا الاستفادة من الدراسات التدخلية المستقبلية لتعزيز صحة القلب والأوعية الدموية ومن ضمنها الدماغية في لبنان.

4. السريّة

سيتم حفظ معلوماتك الصحية في برنامج الطب القلبي والوعائي في كلية الطب في الجامعة الاميركية في بيروت.
سيتمّ تخزين كافة البيانات التي تم تجميعها بطريقة تحصر الوصول إليها بالباحث الرئيسي و مساعده. وستتمّ هذه الإجراءات كلها مع الحرص على عدم انتهاك خصوصية المشاركين.

لن يكون لأي شخص، ما لم ينص القانون على ذلك، حق الاطلاع على ملفك الطبي باستثناء الطبيب المسؤول ومعاونيه، ولجان الأخلاق المهنية المستقلة، ومفتشين من الإدارات الحكومية المنظمة.

5. الموافقة

نودّ أن أعرف إذا كنتن مستعدات للمشاركة في هذه الدراسة. لكن كامل الحق في قبول المشاركة أو رفضها.

أوافق على المشاركة في هذه الدراسة والإجراءات المحدّدة أعلاه (مقابلة مباشرة معي والمتابعة كل سنتين)

نعم..... لا.....

أوافق على أن يتم التواصل معي للدراسات المستقبلية المتعلقة بالأمراض الاوعية الدموية

نعم..... لا.....

أوافق على أن يتم التواصل معي للدراسات المستقبلية المتعلقة بجميع أنواع الأمراض كافةً

نعم..... لا.....

أوافق على أن يتم التواصل معي إذا كان هناك أي حاجة في المستقبل لدمي و / أو البول

نعم..... لا.....

ستكون بياناتك المرمّزة مشتركة مع باحثين آخرين ذات الصلة بالدراسات. وهؤلاء الباحثون لا يعرفون هويتك.

أوافق على أن يكون يتم تبادل البيانات الخاصة بي المرمّزة مع باحثين آخرين من اجل دراسات مشابهة

نعم..... لا.....

موافقة الباحث:

لقد شرحت بالتفصيل للمشترك في البحث الطبي ل_____ (اسم المشترك او ممثله القانوني أو وليه الجبري أو وصيه اذا كان المشترك قاصرا أو غير قادر على التوقيع) طبيعته ومجرياته وتأثيراته السلبية. ولقد أجبت على كل أسئلته بوضوح على خير ما أستطيع. وسوف أعلم المشترك بأي تغييرات في مجريات هذا البحث أو تأثيراته السلبية أو فوائده في حال حصولها أثناء البحث.

_____ _____

إسم الباحث او الشخص المولى الحصول على موافقة المشترك

توقيع الباحث او الشخص المولى الحصول على موافقة المشترك

_____

التاريخ و الساعة

موافقة المشترك:

لقد قرأت استمارة القبول هذه وفهمت مضمونها. تمت الأجابة على أسئلتي جميعها. وبناء عليه فأنني، حرا مختارا، أجيز ان اكون عضوا في فوج صحة القلب والأوعية الدموية والدماغية و أوافق على الإشتراك فيه، وإني أعلم ان الباحث الدكتور كمال بدر وزملاءه ومعاونيه سيكونون مستعدين للإجابة على أسئلتي، وأنه باستطاعتي الإتصال بهم على الهاتف _____01350000_____ . واذا شعرت لاحقا ان الأجوبة تحتاج الى مزيد من الإيضاح فسوف أتصل بأحد اعضاء لجنة الأخلاقيات (01- 350000 .5445). كما أعرف تمام المعرفة بانني حر في الإنسحاب من هذا البحث متى شئت حتى بعد التوقيع على الموافقة دون ان يؤثر ذلك على العناية الطبية المقدمة لي في حال كنت محتاجا لها. أعلم أني سوف أحصل على نسخة طبق الأصل عن هذه الموافقة.

_____ _____

إسم المشترك

توقيع المشترك او ممثله القانوني او وليه الجبري أو وصيه

_____

إسم الممثل القانوني او الولي الجبري أو الوصي

_____

التاريخ و الساعة (بيد المشترك او ممثله القانوني أووليه الجبري أو وصيه)

_____ _____

إسم الشاهد (إذا كان المشترك أو الوصي أميا)

توقيع الشاهد

_____

التاريخ و الساعة

APPENDIX B

AMENDED DATA COLLECTION FORM

Institutional Review Board
American University of Beirut

Research ID (filled by Research Team)_____ **Hospital of Recruitment**_____

20 JUN 2016
RECEIVED

Name of Participant _____ ☐Admitted Patient ☐Female Family Member

If a Female family member, Name of Index Cardiac Patient _____

Relationship with the index case ☐Spouse ☐Daughter ☐Mother ☐Sister ☐Others, specify_____

Date of Birth ⌊⌊ ⌊⌊ ⌊⌊⌊⌊ **Weight (Kg)**_____ **Weight when you were 21 yrs old (Kg)** _____
dd mm year **Weight one year ago (Kg)** _____

Phone Number _____ **Height (cm)** _____ **Waist Circumference (cm)**_____ **Hip Circumference (cm)**_____
(measured by the research team) (measured by the research team)

Demographics

Current Marital Status ☐Currently Married ☐Widowed ☐Separated ☐Divorced ☐Never married

Number of children _____

Education ☐Illiterate ☐Elementary or less ☐Intermediate ☐Secondary ☐University ☐ Technical BT ☐ Technical TS

Work Status ☐Full time ☐Part time ☐Retired ☐Disabled ☐ Unemployed

Type of Occupation _____

Place of residence: ☐Rural ☐Suburban ☐Urban

Governorate_____ District_____

Village_____

GPS Coordinates _____

Mail address _____

_____

Email address_____

Is the house you live in ☐Owned ☐Rented ☐Rented with mortgage payments to a bank ☐Declined to answer ☐ Others, specify

Number of rooms (excluding kitchen and bathrooms)
_____

Who else lives with you
☐Alone ☐ spouse
☐Children unmarried
☐ Children married
☐Other relatives, specify
☐Other non-relatives, specify
☐Nursing Home

Number of people in same household (including yourself)
_____

Page 1 of 13

Institutional Review Board
American University of Beirut

11 JUL 2016
APPROVED

I will read you some statements related to your household income. Which of these statements comes closest to describing your household income? (Read) ☐ Our household income covers our expenses well and we are able to save ☐ Our household income covers our expenses without notable difficulties.☐I Our household income does not cover our expenses and we face some difficulties in meeting our needs. ☐ Our household income does not cover our expenses and we face significant difficulties in meeting our needs ☐ I don't know (Do not read). ☐ Declined to answer (Do not read).

Food Security:

Which of these sentences applies the most to the food eaten by your household during the past 6 months?
☐ We had enough to eat of the kinds of food we wanted ☐We had enough to eat but not always the kinds of food we wanted ☐ Sometimes we did not have enough to eat ☐Often we did not have enough to eat

In the last 6 months, was there a time when you were concerned that you would run out of food for your household for the next month? ☐Yes ☐No

In the past 6 months, has it ever happened that the food you bought was not enough and you didn't have money to buy more? ☐Yes ☐No

Were there any foods you feel your family did not eat enough of in the last 6 months? ☐Yes ☐No **If yes, specify**

In the past 6 months, did you or any other adult in your household ever cut the size of your meal because there was not enough food? ☐Yes ☐No

In the past 6 months, did you or any other household members ever skip a meal because there was not enough food? ☐Yes ☐No

In the past 6 months did you or any member in your household not eat for a whole day or go to bed hungry because there was not enough food?
☐Yes ☐No

****Part of our study is trying to understand how people feel about their health****

So you are here now because of cardiovascular/cerebrovascular problems, but before this, how was your health?
☐Very Good ☐Good ☐Fair ☐Poor ☐Very Poor

And how do you feel your health now? ☐Very Good ☐Good ☐Fair ☐Poor ☐Very Poor

Why do you feel [selected category]?_____

Medical History

In the Past Year, have you had the following:

☐Physical Exam	For Symptoms ☐Yes ☐No	☐Mammography	For Symptoms ☐Yes ☐No
☐Eye Exam	For Symptoms ☐Yes ☐No	☐Fasting Blood Sugar	For Symptoms ☐Yes ☐No
☐Lipid Test	For Symptoms ☐Yes ☐No	☒Blood Pressure	For Symptoms ☐Yes ☐No

Have you had any of the following clinician diagnosed illnesses (Mark All that Apply)

Cardiovasc/Resp

☐Family History of CVD (before 55)
☐Myocardial Infarction
Were you hospitalized ☐ Yes ☐No
☐Angina Pectoris
Confirmed by Angiogram ☐ Yes ☐No
☐Coronary Artery Bypass Surgery
☐PCI or stent
☐Congestive Heart Failure
☐Stroke
☐Deep Vein Thrombosis
☐Transient Ischemic Attack
☐Peripheral Artery Disease
☐Aortic Aneurysm
☐Carotid Surgery
☐Atrial Fibrillation
☐ICD-implantable Cardiac Fibrillator
☐Asthma
☐Emphysema/Chronic Bronchitis

Endo

☐ High Blood glucose(pre-diabetic)
☐ Diabetes Mellitus
☐Elevated Cholesterol
☐High Blood Pressure
☐Hyperparathyroidism
☐Hypothyroidism

Ortho

☐Hip Fracture
☐Vertebral Fracture
☐Rheumatoid Arthritis

Eyes & Ears

☐Glaucoma
☐Macular Degeneration of the retina
☐Cataract
☐Hearing loss (by audiogram)

Cancer

☐Cancer of colon or rectum
☐Colorectal polyps
☐Leukemia or lymphoma
☐Melanoma
☐Skin Cancer
☐Other cancer, specify_____

GI/GU

☐Gall bladder removal
☐Kidney Stones
☐Ulcerative colitis
☐gastric/duodenal ulcer
☐Celiac Disease
☐Chronic Hepatitis (B or C)
☐Gastric Banding/Bypass

Others

☐Gout
☐Alcohol dependence problem
☐Multiple Sclerosis
☐Parkinson Disease
☐Hernia Repair
☐Appendectomy
☐Alzheimer or any kind of dementia
☐Pernicious Anemia/Vit B12 deficiency
☐Depression (clinically diagnosed)
☐Other major illnesses or surgeries

For Females Only

How many pregnancies have you had:_____

How many deliveries have you had:_____

Are you still getting your period regular ☐Yes ☐No

Have you had a period in the last month ☐Yes ☐No

If yes, period was due to ☐hormones ☐Natural

If No, Have your natural menstrual periods stopped ☐Yes ☐No ☐ Don't know

If yes, why: ☐ Natural menopause ☐Hysterectomy and 1 or no ovary removed ☐ Hysterectomy and both ovaries removed ☐ both ovaries removed and no hysterectomy ☐Radiation/Chemotherapy ☐ Others, specify.

Specify the age of the chosen category: _____

If No, How many months ago was your last menstrual period: ☐ 2 months ☐3-6 months ☐ 7-12 months ☐ >12 months ☐ Don't know/can't remember

If Don't know, did you have a period in the last year ☐Yes ☐ No

Have you had any of the following clinician diagnosed illnesses:

☐Fibrocystic/other benign breast cancer;
Confirmed by Biopsy ☐Yes ☐No
☐Breast Cancer
☐Ovarian Cancer

Are you currently on Hormone Replacement Therapy (HRT)
☐Yes ☐No

Use of Oral Contraceptives
☐Current ☐ Past ☐None

For Males Only

Have you had any of the following clinician diagnosed illnesses ☐Prostate Cancer ☐Prostatic enlargement treated by drugs, surgery, or laser

****Now we have some questions about the medications you are taking ****

Regular Medications: Mark if used regularly in the past 2 years and specify their names:

Days/week	1	2-3	4-6	6+	Dose/day
Acetaminophen(e.g Tylenol)					
Baby Aspirin (low dose)					
Ibuprofen					
Anti-inflammatory analgesics					
Insulin					
Metformin (Glucophage)					
Other oral hypoglycemic agents					
Thyroid Hormones					
Celebrex (Cox2 inhibitors)					
Thiazide Diuretics					
Lasix					
Potassium					
Calcium Blocker					
Beta Blocker					
ACE inhibitors					
Angiotensin Receptor Blocker					
Other Anti-hypertensives					
Coumadin					
Plavix					
Pradaxa/Xarelto					
Prasugrel					
Digoxin					
Anti-Arrythmic					
Mevacor (Lovastatin)					
Zocor (simvastatin)					
Crestor					
Pravachol (pravastatin)					
Lipitor (Atorvastatin)					
Other statins					
Other cholesterol lowering drug (Niacin, Lopid, Tricor (fenofibrate), Questran, Colestid, Zetia)					
Steroids taken orally (prednisone ,decadrone, Medrol)					
Minor Tranquilizers (Valium, alprazolam,lorazepam)					
H2 Blockers (Zantac, Pepcid, Tagamet, Axid)					
Tricyclics					
SSRI (selexa, Lexapro, Prozac, Luvox, Zoloft)					
Other antidepressants					
Anticholinergics					

Bisphosphonates (Fosamax, Boniva)					
Other medications to be stated					

****Based on the those mentioned drugs related to cardiovascular (cerebrovascular) diseases****

Drug Adherence

1) Do you sometimes forget to take your [health concern] pills? ☐Yes ☐ No

2) People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not take your medicine? ☐Yes ☐ No

3) Have you ever cut back or stopped taking your medicine without telling your doctor because you felt worse when you took it? ☐Yes ☐ No

4) When you travel or leave home, do you sometimes forget to bring along your medicine? ☒Yes ☐ No

5) Did you take all your medicine yesterday? ☐Yes ☐ No

6) When you feel like your symptoms are under control, do you sometimes stop taking your medicine? ☐Yes ☐ No

7) Taking medicine every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your treatment plan? ☐Yes ☐ No

8) How often do you have difficulty remembering to take all your medicine?
A. Never/rarely
B. Once in a while
C. Sometimes
D. Usually
E. All the time

Knowledge and attitudes about Blood Pressure

Have you ever been told by a doctor or health care provider that you have hypertension? ☐Yes ☐No
If yes, are you worried about it? ☐Yes ☐No
If yes, have you been prescribed a medicine as a treatment for Blood Pressure ☐Yes ☐No
If yes, how important do you think taking medicine is to keeping blood pressure under control?
☐Very Important ☐Somewhat important ☐Not at all important

What does the term hypertension (daght) mean?_____*(and mark all that apply):*
☐Don't know ☐Pressure of the blood ☐High level stress/Tension ☐Nervous condition ☐High blood sugar ☐Over activity ☐Others, specify_____

How dangerous is hypertension to your health? ☐Extremely ☐Somewhat ☐Not at all ☐Don't know
☐It depends: specify_____

Can people do things to lower their blood pressure? ☐Yes ☐No ☐Don't know

If Yes, like what? ☐Don't know ☐Taking medications ☐Exercising ☐Less stress ☐Quitting smoking ☐Change diet(salt) ☐Reducing alcohol ☐Losing weight ☐Others, specify_____

What was your blood pressure level at your most recent visit?
Systolic _____☐ Doesn't recall ☐ Wasn't told
Diastolic _____☐ Doesn't recall ☐ Wasn't told

Diet and Behaviors

Please select the person who does the following activities in your household on a regular basis (Mark all that apply)

Does Grocery Shopping	☐Myself	☐Spouse	☐Children	☐House Maid	☐Others, specify_____
Prepares your own meals	☐Myself	☐Spouse	☐Children	☐House Maid	☐Others, specify_____
Does your own housework	☐Myself	☐Spouse	☐Children	☐House Maid	☐Others, specify_____
Handles your medication	☐Myself	☐Spouse	☐Children	☐House Maid	☐Others, specify_____

Dietary Habits and Knowledge:

A. Eating out: How many times per week do you typically eat?

	Never	1-2 times	3-4 times	5+ times
At Home, at the kitchen/dining table (no TV)				
At Home, in front of the TV/computer				
At Work, on your desk office				
On-the-go (while walking, standing, doing something else)				

How many times do you typically eat?	Never	1-3x/mnth	1-3x/wk	4-6x/wk	Daily
Outside the Home (Fast food) *(McDonald KFC, shawarma, falafel, manakeesh)*					
Outside Home, Other restaurants/food sources					

B. Knowledge and attitudes about food

Are there health problems that can occur when a person is overweight or obese? ☐Yes ☐No

If yes, specify ☐Diabetes ☐Hypertension ☐Hypercholesterolemia ☐Hypertension ☐Cardiac problems ☐Inability to move

☐Back pain ☐Others, specify _____

What are the best ways to prevent overweight and obesity (more than one answer can be selected)

☐Avoid sweet drinks ☐Avoid fatty foods ☐Eat smaller portions ☐Increase physical activity level ☐Others, specify:_____

Do you consider yourself as ☐Normal weight ☐Overweight ☐Obese

In the last 12 months, have you been trying to control your weight? ☐Yes ☐No ☐Don't know

If Yes, Please rate the extent to which you have been successful: ☐Not Successful ☐Somewhat successful ☐Very Successful

Do you think it is normal for people to gain weight as they become older? ☐Yes ☐No

Why?_____

Give an example of what you think is a healthy meal for you and your family

_____

********So now we move to questions about exercise and the extent to which you are being physically active, and we have questions about activity at work, to go places, at home and for fun. Let's start if it is ok with you*******

Physical Activity:

Do you currently have a job or do any unpaid work outside your home? ☐Yes ☐No

If Yes, in the last 7 days:

Part I: Job related Physical Activity The first section is about your work. This includes paid jobs, farming, volunteer work, course work, and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home, like housework, yard work, general maintenance, and caring for your family. **These are asked in Part 3**				
			Number of days/week	**Time/day** (Hours: minutes)
Does your work involve **vigorous**-intensity activity that causes **large increases in breathing or heart rate** like carrying, lifting heavy loads, digging or construction work for at least 10 minutes continuously?	☐Yes ☐No	If Yes, ☐Indoor ☐Outdoor	If Yes, _____	If Yes, __, __
Does your work involve **moderate**-intensity activity that causes **small increases in breathing or heart rate** such as brisk walking (or carrying light loads) for at least 10 minutes continuously?	☐Yes ☐No	If Yes, ☐Indoor ☐Outdoor	If Yes, _____	If Yes, __, __
During the **last 7 days**, how many days did you **walk for at least 10 minutes** at a time as part of your work? Please do not count any walking you did to travel to or from work.			If Yes, **Number of days/week:** _____ ☐No job related walking	__, __
PART 2: TRANSPORTATION PHYSICAL ACTIVITY **Travel to and from places** (excluding the activities mentioned at work), ex. *To work, for shopping, to market, place of worship*				
how many days did you **travel in a motor vehicle** like a bus or car			If Yes, **Number of days/week:** _____ ☐No traveling in a motor vehicle	__, __
What is your usual walking pace outdoors: ☐Unable to walk ☐Easy, casual (<3Km/h) ☐Normal Average (3-5 Km/h) ☐Brisk Space(4-6km/h) ☐Very Brisk (6km/h or more)				
Do you walk or use bicycle (pedal cycle), for at least 10 min continuously to get to and from places?	☐Yes ☐No		If Yes, _____	If Yes, __, __
How many total flights of stairs do you climb daily? ☐None ☐2 flights or less ☐3-4 ☐5-9 ☐10-14 ☐15 or more				

Part 3: *HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY*

This section is about some of the physical activities you might have done in the last 7 days in and around your home

Do you do heavy work at home or outside? If no, skip to next section on recreational activities

how many days did you do vigorous physical activities like heavy lifting, chopping wood, shoveling snow, or digging in the garden or yard?			If Yes, Number of days/week: _____ ☐No vigorous activity in garden or yard	If Yes, ___, ___
how many days did you do **moderate activities** like carrying light loads, sweeping, washing windows, and raking **in the garden or yard?**			If Yes, Number of days/week: _____ ☐No moderate activity in garden or yard	If Yes, ___, ___
on how many days did you do **moderate activities** like carrying light loads, washing windows, scrubbing floors and **sweeping inside your home?**			If Yes, Number of days/week: ☐No moderate activity inside home	If Yes, ___, ___
Recreational Activities (excluding the work and transport activities that you already mentioned)				
Not counting any walking you have already mentioned, during the last 7 days, on how many days did you **walk for at least 10 minutes at a time in your leisure time?**			If Yes, _____ ☐ No walking in leisure time	If Yes, ___, ___
Do you do any vigorous-intensity sports, fitness or recreational (leisure) activities, that cause large increases in breathing or heart rate like (running, aerobics, fast bicycling, fast swimming or football) for at least 10 minutes continuously?	☐Yes ☐No	If Yes, ☐Indoor ☐Outdoor	If Yes, _____	If Yes, ___, ___
Do you do moderate-intensity sports, fitness or recreational (leisure) activities, that cause small increases in breathing or heart rate such as brisk walking, cycling, swimming, volleyball) for at least 10 minutes continuously?	☐Yes ☐No	If Yes, ☐Indoor ☐Outdoor	If Yes, _____	If Yes, ___, ___

Sedentary behavior (including sitting or reclining at work, at home, getting to and from places, or with friends including time spent sitting at a desk, sitting with friends, traveling in a car, bus, reading, playing cards or watching television. However, this doesn't include sleeping)

How much time do you usually spend sitting or reclining on a typical day	____**(hr),** ____**(min)**
How many hours per week do you spend standing or walking around at home or at work	____**(hr),** ____**(min)**
How many hours per week do you spend sitting at work or in a car	____**(hr),** ____**(min)**

Are you satisfied with how much exercise you do in a typical week? ☐ Satisfied ☐ Neutral ☐ Not Satisfied

If not satisfied, what would make it easier for you to increase your activity: ☐ presence of a nearby gym ☐ presence of a nearby outdoor area ☐ reducing the fees of gyms ☐ having a partner to accompany and encourage me ☐ Having more time ☐ Group walks ☐ Others, specify_____

*******Part of our study is trying to understand how much people are being exposed to environmental toxins. I will therefore ask you few questions about smoking and other sources of toxins.*******

Environmental Health

Cigarette smoking ☐Current ☐Past ☐Never

If Current, number of years since your started smoking _____

If Current, number of cigarettes per day ☐1-4 ☐5-14 ☐15-24 ☐25-34 ☐35-44 ☐45+

If Past, number of years of smoking _____

If Past, age when you stopped _____

Waterpipe smoking ☐Current ☐Past ☐Never

If current or past, how many times/ week ☐Once ☐Twice ☐3x/week ☐4-6 times/week ☐Daily

If current or past, age at which you started:

If current or past, specify the duration each time you smoked narghile in minutes _____

If past, number of years since you quitted

Are you a passive cigarette/waterpipe smoker (choose more than one answer if applicable) ☐Home ☐Work ☐Cafe ☐N/A

Does your house overlook a traffic street? ☐Yes ☐No

If Yes, in what apartment level are you? _____

How long have you been living in this apartment ☐1-5 yrs ☐5-10 yrs ☐10-15 yrs ☐15-20 yrs ☐20-30 yrs ☐> 30 yrs

Are there shops at the street level? ☐Yes ☐No

Is your house close to a local diesel generator ☐Yes ☐No ☐Don't know

Can you see the exhaust of a diesel generator from one of your balconies or windows? ☐Yes ☐No

How long have you been living/ever lived near a local diesel generator ☐Never ☐1-5 yrs ☐5-10yrs ☐10-15yrs ☐15-20 yrs ☐20-30 yrs ☐> 30 yrs

What are your indoor residential heating options in winter (e.g. chimney, wood/ diesel burning stove, electric heater, water heater)_____

What kind of transportation means do you use most often to go to work ☐Own Car ☐Bus ☐Taxi ☐Bicycle ☐Motorbike ☐Others, specify_____

How long does it take you to get from : Home to work _____ ☐hr ☐min Work to home _____ ☐hr ☐min

*******Now if it is ok with you, we have some questions about your psychosocial wellbeing*******

Psychosocial Health

How do you rate the quality of your life? ☐Excellent ☐Good ☐Fair ☐Poor ☐Awful

How much of the time during the last month, have you:

	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
Been a happy person						
Felt calm and peaceful						
Been a very nervous person						
Felt downhearted and blue						
Felt so down in the dumps so that nothing could cheer you up						

For those who have children:

How many of your children would you say you have a close relationship with? _____

How many of your other family members would you say you have a close relationship with? _____

How many of your friends would you say you have a close relationship with? _____

How often do you lack companionship? ☐Often ☐Some of the time ☐Hardly ever or Never

How much do you feel lonely? ☐Often ☐Some of the time ☐Hardly ever or Never

How much do you feel that there are people you can talk to? ☐Often ☐Some of the time ☐Hardly ever or Never

How often do you eat fried or sautéed food at home? ☐< once/week ☐1-3x/week ☐4-6x/week ☐Daily

What type of cooking oil is usually used at home: (brand and type, ex. Mazola corn oil): _____

How often do you eat deep fried food away from home? ☐< once/week ☐1-3x/week ☐4-6x/week ☐Daily

How many times each week (including weekends) do you eat breakfast: ☐Never, almost never ☐1-2x per week ☐3-4x/week ☐5 or more /week

********In addition to the already answered questions, it is very important to include details about your diet. We will now go over a section that describes your consumption pattern during the past year, using a frequency of either per month, week or day*******

Indicate how often on average you have consumed the amount specified during the past year:

Foods	Standard portion		Never OR <1/mo.	1-3/ mo.		1/ week	2-4/ week	5-6/ week		1/ day	2-3/ day	4-5/ day	6+/ day
Breads and cereals													
Bread, white	1 M. Arabic loaf/ 1baguette	p.13			W				D				
Bread, whole wheat	1 M. Arabic loaf/1baguette	p.13			W				D				
Kaak	5 finger-sized	p.13			W				D				
Toast/rice cakes	3 toast (palm-sized)	p.13			W				D				
Rice, white	1 cup	p.4			W				D				
Rice, brown	1 cup	p.4											
Pasta/noodles, plain	1 cup	p.4			W				D				
Wheat/bulgur	1 cup	p.4			W				D				
Breakfast cereal, *high and medium fiber*	1 cup	p.3			W				D				
Breakfast cereal, *low fiber ≤ 1 grams*	1 cup	p.3			W				D				

Popcorn	3 cups	p.3			W				D				
Dairy products													
Milk, skim/low-fat (0-2%)	1 cup	p.12			W				D				
Milk, whole-fat	1 cup	p.12			W				D				
Milkshake, sweetened	1 carton	p.13			W				D				
Yogurt, fat-free/low-fat	1 cup	p.12			W				D				
Yogurt, whole-fat	1 cup	p.12			W				D				
Cheese, low & medium fat *(akkawi, baladi, feta, halloumi, mozzarella, cream)*	1 slice/ 1 triangle/ 2 cubes	p.13			W				D				
Cheese, high fat *(cheddar, kashkaval, goat, blue cheese)*	1 slice/ 1 triangle/ 2 cubes	p.13			W				D				
Labneh, regular	1 tbsp.	p.11			W				D				
Labneh, low fat	1 tbsp.	p.11			W				D				
Fruits													
Citrus orange/grapefruit □ Regular □ Seasonal	1 M./ ½ cup chopped	p.14			W				D				
Peach/ plums/ prunes □ Regular □ Seasonal	1 M./ ½ cup chopped	p.14			W				D				
Strawberries □ Regular □ Seasonal	1 M./ ½ cup chopped	p.14			W				D				
Grapes □ Regular □ Seasonal	1 M./ ½ cup chopped	p.14			W				D				
Banana/ apples □ Regular □ Seasonal	1 M./ ½ cup chopped	p.14			W				D				
Fruits, dried (regular)	¼ cup	p.4			W				D				
Fruits, canned	½ cup	p.4			W				D				
Orange juice	1 cup	p.12			W				D				
Other Fruit juice	1 cup	p.12			W				D				
Fruit juice, sweetened	1 cup/ 1 carton	p.13			W				D				
Vegetables													
Tomatoes	1 M./ ½ cup	p.14			W				D				
Salad, green: lettuce, mint, cucumber, rocket.	1 cup	p.8			W				D				
Dark green or deep yellow, cooked (*spinach, Swiss chard, carrots)*	½ cup	p.4			W				D				
Corn/ green peas, fresh/frozen	½ cup	p.4			W				D				
Potatoes, baked / boiled	1 M./ ½ cup	p.9-14			W				D				
Cauliflower/ cabbage/ broccoli	½ cup/ 1 item	p.4-14			W				D				
zucchini/ eggplant	½ cup/ 1 item	p.4-14			W				D				
Vegetables, canned	½ cup	p.4			W				D				
Vegetable juice	1 cup	p.12			W				D				
Meat and substitutes													
Lentils	1 cup	p.4			W				D				
Beans	1 cup	p.4			W				D				
Chickpeas *(including hummus)*	1 cup	p.4			W				D				
Processed meats *(sausage, luncheon meats, hotdog)*	2 slices/ 1 hotdog	p.2			W				D				
Legumes: *lentils, beans, chickpeas*	1 cup	p.4			W				D				
Red meat: beef/lamb/goat	1 M. steak/ 10 cubes	p.2, 3oz			W				D				

(including burgers)													
Poultry *(including burgers)*	½ breast/1 leg/3 drumsticks /7 wings/ 10 taouk	p.14			W				D				
Fish, canned (tuna, sardines)	½ L. can/ 1S.can	p.14			W				D				
Fish/seafood *(including burgers)*	1 M. filet	p.14			W				D				
Shrimps	7 shrimps	p.14			W				D				
Eggs	1 egg				W				D				
Organ meats	½ cup	p.4			W				D				
Fats and Oils (salads, sandwiches, cooking, and frying)													
Olive oil	1 tbsp.	p.11			W				D				
Canola oil	1 tbsp.	p.11			W				D				
Corn oil	1 tbsp.	p.11			W				D				
Sunflower oil	1 tbsp.	p.11			W				D				
Soybean oil	1 tbsp.	p.11			W				D				
Coconut oil	1 tbsp.	p.11			W				D				
Other vegetable oils *(including palm oil)*	1 tbsp.	p.11			W				D				
Olives	5 olives				W				D				
Butter	1 tbsp.	p.6			W				D				
Ghee	1 tbsp.	p.6			W				D				
Mayonnaise	1 tbsp.	p.6			W				D				
Tahini	1 tbsp.	p.11			W				D				
Walnuts	½ cup/ 1 S. bag	p.4			W				D				
Nuts & seeds: Raw/ dry-roasted, peanuts, almonds, seeds..	½ cup/ 1 S. bag	p.4			W				D				
Nuts & seeds: Oil-roasted peanuts, almonds, seeds..	½ cup/ 1 S. bag	p.4			W				D				
Sweets and pastries													
Arabic sweets	½ knefe + kaak/ 2 maamoul / 4 small baklava				W				D				
Cakes and pastries	1 M. piece	p.15			W				D				
Croissant	1 M. piece	p.15			W				D				
Doughnuts	1 M. piece	p.15			W				D				
biscuits	5 plain biscuits	p.15			W				D				
Chocolate	1 M. bar	p.15			W				D				
Frozen yogurt	1 scoop	p.9			W				D				
Ice cream	1 scoop/ 1 stick	p.9			W				D				
Sugar, granulated (added)	1 tbsp.	p.11			W				D				
Honey, jam, molasses	1 tbsp.	p.11			W				D				
Beverages													
Soft drink, caffeinated, regular *(Coca-Cola, Pepsi)*	1 can (330 mL)				W				D				
Soft drink, no caffeine, regular *(7-Up, Mirinda)*	1 can (330 mL)				W				D				
Soft drink, caffeinated, diet *(Diet Coke, Diet Pepsi)*	1 can (330 mL)				W				D				
Soft drink, no caffeine, diet *(Diet-7-Up, Diet*	1 can (330 mL)				W				D				

Mirinda)													
Turkish coffee	1 fenjen				W				D				
Black coffee	1 cup	p.12			W				D				
Decaffeinated Coffee	1 cup	p.12			W				D				
Non-dairy creamer	1 tbsp.	p.11			W				D				
Herbal tea	1 cup	p.12			W				D				
Black/green tea	1 cup	p.12			W				D				
Tea	1 cup	p.12			W				D				
Hot chocolate	1 cup	p.12			W				D				
Energy drink	1 can (260 mL)				W				D				
Non-alcoholic beer	1 bottle (350mL)	p.15			W				D				
Beer	1 bottle (350mL)	p.15			W				D				
Wine	1 glass (150 mL)	p.15			W				D				
Liquor (vodka, whiskey..)	1 shot (45 mL)	p.15			W				D				
Water	1 cup				W				D				
Miscellaneous													
Manaeesh, zaatar/cheese	1 regular portion				W				D				
French fries	1 cup	p.4			W				D				
Potato chips	1 M. bag				W				D				
Falafel sandwich	1 S. sandwich				W				D				
Pizza	1 M. slice	p.15			W				D				
Thyme & sesame (excluding manaeesh)	1 tbsp.	p.11			W				D				
Ketchup	1 tbsp.	p.11			W				D				
Mustard	1 tbsp.	p.11			W				D				
Pickles	1 M. piece/ ¼ cup	p. 4			W				D				
Artificial sweetener	1 packet				W				D				

Abbreviations: S.=small; M.=medium; L.=large; tbsp..=tablespoon; 1 cup=240 Ml

How many times do you season your food with a tomato-based sauce (tomato, onion, garlic and simmered with olive oil)? number of times per day / week / month?

Are there any other foods not mentioned in the list and that you consume <u>AT LEAST ONCE A WEEK</u> (such as nut butters, oatmeal, sports drink, decaffeinated tea, energy bars, meal replacement drinks, etc.)

Foods	Portion consumed	2-4 /week	5-6 /week	1 /week	2-3 /day	4-5 /day	6+ /day

APPENDIX C

ORIGINAL DATA COLLECTION FORM

Research ID (filled by Research Team)_____

Name of Participant_____ ☐Admitted Patient ☐Female Family Member

If a Female family member, Name of Index Cardiac Patient _____

Relationship with the index case ☐Spouse ☐Daughter ☐Mother ☐Sister ☐Others, specify_____

Date of Birth ⌊⌊ dd ⌊⌊ mm ⌊⌊⌊⌊ year **Weight (Kg)**_____ **Weight when you were 21 yrs old (Kg)**_____

Phone Number_____ **Height (cm)** _____ **Waist Circumference (cm)**_____ **Hip Circumference (cm)**_____
(measured by the research team) (measured by the research team)

Institutional Review Board
American University of Beirut
12 OCT 2015
RECEIVED

Demographics

Current Marital Status ☐Currently Married ☐Widowed ☐Separated ☐Divorced ☐Never married

Number of children _____

Education ☐Illiterate ☐Elementary or less ☐Intermediate ☐Secondary ☐University ☐ Technical BT ☐ Technical TS

Work Status ☐Full time ☐Part time ☐Retired ☐Disabled ☐ Unemployed

Type of Occupation _____

Place of residence: ☐Rural ☐Suburban ☐Urban

Governorate_____ District_____

Village_____

GPS Coordinates _____

Mail address _____

_____

Email address_____

Is the house you live in ☐Owned ☐Rented ☐Rented with mortgage payments to a bank ☐Declined to answer ☐ Others, specify

Number of rooms (excluding kitchen and bathrooms)

_____

Number of people in same household (including yourself)

_____

Living Arrangements
☐Alone ☐With spouse
☐With my child's family
☐Nursing Home
☐ Others, specify_____

Institutional Review Board
American University of Beirut
10 DEC 2015
APPROVED

Page 1 of 11

I will read you some statements related to your household income. Which of these statements comes closest to describing your household income? (Read) ☐ Our household income covers our expenses well and we are able to save ☐ Our household income covers our expenses without notable difficulties.☐I Our household income does not cover our expenses and we face some difficulties in meeting our needs. ☐ Our household income does not cover our expenses and we face significant difficulties in meeting our needs ☐ I don't know (Do not read). ☐ Declined to answer (Do not read).

How would you rate your health at the present time? ☐Very Good ☐Good ☐Fair ☐Poor ☐Very Poor

How would you rate your own health, compared to others of your age? ☐Better ☐Same ☐Worst

Medical History

In the Past Year, have you had the following:

☐Physical Exam For Symptoms ☐Yes ☐No
☐Eye Exam For Symptoms ☐Yes ☐No
☐Mammography For Symptoms ☐Yes ☐No
☐Fasting Blood Sugar For Symptoms ☐Yes ☐No
☐Blood Pressure For Symptoms ☐Yes ☐No

Have you had any of the following clinician diagnosed illnesses (Mark All that Apply)

Cardiovasc/Resp

☐Myocardial Infarction
Were you hospitalized ☐ Yes ☐No
☐Angina Pectoris
Confirmed by Angiogram ☐ Yes ☐No
☐Coronary Artery Bypass Surgery
☐PCI or stent
☐Congestive Heart Failure
☐Stroke
☐Deep Vein Thrombosis
☐Transient Ischemic Attack
☐Peripheral Artery Disease
☐Aortic Aneurysm
☐Carotid Surgery
☐Atrial Fibrillation
☐ICD-implantable Cardiac Fibrillator
☐Asthma
☐Emphysema/Chronic Bronchitis

Endo

☐ Diabetes Mellitus
☐Elevated Cholesterol
☐High Blood Pressure
☐Hyperparathyroidism
☐Hypothyroidism

Ortho

☐Hip Fracture
☐Vertebral Fracture
☐Rheumatoid Arthritis

Eyes & Ears

☐Glaucoma
☐Macular Degeneration of the retina
☐Cataract
☐Hearing loss
(by audiogram)

Cancer

☐Cancer of colon or rectum
☐Colorectal polyps
☐Leukemia or lymphoma
☐Melanoma
☐Skin Cancer
☐Other cancer, specify_____

GI/GU

☐Gall bladder removal
☐Kidney Stones
☐Ulcerative colitis
☐gastric/duodenal ulcer
☐Celiac Disease
☐Chronic Hepatitis (B or C)
☐Gastric Banding/Bypass

Others

☐Gout
☐Alcohol dependence problem
☐Multiple Sclerosis
☐Parkinson Disease
☐Alzheimer or any kind of dementia
☐Pernicious Anemia/Vit B12 deficiency
☐Depression (clinically diagnosed)
☐Other major illnesses or surgeries

For Females Only

How many pregnancies have you had:_____

How many deliveries have you had:_____

Last menstrual period ☐< 1yr ☐≥1 yr
If <1 yr, menstrual cycle regularity ☐Regular ☐Irregular

Reasons the periods ceased:
☐Natural ☐Surgery ☐Endometrial ablation
☐Radiation or chemo

Use of Oral Contraceptives
☐Current ☐ Past ☐None

Surgeries:

Have you had your uterus removed
☐Yes ☐No
Date of Surgery_____

Have you had either of your ovaries removed ☐ Yes ☐No
Number of remaining ovaries_____

Have you had any of the following clinician diagnosed illnesses:
☐Fibrocystic/other benign breast cancer;
Confirmed by Biopsy ☐Yes ☐No
☐Breast Cancer
☐Ovarian Cancer

Are you currently on Hormone Replacement Therapy (HRT)
☐Yes ☐No

For Males Only

Have you had any of the following clinician diagnosed illnesses ☐Prostate Cancer ☐Prostatic enlargement treated by drugs, surgery, or laser

Regular Medications: Mark if used regularly in the past 2 years:

Days/week	1	2-3	4-6	6+	Dose/day
Acetaminophen(e.g Tylenol)					
Baby Aspirin (low dose)					
Ibuprofen					
Anti-inflammatory analgesics					
Statins					
Other lipid lowering					
Insulin					
Metformin (Glucophage)					
Other medications to be stated					

Diet and Behaviors

In the last 12 months, have you been trying to control your weight? ☐Yes ☐No ☐Don't know

If Yes, Please rate the extent to which:

You have been successful in watching your weight ☐Not Successful ☐Somewhat successful ☐Very Successful
You have been successful in losing extra weight ☐Not Successful ☐Somewhat successful ☐Very Successful
You have found it difficult to stay in shape ☐Very difficult ☐Somewhat Difficult ☐ Very Easy

How often do you eat fried or sautéed food at home? ☐< once/week ☐1-3x/week ☐4-6x/week ☐Daily

What type of cooking oil is usually used at home: (brand and type, ex. Mazola corn oil): _____

How often do you eat deep fried food away from home? ☐< once/week ☐1-3x/week ☐4-6x/week ☐Daily

How many times each week (including weekends) do you eat breakfast: ☐Never, almost never ☐1-2x per week ☐3-4x/week ☐5 or more /week

Please select the person who does the following activities in your household on a regular basis (Mark all that apply)

Does Grocery Shopping ☐Myself ☐Spouse ☐Children ☐House Maid ☐Others, specify_____

Prepares your own meals ☐Myself ☐Spouse ☐Children ☐House Maid ☐Others, specify_____

Does your own housework ☐Myself ☐Spouse ☐Children ☐House Maid ☐Others, specify_____

Handles your medication ☐Myself ☐Spouse ☐Children ☐House Maid ☐Others, specify_____

Dietary Habits and Knowledge:

A. Eating out: How many times per week do you typically eat?

	Never	1-2 times	3-4 times	5+ times
Outside the Home (Fast food) *(McDonald KFC, shawarma, falafel, manakeesh)*				
Outside Home, Other restaurants/food sources				
At Home, at the kitchen/dining table (no TV)				
At Home, in front of the TV/computer				
At Work, on your desk office				
On-the-go (while walking, standing, doing something else)				

B. Knowledge and attitudes about food

Are there health problems that can occur when a person is overweight or obese? ☐Yes ☐No

If yes, specify (max of 5)_____, _____, _____, _____, _____

Are these different between women and men? ☐Yes ☐No

If yes, how ☐Effect on Men> Effect on Women ☐Effect on Women >Effect on Men ☐Varies with each disease

Is it possible to prevent overweight and obesity ☐Yes ☐No

If yes, how? (more than one answer can be selected) ☐Avoid sweet drinks ☐Avoid fatty foods ☐Eat smaller portions ☐Increase physical activity level ☐Others, specify:_____

How likely do you think you are to become overweight or obese ☐Not likely ☐Not sure ☐Likely

Why?_____

How serious do you think it is to become overweight obese ☐Very serious ☐Somewhat serious ☐Doesn't matter ☐Don't know. Why?_____

Give an example of what you think is a healthy meal for you and your family

_____

Do men and women need different sorts of food to be healthy ☐Yes ☐No ☐Don't kow

Why?_____

C. Knowledge and attitudes about Blood Pressure

What does the term hypertension (daght) mean?_____*(and mark all that apply):*

☐Don't know ☐Pressure of the blood ☐High level stress/Tension ☐Nervous condition ☐High blood sugar ☐Over activity ☐Others, specify_____

How dangerous is hypertension to your health? ☐Extremely ☐Somewhat ☐Not at all ☐Don't know

☐It depends: specify_____

Can people do things to lower their blood pressure? ☐Yes ☐No ☐Don't know

If Yes, like what?_____

Have you ever been told by a doctor or health care provider that you have hypertension? ☐Yes ☐No

If yes, are you worried about it? ☐Yes ☐No

If yes, how important do you think taking medicine is to keeping blood pressure under control?

☐Very Important ☐Somewhat important ☐Not at all important

What was your blood pressure level at your most recent visit?
Systolic _____☐ Doesn't recall ☐ Wasn't told
Diastolic _____☐ Doesn't recall ☐ Wasn't told

Can changing lifestyle help to lower your blood pressure? ☐Yes ☐No ☐Don't know

What are the most important factors in controlling your high blood pressure? *(mark all that apply)*
☐Don't know ☐Taking medications ☐Exercising ☐Less stress ☐Quitting smoking ☐Change diet(salt)
☐Reducing alcohol ☐Losing weight ☐Others, specify_____

Physical Activity:

How many total flights of stairs do you climb daily? ☐None ☐2 flights or less ☐3-4 ☐5-9 ☐10-14 ☐15 or more

In a typical week, how much time do you spend doing the following:

At work				
Does your work involve **vigorous**-intensity activity that causes **large increases in breathing or heart rate** like carrying, lifting heavy loads, digging or construction work for at least 10 minutes continuously?	☐Yes ☐No	If Yes, ☐Indoor ☐Outdoor	**Number of days/week** If Yes, _____	**Time/day** (Hours: minutes) If Yes, ___, ___
Does your work involve **moderate**-intensity activity that causes **small increases in breathing or heart rate** such as brisk walking (or carrying light loads) for at least 10 minutes continuously?	☐Yes ☐No	If Yes, ☐Indoor ☐Outdoor	If Yes, _____	If Yes, ___, ___
Travel to and from places (excluding the activities mentioned at work), ex. *To work, for shopping, to market, place of worship*				
Do you walk or use bicycle (pedal cycle), for at least 10 min continuously to get to and from places?	☐Yes ☐No		If Yes, _____	If Yes, ___, ___
What is your usual walking pace outdoors: ☐Unable to walk ☐Easy, casual (<3Km/h) ☐Normal Average (3-5 Km/h) ☐Brisk Space(4-6km/h) ☐Very Brisk (6km/h or more)				
Recreational Activities (excluding the work and transport activities that you already mentioned)				
Do you do any vigorous-intensity sports, fitness or recreational (leisure) activities, that cause large increases in breathing or heart rate like (running or football) for at least 10 minutes continuously?	☐Yes ☐No	If Yes, ☐Indoor ☐Outdoor	If Yes, _____	If Yes, ___, ___
Do you do moderate-intensity sports, fitness or recreational (leisure) activities, that cause small increases in breathing or heart rate such as brisk walking, cycling, swimming, volleyball) for at least 10 minutes continuously?	☐Yes ☐No	If Yes, ☐Indoor ☐Outdoor	If Yes, _____	If Yes, ___, ___
Sedentary behavior (including sitting or reclining at work, at home, getting to and from places, or with friends including time spent sitting at a desk, sitting with friends, traveling in a car, bus, reading, playing cards or watching television. However, this doesn't include sleeping)				

How much time do you usually spend sitting or reclining on a typical day	____(hr), ____(min)

Are you satisfied with how much exercise you do in a typical week? ☐ Satisfied ☐ Neutral ☐ Not Satisfied

If not satisfied, what would make it easier for you to increase your activity: ☐ presence of a nearby gym ☐ presence of a nearby outdoor area ☐ reducing the fees of gyms ☐ having a partner to accompany and encourage me ☐ Having more time ☐ Group walks ☐ Others, specify_____

Environmental Health

Cigarette smoking ☐Current ☐Past ☐Never

If Current, number of years since your started smoking _____

If Current, number of cigarettes per day ☐1-4 ☐5-14 ☐15-24 ☐25-34 ☐35-44 ☐45+

If Past, number of years of smoking _____

If Past, number of years since you last stopped _____

Waterpipe smoking ☐Current ☐Past ☐Never

If current or past, how many times/ week ☐Once ☐Twice ☐3x/week ☐4-6 times/week ☐Daily

If current or past, specify the duration each time you smoked narghile in minutes _____

Are you a passive cigarette/waterpipe smoker (choose more than one answer if applicable) ☐Home ☐Work ☐Cafe ☐N/A

Does your house overlook a traffic street? ☐Yes ☐No

If Yes, in what apartment level are you? _____

How long have you been living in this apartment ☐1-5 yrs ☐5-10 yrs ☐10-15 yrs ☐15-20 yrs ☐20-30 yrs ☐> 30 yrs

Are there shops at the street level? ☐Yes ☐No

Is your house close to a local diesel generator ☐Yes ☐No

How long have you been living/ever lived near a local diesel generator ☐Never ☐1-5 yrs ☐5-10yrs ☐10-15yrs ☐15-20 yrs ☐20-30 yrs ☐> 30 yrs

What are your indoor residential heating options in winter (e.g. chimney, wood/ diesel burning stove, electric heater, water heater)_____

What kind of transportation means do you use most often to go to work ☐Own Car ☐Bus ☐Taxi ☐Bicycle ☐Motorbike ☐Others, specify_____

How long does it take you to get from : Home to work _____ ☐hr ☐min Work to home _____ ☐hr ☐min

Psychosocial Health

How do you rate the quality of your life? ☐Excellent ☐Good ☐Fair ☐Poor ☐Awful

Choose the best answer for how you felt the past few weeks:

. Been able to concentrate on whatever you are doing? ☐Better than usual ☐Same as usual ☐Worse than usual ☐Much worse than usual

:. Lost much sleep over worry? ☐Not at all ☐No more than usual ☐Rather more than usual ☐Much more than usual

. Felt that you are playing a useful role in people around you? ☐More so than usual ☐Same as usual ☐Less useful than usual ☐Much less useful

. Felt capable of making decisions about things? ☐More so than usual ☐Same as usual ☐Less so than usual ☐Much less capable

. Felt constantly under strain? ☐Not at all ☐No more than usual ☐Rather more than usual ☐Much more than usual

. Felt you couldn't overcome your difficulties ☐Not at all ☐No more than usual ☐Rather more than usual ☐Much more than usual

Been able to enjoy your normal day to day activities? ☐More so than usual ☐Same as usual ☐Less so than usual ☐Much less than usual

Been able to face up to your problems? ☐More so than usual ☐Same as usual ☐Less so than usual ☐Much less capable

Been feeling unhappy and depressed? ☐Not at all ☐No more than usual ☐Rather more than usual ☐Much more than usual

). Been losing confidence in yourself? ☐Not at all ☐No more than usual ☐Rather more than usual ☐Much more than usual

. Been thinking of yourself as a worthless person? ☐Not at all ☐No more than usual ☐Rather more than usual ☐ Much more than usual

. Been feeling reasonably happy, all things considered? ☐More so than usual ☐Same as usual ☐Less so than usual ☐Much less capable

or those who have children:

How many of your children would you say you have a close relationship with? _____

How many of your other family members would you say you have a close relationship with? _____
How many of your friends would you say you have a close relationship with? _____
How often do you lack companionship? ☐Often ☐Some of the time ☐Hardly ever or Never
How much do you feel lonely? ☐Often ☐Some of the time ☐Hardly ever or Never
How much do you feel that there are people you can talk to? ☐Often ☐Some of the time ☐Hardly ever or Never

Indicate how often on average you have consumed the amount specified during the <u>past year:</u>

Foods	Standard portion		Never OR <1/mo.	1-3/ mo.		1/ week	2-4/ week	5-6/ week		1/ day	2-3/ day	4-5/ day	6+/ day
Breads and cereals													
Bread, white	1 M. Arabic loaf/ 1baguette	p.13			W				D				
Bread, whole wheat	1 M. Arabic loaf/1baguette	p.13			W				D				
Kaak	5 finger-sized	p.13			W				D				
Toast/rice cakes	3 toast (palm-sized)	p.13			W				D				
Rice, white	1 cup	p.4			W				D				
Rice, brown	1 cup	p.4											
Pasta/noodles, plain	1 cup	p.4			W				D				
Wheat/bulgur	1 cup	p.4			W				D				
Breakfast cereal, *high and medium fiber*	1 cup	p.3			W				D				
Breakfast cereal, *low fiber ≤ 1 grams*	1 cup	p.3			W				D				
Popcorn	3 cups	p.3			W				D				
Dairy products													
Milk, skim/low-fat (0-2%)	1 cup	p.12			W				D				
Milk, whole-fat	1 cup	p.12			W				D				
Milkshake, sweetened	1 carton	p.13			W				D				
Yogurt, fat-free/low-fat	1 cup	p.12			W				D				
Yogurt, whole-fat	1 cup	p.12			W				D				
Cheese, low & medium fat *(akkawi, baladi, feta, halloumi, mozzarella, cream)*	1 slice/ 1 triangle/ 2 cubes	p.13			W				D				
Cheese, high fat *(cheddar, kashkaval, goat, blue cheese)*	1 slice/ 1 triangle/ 2 cubes	p.13			W				D				
Labneh, regular	1 tbsp.	p.11			W				D				
Labneh, low fat	1 tbsp.	p.11			W				D				
Fruits													
Fruits, fresh □ Regular □ Seasonal	1 M./ ½ cup chopped	p.14			W				D				
Fruits, dried (regular)	¼ cup	p.4			W				D				
Fruits, canned	½ cup	p.4			W				D				
Fruit juice, fresh	1 cup	p.12			W				D				
Fruit juice, sweetened	1 cup/ 1 carton	p.13			W				D				
Vegetables													
Tomatoes	1 M./ ½ cup	p.14			W				D				
Salad, green: lettuce, mint, cucumber, rocket.	1 cup	p.8			W				D				
Dark green or deep yellow, cooked (*spinach, Swiss chard, carrots)*	½ cup	p.4			W				D				
Corn/ green peas, fresh/frozen	½ cup	p.4			W				D				
Potatoes, baked / boiled	1 M./ ½ cup	p.9-14			W				D				
Cauliflower/ cabbage/ broccoli /zucchini/ eggplant	½ cup/ 1 item	p.4-14			W				D				
Vegetables, canned	½ cup	p.4			W				D				
Vegetable juice	1 cup	p.12			W								

Meat and substitutes														
Legumes: *lentils, beans, chickpeas*	1 cup	p.4			W				D					
Red meat: beef/lamb/goat *(excluding burgers)*	1 M. steak/ 10 cubes	p.2, 3oz			W				D					
Poultry	½ breast/1 leg/3 drumsticks /7 wings/ 10 taouk	p.14			W				D					
Fish/seafood	1 M. filet/ 7 shrimps	p.14			W				D					
Fish, canned (tuna, sardines)	½ L. can/ 1S.can	p.14			W				D					
Eggs	1 egg				W				D					
Organ meats	½ cup	p.4			W				D					
Processed meats *(sausage, luncheon meats, hotdog)*	2 slices/ 1 hotdog	p.2			W				D					
Fats and Oils (salads, sandwiches, cooking, and frying)														
Vegetable oil	1 tbsp.	p.11			W				D					
Olive oil	1 tbsp.	p.11			W				D					
Olives	5 olives				W				D					
Butter	1 tbsp.	p.6			W				D					
Ghee	1 tbsp.	p.6			W				D					
Mayonnaise	1 tbsp.	p.6			W				D					
Tahini	1 tbsp.	p.11			W				D					
Nuts & seeds: Raw/ dry-roasted walnuts, peanuts, almonds, seeds..	½ cup/ 1 S. bag	p.4			W				D					
Nuts & seeds: Oil-roasted peanuts, almonds, seeds..	½ cup/ 1 S. bag	p.4			W				D					
Sweets and pastries														
Cakes, cookies, biscuits, doughnuts & croissants	5 plain biscuits/ 1 M. pastry	p.15			W				D					
Chocolate	1 M. bar	p.15			W				D					
Ice cream/ frozen yogurt	1 scoop/ 1 stick	p.9			W				D					
Sugar, granulated	1 tbsp.	p.11			W				D					
Honey, jam, molasses	1 tbsp.	p.11			W				D					
Arabic sweets	½ knefe + kaak/ 2 maamoul / 4 small baklava				W				D					
Beverages														
Soft drink, caffeinated, regular *(Coca-Cola, Pepsi)*	1 can (330 mL)				W				D					
Soft drink, no caffeine, regular *(7-Up, Mirinda)*	1 can (330 mL)				W				D					
Soft drink, caffeinated, diet *(Diet Coke, Diet Pepsi)*	1 can (330 mL)				W				D					
Soft drink, no caffeine, diet *(Diet-7-Up, Diet Mirinda)*	1 can (330 mL)				W				D					
Turkish coffee	1 fenjen				W				D					
Black coffee	1 cup	p.12			W				D					
Coffee w/ creamer	1 cup	p.12			W				D					
Coffee w/ fat-free	1 cup	p.12			W				D					

creamer													
Tea	1 cup	p.12			W				D				
Hot chocolate	1 cup	p.12			W				D				
Energy drink	1 can (260 mL)				W				D				
Non-alcoholic beer	1 bottle (350mL)	p.15			W				D				
Beer	1 bottle (350mL)	p.15			W				D				
Wine	1 glass (150 mL)	p.15			W				D				
Liquor (vodka, whiskey..)	1 shot (45 mL)	p.15			W				D				
Water	1 cup				W				D				
Miscellaneous													
Manaeesh, zaatar/cheese	1 Liter				W				D				
French fries	1 cup	p.4			W				D				
Potato chips	1 M. bag				W				D				
Falafel sandwich	1 S. sandwich				W				D				
Burgers(beef, chicken, fish)	1 M. burger				W				D				
Pizza	1 M. slice	p.15			W				D				
Thyme & sesame (excluding manaeesh)	1 tbsp.	p.11			W				D				
Ketchup	1 tbsp.	p.11			W				D				
Mustard	1 tbsp.	p.11			W				D				
Artificial sweetener	1 packet				W				D				

Abbreviations: S.=small; M.=medium; L.=large; tbsp..=tablespoon; 1 cup=240 Ml

Are there any other foods not mentioned in the list and that you consume <u>AT LEAST ONCE A WEEK</u> (such as nut butters, oatmeal, sports drink, decaffeinated coffee, decaffeinated tea, energy bars, meal replacement drinks, etc.)

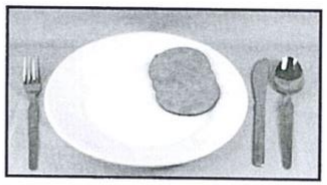
Foods	Portion consumed	2-4 /week	5-6 /week	1 /week	2-3 /day	4-5 /day	6+ /day

Serving Size Booklet

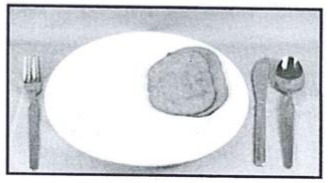
Thank you for participating in this important study.

Please look through this booklet as it will help you estimate your portion sizes.

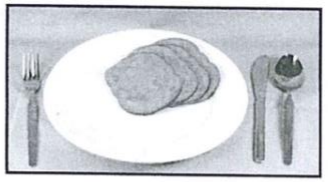
Beef, Pork, Chicken and Fish



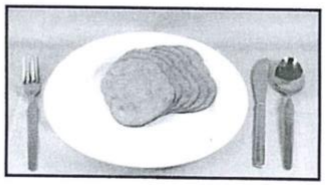
1-1/2 ounces



3 ounces



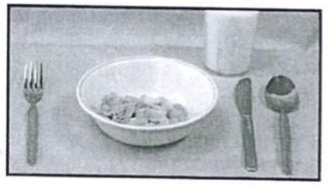
6 ounces



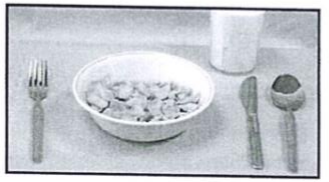
9 ounces

Cereal and Soup

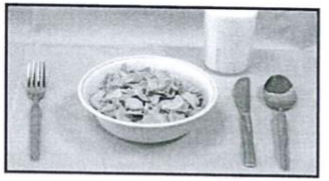
1/2 cup



1 cup

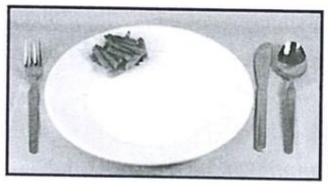


1-1/2 cups

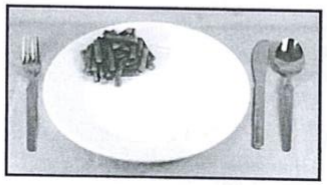


2 cups

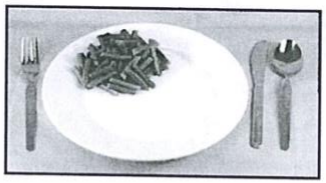
Vegetables such as Green Beans, Corn and Potatoes



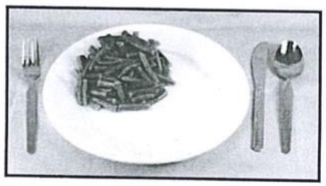
1/4 cup



1/2 cup



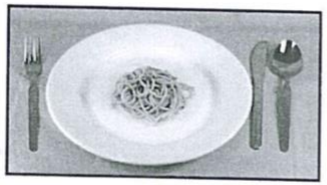
1 cup



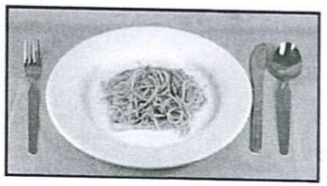
1-1/2 cups

Spaghetti and Casseroles

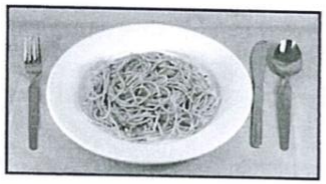
1/2 cup



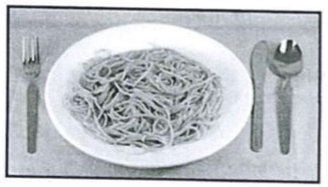
1 cup



2 cups

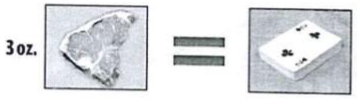


3 cups

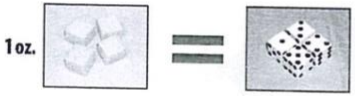


Five Ways to Size Up Your Servings

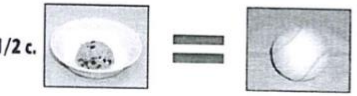
1. **3 ounces** of meat is about the size and thickness of a deck of playing cards or an audiotape cassette.



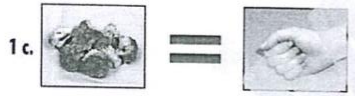
2. **1 ounce** of cheese is about the size of 4 stacked dice.



3. **1/2 cup** of ice cream is about the size of a racquetball or tennis ball.



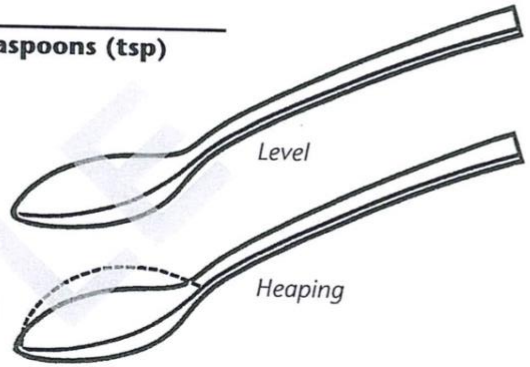
4. **1 cup** of mashed potatoes or broccoli is about the size of your fist.



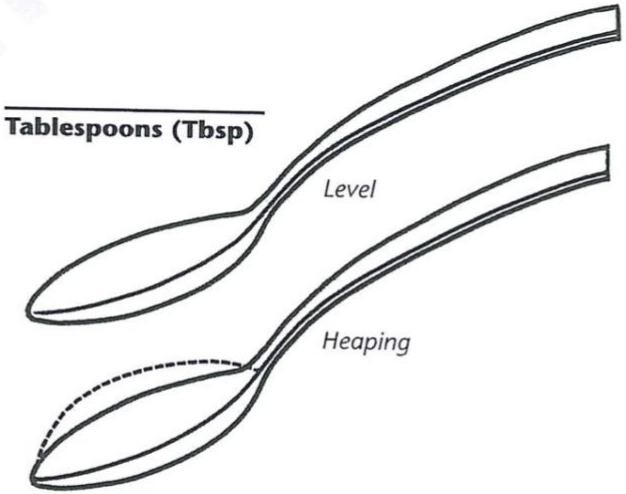
5. **1 teaspoon** of butter or peanut butter is about the size of the tip of your thumb.

Eating and Serving Spoons

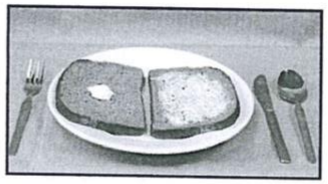
teaspoons (tsp)



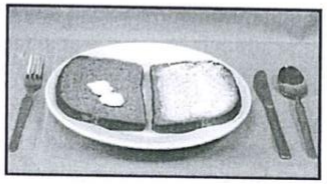
Tablespoons (Tbsp)



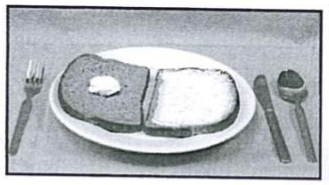
Spreads such as Butter, Margarine, Mayonnaise, or Peanut Butter



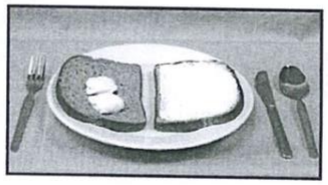
1 teaspoon (tsp)



2 teaspoons



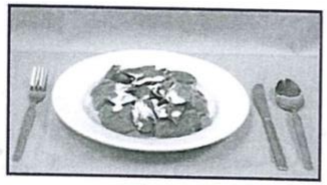
3 teaspoons
= 1 Tablespoon



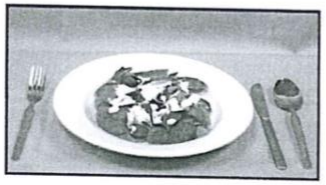
2 Tablespoons

Salad Dressing

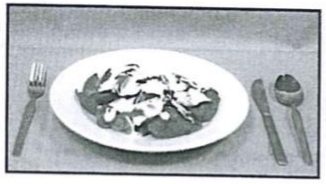
1 Tablespoon (Tbsp)



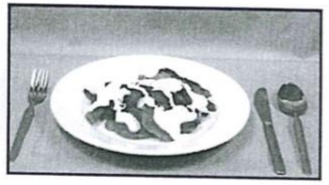
2 Tablespoons



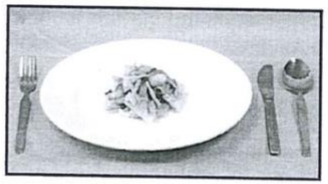
3 Tablespoons



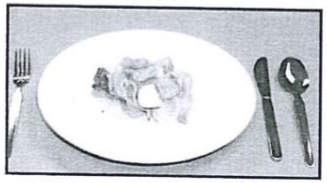
4 Tablespoons
= 1/4 cup



Salads



1/2 cup



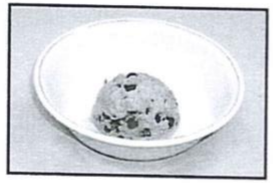
1 cup

1-1/2 cups

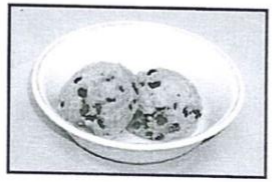
2 cups

Ice Cream, Mashed Potatoes, or Cottage Cheese

1/2 cup

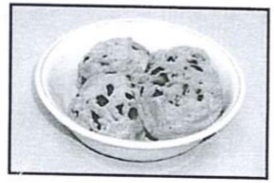


1 cup



1-1/2 cups

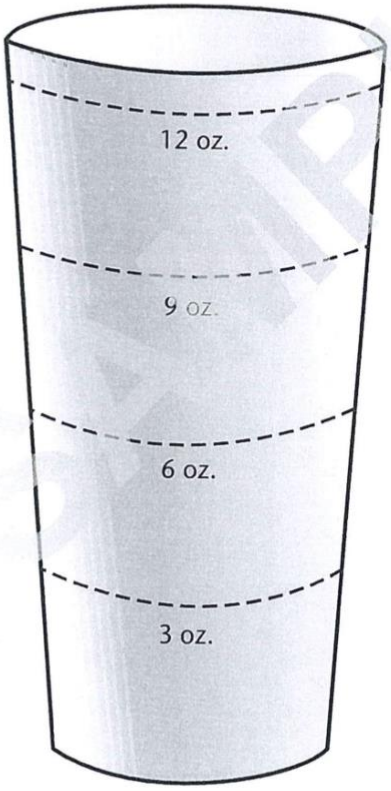
2 cups

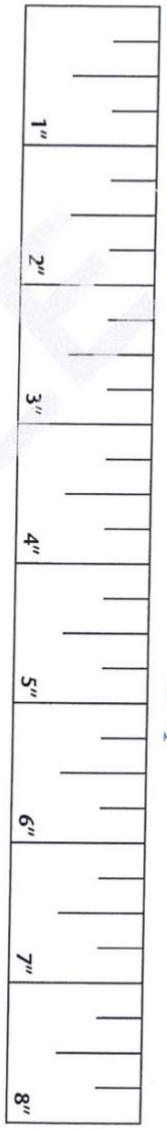


Thickness

1
2
3
4
5

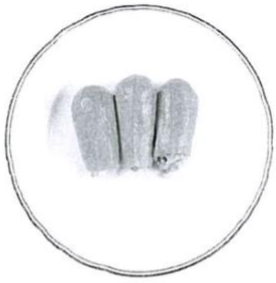
12 fluid ounces





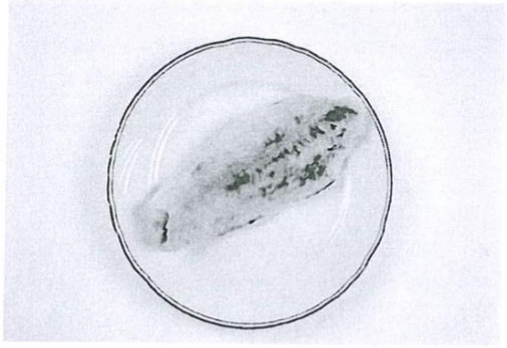
1 medium fruit/tomato

1 medium potato



1 of these = 1 item of zucchini

1 chicken leg

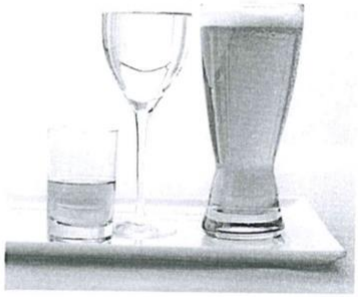


1/2 is 1 medium fish filet

1/2 large or 1 small canned tuna

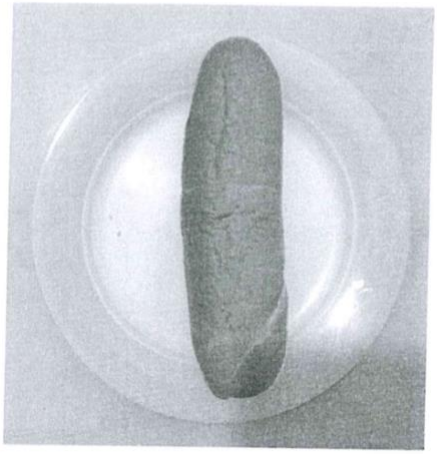
1 medium croissant

1 medium chocolate bar

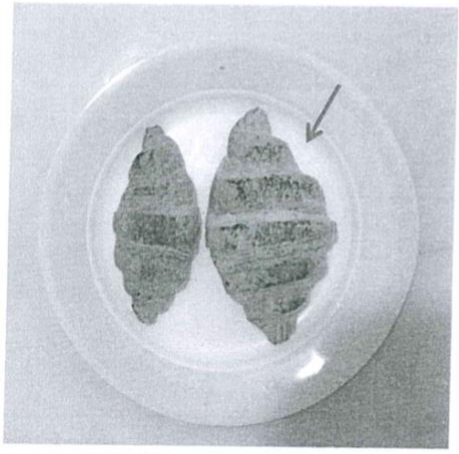


1 beer bottle, 1 glass of wine, 1 glass of liquor

1 medium pizza slice

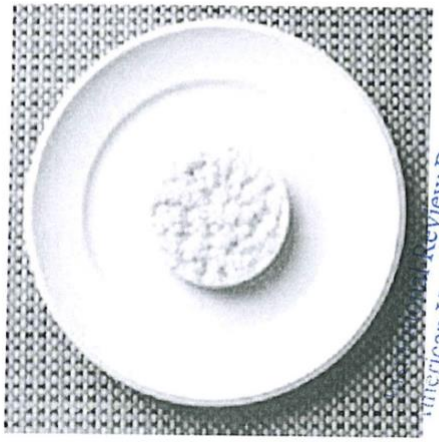


French baguette



Medium croissant

1 finger sized kaak



Rice cake

Milkshake carton

Cream cheese cube/triangle

13

REFERENCES

Al-Baghli, N. A., Al-Ghamdi, A. J., Al-Turki, K. A., El-Zubaier, A. G., Al-Ameer, M. M., & Al-Baghli, F. A. (2008). Overweight and obesity in the eastern province of Saudi Arabia. *Saudi Med J, 29*(9), 1319-1325.

Al-Hajje, A., Awada, S., Rachidi, S., Zein, S., Bawab, W., El-Hajj, Z., . . . Salameh, P. (2015). Factors affecting medication adherence in Lebanese patients with chronic diseases. *Pharmacy practice, 13*(3).

Al-Kandari, Y. (2006). Prevalence of obesity in Kuwait and its relation to sociocultural variables. *Obesity reviews, 7*(2), 147-154.

Albus, C. (2010). Psychological and social factors in coronary heart disease. *Annals of medicine, 42*(7), 487-494.

Aldana, S. G., Whitmer, W. R., Greenlaw, R., Avins, A. L., Thomas, D., Salberg, A., . . . Fellingham, G. W. (2006). Effect of intense lifestyle modification and cardiac rehabilitation on psychosocial cardiovascular disease risk factors and quality of life. *Behavior modification, 30*(4), 507-525.

Ali, M. A., Yasir, J., Sherwani, R. N., Fareed, M., Arshad, F., Abid, F., . . . Siddiqui, U. (2017). Frequency and predictors of non-adherence to lifestyle modifications and medications after coronary artery bypass grafting: A cross-sectional study. *Indian heart journal, 69*(4), 469-473.

Alsheikh-Ali, A. A., Omar, M. I., Raal, F. J., Rashed, W., Hamoui, O., Kane, A., . . . Mashhoud, W. M. (2014). Cardiovascular risk factor burden in Africa and the middle east: the Africa middle east cardiovascular epidemiological (ACE) study. *PloS one, 9*(8), e102830.

Ama Moor, V. J., Nansseu, J. R. N., Nouaga, M. E. D., Noubiap, J. J. N., Nguetsa, G. D., Tchanana, G., . . . Fokom-Domgue, J. (2016). Assessment of the 10-year risk of cardiovascular events among a group of Sub-Saharan African post-menopausal women. *Cardiology journal, 23*(2), 123-131. doi:10.5603/CJ.a2015.0056

Amaltinga, A. P. M. (2017). Non adherence to diabetic medication among diabetic patients, a case study of Dormaa Hospital Ghana. *Science Journal of Public Health, 5*(2), 88-97.

Ambrose, J. A., & Barua, R. S. (2004). The pathophysiology of cigarette smoking and cardiovascular disease: an update. *Journal of the American College of Cardiology, 43*(10), 1731-1737.

Arimoto, A., & Tadaka, E. (2019). Reliability and validity of Japanese versions of the UCLA loneliness scale version 3 for use among mothers with infants and toddlers: a cross-sectional study. *BMC women's health, 19*(1), 105.

Arnett, D. K., Blumenthal, R. S., Albert, M. A., Buroker, A. B., Goldberger, Z. D., Hahn, E. J., . . . McEvoy, J. W. (2019). 2019 ACC/AHA guideline on the primary prevention of cardiovascular disease: a report of the American College

of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *J Am Coll Cardiol, 74*(10), e177-e232.

Astrup, A., Dyerberg, J., Elwood, P., Hermansen, K., Hu, F. B., Jakobsen, M. U., . . . LeGrand, P. (2011). The role of reducing intakes of saturated fat in the prevention of cardiovascular disease: where does the evidence stand in 2010? *The American journal of clinical nutrition, 93*(4), 684-688.

Al-Baghli, N. A., Al-Ghamdi, A. J., Al-Turki, K. A., El-Zubaier, A. G., Al-Ameer, M. M., & Al-Baghli, F. A. (2008). Overweight and obesity in the eastern province of Saudi Arabia. *Saudi Med J, 29*(9), 1319-1325.

Al-Hajje, A., Awada, S., Rachidi, S., Zein, S., Bawab, W., El-Hajj, Z., . . . Salameh, P. (2015). Factors affecting medication adherence in Lebanese patients with chronic diseases. *Pharmacy practice, 13*(3).

Al-Shaar, L., Li, Y., Rimm, E. B., Manson, J. E., Rosner, B., Hu, F. B., . . . Willett, W. C. (2020). Physical Activity and Mortality among Male Survivors of Myocardial Infarction. *Medicine & science in sports & exercise, 52*(8), 1729-1736.

Al-Shaar, L., Satija, A., Wang, D. D., Rimm, E. B., Smith-Warner, S. A., Stampfer, M. J., . . . Willett, W. C. (2020). Red meat intake and risk of coronary heart disease among US men: prospective cohort study. *Bmj, 371*.

Al-Kandari, Y. (2006). Prevalence of obesity in Kuwait and its relation to sociocultural variables. *Obesity reviews, 7*(2), 147-154.

Albus, C. (2010). Psychological and social factors in coronary heart disease. *Annals of medicine, 42*(7), 487-494.

Aldana, S. G., Whitmer, W. R., Greenlaw, R., Avins, A. L., Thomas, D., Salberg, A., . . . Fellingham, G. W. (2006). Effect of intense lifestyle modification and cardiac rehabilitation on psychosocial cardiovascular disease risk factors and quality of life. *Behavior modification, 30*(4), 507-525.

Ali, M. A., Yasir, J., Sherwani, R. N., Fareed, M., Arshad, F., Abid, F., . . . Siddiqui, U. (2017). Frequency and predictors of non-adherence to lifestyle modifications and medications after coronary artery bypass grafting: A cross-sectional study. *Indian heart journal, 69*(4), 469-473.

Alsheikh-Ali, A. A., Omar, M. I., Raal, F. J., Rashed, W., Hamoui, O., Kane, A., . . . Mashhoud, W. M. (2014). Cardiovascular risk factor burden in Africa and the middle east: the Africa middle east cardiovascular epidemiological (ACE) study. *PloS one, 9*(8), e102830.

Ama Moor, V. J., Nansseu, J. R. N., Nouaga, M. E. D., Noubiap, J. J. N., Nguetsa, G. D., Tchanana, G., . . . Fokom-Domgue, J. (2016). Assessment of the 10-year risk of cardiovascular events among a group of Sub-Saharan African post-menopausal women. *Cardiology journal, 23*(2), 123-131. doi:10.5603/CJ.a2015.0056

Amaltinga, A. P. M. (2017). Non adherence to diabetic medication among diabetic patients, a case study of Dormaa Hospital Ghana. *Science Journal of Public Health, 5*(2), 88-97.

Ambrose, J. A., & Barua, R. S. (2004). The pathophysiology of cigarette smoking and cardiovascular disease: an update. *Journal of the American College of Cardiology, 43*(10), 1731-1737.

Arimoto, A., & Tadaka, E. (2019). Reliability and validity of Japanese versions of the UCLA loneliness scale version 3 for use among mothers with infants and toddlers: a cross-sectional study. *BMC women's health, 19*(1), 105.

Arnett, D. K., Blumenthal, R. S., Albert, M. A., Buroker, A. B., Goldberger, Z. D., Hahn, E. J., . . . McEvoy, J. W. (2019). 2019 ACC/AHA guideline on the primary prevention of cardiovascular disease: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *J Am Coll Cardiol, 74*(10), e177-e232.

Ashur, S., Shamsuddin, K., Shah, S., Bosseri, S., & Morisky, D. (2015). Reliability and known-group validity of the Arabic version of the 8-item Morisky Medication Adherence Scale among type 2 diabetes mellitus patients. *Eastern Mediterranean health journal, 21*(10).

Astrup, A., Dyerberg, J., Elwood, P., Hermansen, K., Hu, F. B., Jakobsen, M. U., . . . LeGrand, P. (2011). The role of reducing intakes of saturated fat in the prevention of cardiovascular disease: where does the evidence stand in 2010? *The American journal of clinical nutrition, 93*(4), 684-688.

Aune, D., Keum, N., Giovannucci, E., Fadnes, L. T., Boffetta, P., Greenwood, D. C., . . . Norat, T. (2016). Nut consumption and risk of cardiovascular disease, total cancer, all-cause and cause-specific mortality: a systematic review and dose-response meta-analysis of prospective studies. *BMC Med, 14*(1), 207. doi:10.1186/s12916-016-0730-3

Awad, A., Osman, N., & Altayib, S. (2017). Medication adherence among cardiac patients in Khartoum State, Sudan: a cross-sectional study. *Cardiovascular journal of Africa, 28*(6), 350.

Banks, E., Joshy, G., Weber, M. F., Liu, B., Grenfell, R., Egger, S., . . . Beral, V. (2015). Tobacco smoking and all-cause mortality in a large Australian cohort study: findings from a mature epidemic with current low smoking prevalence. *BMC medicine, 13*(1), 38-38. doi:10.1186/s12916-015-0281-z

Bansilal, S. M. D. M. S., Castellano, J. M. M. D. P., Garrido, E. M. P. H., Wei, H. G. M. D., Freeman, A. M. S., Spettell, C. P., . . . Fuster, V. M. D. P. (2016). Assessing the Impact of Medication Adherence on Long-Term Cardiovascular Outcomes. *Journal of the American College of Cardiology, 68*(8), 789-801. doi:10.1016/j.jacc.2016.06.005

Bauman, A., Bull, F., Chey, T., Craig, C. L., Ainsworth, B. E., Sallis, J. F., . . . Pratt, M. (2009). The international prevalence study on physical activity: results from 20 countries. *International journal of behavioral nutrition and physical activity, 6*(1), 1-11.

Bertoluci, M. C., & Rocha, V. Z. (2017). Cardiovascular risk assessment in patients with diabetes. *Diabetology and metabolic syndrome, 9*(1), 25-25. doi:10.1186/s13098-017-0225-1

Bhatt, D. L., Steg, P. G., Ohman, E. M., Hirsch, A. T., Ikeda, Y., Mas, J.-L., . . . Röther, J. (2006). International prevalence, recognition, and treatment of cardiovascular risk factors in outpatients with atherothrombosis. *Jama, 295*(2), 180-189.

Bhupathiraju, S. N., Lichtenstein, A. H., Dawson-Hughes, B., & Tucker, K. L. (2011). Adherence Index Based on the AHA 2006 Diet and Lifestyle Recommendations Is Associated with Select Cardiovascular Disease Risk Factors in Older Puerto Ricans. *The Journal of nutrition, 141*(3), 460-469. doi:10.3945/jn.110.133603

Bloom, D. E., Chisholm, D., Jané-Llopis, E., Prettner, K., Stein, A., & Feigl, A. (2011). *From burden to" best buys": reducing the economic impact of non-communicable disease in low-and middle-income countries*. Retrieved from

Bramlage, P., Ketelhut, R., Fronk, E.-M., Wolf, W.-P., Smolnik, R., Zemmrich, C., & Schmieder, R. E. (2014). Clinical Impact of Patient Adherence to a Fixed-Dose Combination of Olmesartan, Amlodipine and Hydrochlorothiazide. *Clinical drug investigation, 34*(6), 403-411. doi:10.1007/s40261-014-0188-z

Burke, L. E., Dunbar-Jacob, J. M., & Hill, M. N. (1997). Compliance with cardiovascular disease prevention strategies: a review of the research. *Ann Behav Med, 19*(3), 239-263. doi:10.1007/bf02892289

Buttar, H. S., Li, T., & Ravi, N. (2005). Prevention of cardiovascular diseases: Role of exercise, dietary interventions, obesity and smoking cessation. *Experimental & clinical cardiology, 10*(4), 229.

Cappuccio, F. P. (2013). Cardiovascular and other effects of salt consumption. *Kidney international supplements, 3*(4), 312-315.

Castelli, W. P., Garrison, R. J., Wilson, P. W. F., Abbott, R. D., Kalousdian, S., & Kannel, W. B. (1986). Incidence of Coronary Heart Disease and Lipoprotein Cholesterol Levels: The Framingham Study. *JAMA : the journal of the American Medical Association, 256*(20), 2835-2838. doi:10.1001/jama.1986.03380200073024

Centers for Disease Control and Prevention. (2020). Heart Disease Facts. Retrieved from https://www.cdc.gov/heartdisease/facts.htm

Chamieh, M. C., Moore, H. J., Summerbell, C., Tamim, H., Sibai, A. M., & Hwalla, N. (2015). Diet, physical activity and socio-economic disparities of obesity in Lebanese adults: findings from a national study. *BMC public health, 15*(1), 1-13.

Chan, H.-K., & Hassali, M. A. (2014). Modified labels for long-term medications: influences on adherence, comprehension and preferences in Malaysia. *International journal of clinical pharmacy, 36*(5), 904-913. doi:10.1007/s11096-014-0003-1

Chobanian, A. V., Bakris, G. L., Black, H. R., Cushman, W. C., Green, L. A., Izzo Jr, J. L., . . . Wright Jr, J. T. (2003). The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure: the JNC 7 report. *Jama, 289*(19), 2560-2571.

Chung, W. W., Chua, S. S., Lai, P. S. M., & Morisky, D. E. (2015). The Malaysian Medication Adherence Scale (MALMAS): Concurrent Validity Using a Clinical Measure among People with Type 2 Diabetes in Malaysia. *PloS one, 10*(4), e0124275-e0124275. doi:10.1371/journal.pone.0124275

Cohen, H. W., & Alderman, M. H. (2007). Sodium, blood pressure, and cardiovascular disease. *Current opinion in cardiology, 22*(4), 306-310.

Committee, I. R. (2016). Guidelines for data processing and analysis of the International Physical Activity Questionnaire (IPAQ)–short and long forms, revised November, 2005. 2005. In.

Control, C. f. D., & Prevention. (2008). US Department of Health and Human Services Physical activity guidelines for Americans 2008. *Washington, DC*.

Cordahi, C. F. (2015). *Adherence to the Mediterranean diet and risk of metabolic syndrome in Lebanese urban adults.*

Craig, C. L., Marshall, A. L., Sjöström, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., . . . Sallis, J. F. (2003). International physical activity questionnaire: 12-

country reliability and validity. *Medicine & science in sports & exercise, 35*(8), 1381-1395.
Cutler, R. L., Fernandez-Llimos, F., Frommer, M., Benrimoj, C., & Garcia-Cardenas, V. (2018). Economic impact of medication non-adherence by disease groups: a systematic review. *BMJ open, 8*(1), e016982.
Cziraky, M. J., Watson, K. E., & Talbert, R. L. (2008). Targeting low HDL-cholesterol to decrease residual cardiovascular risk in the managed care setting. *Journal of Managed Care Pharmacy, 14*(8 Supp A), 1-31.
Darden, D., Richardson, C., & Jackson, E. A. (2013). Physical activity and exercise for secondary prevention among patients with cardiovascular disease. *Current cardiovascular risk reports, 7*(6), 411-416.
Dauchet, L., Amouyel, P., & Dallongeville, J. (2005). Fruit and vegetable consumption and risk of stroke: a meta-analysis of cohort studies. *Neurology, 65*(8), 1193-1197.
Dauchet, L., Amouyel, P., Hercberg, S., & Dallongeville, J. (2006). Fruit and vegetable consumption and risk of coronary heart disease: a meta-analysis of cohort studies. *The Journal of nutrition, 136*(10), 2588-2593.
Davis, C. P. (2019). Heart Disease: Causes of a Heart Attack Retrieved from https://www.medicinenet.com/heart_disease_pictures_slideshow_visual_guide/article.htm
Després, J.-P., Lemieux, I., Dagenais, G.-R., Cantin, B., & Lamarche, B. t. (2000). HDL-cholesterol as a marker of coronary heart disease risk: the Québec cardiovascular study. In (Vol. 153, pp. 263-272). Amsterdam: Elsevier Ireland Ltd.
Dobbels, F., Damme-Lombaert, R. V., Vanhaecke, J., & Geest, S. D. (2005). Growing pains: Non-adherence with the immunosuppressive regimen in adolescent transplant recipients. *Pediatric transplantation, 9*(3), 381-390.
Doll, R. (2008). Efficacy of cholesterol-lowering therapy in 18 686 people with diabetes in 14 randomised trials of statins: a meta-analysis. *Lancet, 371*(9607), 117-125.
Dupre, M. E., Nelson, A., Lynch, S. M., Granger, B. B., Xu, H., Churchill, E., . . . Peterson, E. D. (2017). Socioeconomic, psychosocial and behavioral characteristics of patients hospitalized with cardiovascular disease. *The American journal of the medical sciences, 354*(6), 565-572.
Dzau, V. J., Antman, E. M., Black, H. R., Hayes, D. L., Manson, J. E., Plutzky, J., . . . Stevenson, W. (2006). The cardiovascular disease continuum validated: clinical evidence of improved patient outcomes: part I: Pathophysiology and clinical trial evidence (risk factors through stable coronary artery disease). *Circulation, 114*(25), 2850-2870.
Eckel, R. H., Jakicic, J. M., Ard, J. D., de Jesus, J. M., Miller, N. H., Hubbard, V. S., . . . Millen, B. E. (2014). 2013 AHA/ACC guideline on lifestyle management to reduce cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Journal of the American College of Cardiology, 63*(25 Part B), 2960-2984.
Eckel, R. H., Kahn, R., Robertson, R. M., & Rizza, R. A. (2006). Preventing cardiovascular disease and diabetes : A call to action from the american diabetes association and the american heart association. *Circulation (New York, N.Y.), 113*(25), 2943-2946. doi:10.1161/CIRCULATIONAHA.106.176583

Einarson, T. R., Acs, A., Ludwig, C., & Panton, U. H. (2018). Prevalence of cardiovascular disease in type 2 diabetes: a systematic literature review of scientific evidence from across the world in 2007–2017. *Cardiovascular diabetology, 17*(1), 83.

El Rhazi, K., Nejjari, C., Romaguera, D., Feart, C., Obtel, M., Zidouh, A., . . . Gateau, P. B. (2012). Adherence to a Mediterranean diet in Morocco and its correlates: cross-sectional analysis of a sample of the adult Moroccan population. *BMC public health, 12*(1), 1-8.

El Sayed Ahmad, R., Baroudi, M., Shatila, H., Nasreddine, L., Chokor, F. A. Z., Chehab, R. F., . . . Naja, F. (2020). Validity and Reproducibility of a Culture-Specific Food Frequency Questionnaire in Lebanon. *Nutrients, 12*(11), 3316.

El-Hajj, M., Salameh, P., Rachidi, S., Al-Hajje, A., & Hosseini, H. (2019). Cigarette and Waterpipe Smoking are Associated with the Risk of Stroke in Lebanon. *Journal of epidemiology and global health, 9*(1), 62-70.

Erkkilä, A. T., & Lichtenstein, A. H. (2006). Fiber and cardiovascular disease risk: how strong is the evidence? *Journal of Cardiovascular Nursing, 21*(1), 3-8.

Esteghamati, A., Khalilzadeh, O., Mohammad, K., Meysamie, A., Rashidi, A., Kamgar, M., . . . Haghazali, M. (2010). Secular trends of obesity in Iran between 1999 and 2007: National Surveys of Risk Factors of Non-communicable Diseases. *Metabolic syndrome and related disorders, 8*(3), 209-213.

Expert Panel on Detection, E. (2001). Executive summary of the third report of the National Cholesterol Education Program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult Treatment Panel III). *Jama, 285*(19), 2486.

Farhat, A. G., Jaalouk, D., Moukarzel, S. R., & Ayoub, J. J. (2016). Consumption of trans fatty acid and omega 6 to omega 3 ratio in Lebanese adults. *Nutrition & Food Science*.

Farley, A., McLafferty, E., & Hendry, C. (2012). The cardiovascular system. *Nurs Stand, 27*(9), 35-39. doi:10.7748/ns2012.10.27.9.35.c9383

Fathia, M. Z., Salsabil, R., Selim, B., Manel, B. H., Kais, S., Abdeljlil, F., . . . Sami, M. M. (2019). Associated factors to non-adherence to blood pressure lowering drugs: Results from an urban Tunisian population 2017. *Ann Cardiovasc Thorac Surg, 2*(2), 4.

Flegal, K. M., & Larkin, F. A. (1990). Partitioning macronutrient intake estimates from a food frequency questionnaire. *Am J Epidemiol, 131*(6), 1046-1058. doi:10.1093/oxfordjournals.aje.a115596

Flegal, K. M., Larkin, F. A., Metzner, H. L., Thompson, F. E., & Guire, K. E. (1988). Counting calories: partitioning energy intake estimates from a food frequency questionnaire. *Am J Epidemiol, 128*(4), 749-760. doi:10.1093/oxfordjournals.aje.a115028

Forde, C. (2018). Scoring the international physical activity questionnaire (IPAQ). *University of Dublin*.

Fox, C. S., Pencina, M. J., Wilson, P. W., Paynter, N. P., Vasan, R. S., & D'Agostino, R. B. (2008). Lifetime risk of cardiovascular disease among individuals with and without diabetes stratified by obesity status in the Framingham heart study. *Diabetes care, 31*(8), 1582-1584.

Fuster, V., Kelly, B. B., Medicine, I. o., Health, B. o. G., & Countries, C. o. P. t. G. E. o. C. D. M. t. C. i. D. (2010). *Promoting Cardiovascular Health in the*

Developing World: A Critical Challenge to Achieve Global Health. Washington, D.C: National Academies Press.
Galal, O. M. (2002). The nutrition transition in Egypt: obesity, undernutrition and the food consumption context. *Public health nutrition, 5*(1a), 141-148. doi:10.1079/PHN2001286
Galobardes, B., Shaw, M., Lawlor, D. A., Lynch, J. W., & Smith, G. D. (2006). Indicators of socioeconomic position (part 1). *Journal of Epidemiology & Community Health, 60*(1), 7-12.
Gao, Z., Chen, Z., Sun, A., & Deng, X. (2019). Gender differences in cardiovascular disease. *Medicine in Novel Technology and Devices, 4*, 100025. doi:10.1016/j.medntd.2019.100025
Georges A. Saade et al. (2014). Country report Lebanon-October 2014.
Goff, D. C., Lloyd-Jones, D. M., Bennett, G., Coady, S., D'agostino, R. B., Gibbons, R., . . . O'donnell, C. J. (2014). 2013 ACC/AHA guideline on the assessment of cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Journal of the American College of Cardiology, 63*(25 Part B), 2935-2959.
Gonzalez, J. S., Peyrot, M., McCarl, L. A., Collins, E. M., Serpa, L., Mimiaga, M. J., & Safren, S. A. (2008). Depression and diabetes treatment nonadherence: a meta-analysis. *Diabetes care, 31*(12), 2398-2403. doi:10.2337/dc08-1341
Granger, B. B., Ekman, I., Hernandez, A. F., Sawyer, T., Bowers, M. T., DeWald, T. A., . . . Bosworth, H. B. (2015). Results of the Chronic Heart Failure Intervention to Improve MEdication Adherence study: a randomized intervention in high-risk patients. *American Heart Journal, 169*(4), 539-548.
Grundy, S. M., Becker, D., Clark, L. T., Cooper, R. S., Denke, M. A., Howard, J., . . . McBride, P. (2002). Detection, evaluation, and treatment of high blood cholesterol in adults (Adult Treatment Panel III). *Circulation, 106*(25), 3143-3421.
Guo, X., Warden, B., Paeratakul, S., & Bray, G. (2004). Healthy eating index and obesity. *European journal of clinical nutrition, 58*(12), 1580-1586.
Hajj, M., Ajrouche, R., Zein, S., Rachidi, S., Awada, S., & Al-Hajje, A. (2020). Evaluation of risk factors and drug adherence in the occurrence of stroke in patients with atrial fibrillation. *Pharmacy practice : official journal of the GRIPP (Global Research Institute of Pharmacy Practice), 18*(2), 1860. doi:10.18549/PharmPract.2020.2.1860
Havranek, E. P., Mujahid, M. S., Barr, D. A., Blair, I. V., Cohen, M. S., Cruz-Flores, S., . . . Lockwood, D. W. (2015). Social determinants of risk and outcomes for cardiovascular disease: a scientific statement from the American Heart Association. *Circulation, 132*(9), 873-898.
He, F. J., & MacGregor, G. A. (2010). Reducing population salt intake worldwide: from evidence to implementation. *Progress in cardiovascular diseases, 52*(5), 363-382.
He, F. J., Nowson, C., Lucas, M., & MacGregor, G. (2007). Increased consumption of fruit and vegetables is related to a reduced risk of coronary heart disease: meta-analysis of cohort studies. *Journal of human hypertension, 21*(9), 717-728.
He, F. J., Nowson, C. A., & MacGregor, G. A. (2006). Fruit and vegetable consumption and stroke: meta-analysis of cohort studies. *The lancet, 367*(9507), 320-326.

He, J., & Whelton, P. K. (1999). Elevated systolic blood pressure and risk of cardiovascular and renal disease: Overview of evidence from observational epidemiologic studies and randomized controlled trials. *The American heart journal, 138*(3), S211-S219. doi:10.1016/S0002-8703(99)70312-1

Hebert, J. R., Ebbeling, C. B., Matthews, C. E., Hurley, T. G., Yunsheng, M., Druker, S., & Clemow, L. (2002). Systematic errors in middle-aged women's estimates of energy intake: comparing three self-report measures to total energy expenditure from doubly labeled water. *Annals of epidemiology, 12*(8), 577-586.

Helou, K., El Helou, N., Mahfouz, M., Mahfouz, Y., Salameh, P., & Harmouche-Karaki, M. (2018). Validity and reliability of an adapted arabic version of the long international physical activity questionnaire. *BMC public health, 18*(1), 1-8.

Heun, R., Bonsignore, M., Barkow, K., & Jessen, F. (2001). Validity of the five-item WHO Well-Being Index (WHO-5) in an elderly population. *European archives of psychiatry and clinical neuroscience, 251*(2), 27-31.

Hooper, L., Martin, N., Abdelhamid, A., & Smith, G. D. (2015). Reduction in saturated fat intake for cardiovascular disease. *Cochrane database of systematic reviews*(6).

Hughes, M. E., Waite, L. J., Hawkley, L. C., & Cacioppo, J. T. (2004). A short scale for measuring loneliness in large surveys: Results from two population-based studies. *Research on aging, 26*(6), 655-672.

Hurley, M. A. (2014). Light smoking at base-line predicts a higher mortality risk to women than to men; evidence from a cohort with long follow-up. *BMC public health, 14*(1), 95-95. doi:10.1186/1471-2458-14-95

Hyre, A. D., Krousel-Wood, M. A., Muntner, P., Kawasaki, L., & DeSalvo, K. B. (2007). Prevalence and predictors of poor antihypertensive medication adherence in an urban health clinic setting. *The Journal of Clinical Hypertension, 9*(3), 179-186.

Institute for Health Metrics and Evaluation. (2019a). Egypt Profile. Retrieved from http://www.healthdata.org/[Egypt]

Institute for Health Metrics and Evaluation. (2019b). Jordan Profile. Retrieved from http://www.healthdata.org/[Jordan]

Institute for Health Metrics and Evaluation. (2019c). Lebanon Profile. Retrieved from http://www.healthdata.org/[Lebanon]

Institute for Health Metrics and Evaluation. (2019d). Syrian Arab Republic Profiles. Retrieved from http://www.healthdata.org/[Syria Arab Republic]

Insull, W. (1997). The problem of compliance to cholesterol altering therapy. *Journal of internal medicine, 241*(4), 317-325.

Isma'eel, H. A., Almedawar, M. M., Breidy, J., Nasrallah, M., Nakhoul, N., Mouneimne, Y., . . . Tamim, H. (2018). Worsening of the cardiovascular profile in a developing country: the greater Beirut area cardiovascular cohort. *Global Heart, 13*(4), 275-283.

Jaam, M. J. (2017). *Barriers to medication adherence in patients with uncontrolled diabetes in a primary healthcare setting in Qatar: a mixed method triangulation study*.

Jackevicius, C. A., Li, P., & Tu, J. V. (2008). CLINICAL PERSPECTIVE. *Circulation, 117*(8), 1028-1036.

Jensen, M., Ryan, D., Apovian, C., Ard, J., Comuzzie, A., Donato, K., . . . Kushner, R. (2014). 2013 AHA/ACC/TOS guideline for the management of overweight and obesity in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and The Obesity Society.

Jeong, S.-W., Kim, S.-H., Kang, S.-H., Kim, H.-J., Yoon, C.-H., Youn, T.-J., & Chae, I.-H. (2019). Mortality reduction with physical activity in patients with and without cardiovascular disease. *European heart journal, 40*(43), 3547-3555.

Jetté, M., Sidney, K., & Blümchen, G. (1990). Metabolic equivalents (METS) in exercise testing, exercise prescription, and evaluation of functional capacity. *Clinical cardiology, 13*(8), 555-565.

Joshipura, K. J., Hu, F. B., Manson, J. E., Stampfer, M. J., Rimm, E. B., Speizer, F. E., . . . Spiegelman, D. (2001). The effect of fruit and vegetable intake on risk for coronary heart disease. *Annals of internal medicine, 134*(12), 1106-1114.

Kahan, D. (2015). Adult physical inactivity prevalence in the Muslim world: Analysis of 38 countries. *Preventive medicine reports, 2*, 71-75.

Kannel, W. B. (1976). Some lessons in cardiovascular epidemiology from Framingham. *The American journal of cardiology, 37*(2), 269-282.

Kassab, Y., Kassab, Y., Hassan, Y., Hassan, Y., Abd Aziz, N., Abd Aziz, N., . . . AbdulRazzaq, H. (2013). Patients' adherence to secondary prevention pharmacotherapy after acute coronary syndromes. *International journal of clinical pharmacy, 35*(2), 275-280. doi:10.1007/s11096-012-9735-y

Kenchaiah, S., Evans, J. C., Levy, D., Wilson, P. W., Benjamin, E. J., Larson, M. G., . . . Vasan, R. S. (2002). Obesity and the risk of heart failure. *New England journal of medicine, 347*(5), 305-313.

Khalil, S. A., & Elzubier, A. G. (1997). Drug compliance among hypertensive patients in Tabuk, Saudi Arabia. *Journal of hypertension, 15*(5), 561-565.

Kilbourne, A. M., Reynolds, C. F., 3rd, Good, C. B., Sereika, S. M., Justice, A. C., & Fine, M. J. (2005). How does depression influence diabetes medication adherence in older patients? *Am J Geriatr Psychiatry, 13*(3), 202-210. doi:10.1176/appi.ajgp.13.3.202

Kim, D., Diez Roux, A. V., Kiefe, C. I., Kawachi, I., & Liu, K. (2010). Do neighborhood socioeconomic deprivation and low social cohesion predict coronary calcification? The CARDIA study. *American journal of epidemiology, 172*(3), 288-298.

Kim, S., Shin, D. W., Yun, J. M., Hwang, Y., Park, S. K., Ko, Y.-J., & Cho, B. (2016). Medication adherence and the risk of cardiovascular mortality and hospitalization among patients with newly prescribed antihypertensive medications. *Hypertension, 67*(3), 506-512.

Klop, B., Elte, J. W. F., & Cabezas, M. C. (2013). Dyslipidemia in obesity: mechanisms and potential targets. *Nutrients, 5*(4), 1218-1240.

Kohl, H. W. (2001). Physical activity and cardiovascular disease: evidence for a dose response. *Medicine and science in sports and exercise, 33*(Supplement), S472-S483. doi:10.1097/00005768-200106001-00017

Kopin, L., & Lowenstein, C. J. (2017). Dyslipidemia. *Annals of internal medicine, 167*(11), ITC81-ITC96.

Korb-Savoldelli, V., Gillaizeau, F., Pouchot, J., Lenain, E., Postel-Vinay, N., Plouin, P. F., . . . Sabatier, B. (2012). Validation of a French version of the 8-item Morisky

medication adherence scale in hypertensive adults. *The Journal of Clinical Hypertension, 14*(7), 429-434.

Kris-Etherton, P., Eissenstat, B., Jaax, S., Srinath, U., Scott, L., Rader, J., & Pearson, T. (2001). Validation for MEDFICTS, a dietary assessment instrument for evaluating adherence to total and saturated fat recommendations of the National Cholesterol Education Program Step 1 and Step 2 diets. *Journal of the American Dietetic Association, 101*(1), 81-86.

Kuroki, Y., Kanauchi, K., & Kanauchi, M. (2012). Adherence index to the American Heart Association Diet and Lifestyle Recommendation is associated with the metabolic syndrome in Japanese male workers. *European journal of internal medicine, 23*(8), e199-e203. doi:10.1016/j.ejim.2012.08.002

Kusaslan Avci, D. (2018). Evaluation of the relationship between loneliness and medication adherence in patients with diabetes mellitus: a cross-sectional study. *Journal of International Medical Research, 46*(8), 3149-3161.

Lapointe, A., Couillard, C., & Lemieux, S. (2006). Effects of dietary factors on oxidation of low-density lipoprotein particles. *The Journal of Nutritional Biochemistry, 17*(10), 645-658.

Lawes, C. M. M. P., Hoorn, S. V. M., Rodgers, A. P., for the International Society of, H., & International Society of, H. (2008). Global burden of blood-pressure-related disease, 2001. *The Lancet (British edition), 371*(9623), 1513-1518. doi:10.1016/S0140-6736(08)60655-8

Lee, G. K., Wang, H. H., Liu, K. Q., Cheung, Y., Morisky, D. E., & Wong, M. C. (2013). Determinants of medication adherence to antihypertensive medications among a Chinese population using Morisky Medication Adherence Scale. *PloS one, 8*(4), e62775.

Lett, H. S., Blumenthal, J. A., Babyak, M. A., Sherwood, A., Strauman, T., Robins, C., & Newman, M. F. (2004). Depression as a risk factor for coronary artery disease: evidence, mechanisms, and treatment. *Psychosomatic medicine, 66*(3), 305-315.

Libby, P., Ridker, P. M., & Hansson, G. K. (2011). Progress and challenges in translating the biology of atherosclerosis. *Nature, 473*(7347), 317-325.

Lin, H. H., Tsai, Y. F., Lin, P. J., & Tsay, P. K. (2010). Effects of a therapeutic lifestyle-change programme on cardiac risk factors after coronary artery bypass graft. *Journal of clinical nursing, 19*(1-2), 60-68.

Lloyd-Jones, D., Adams, R., Carnethon, M., De Simone, G., Ferguson, T. B., Flegal, K., . . . Writing Group, M. (2009). Heart disease and stroke statistics--2009 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. *Circulation (New York, N.Y.), 119*(3), e21-181. doi:10.1161/CIRCULATIONAHA.108.191261

Lloyd-Jones, D. M., Hong, Y., Labarthe, D., Mozaffarian, D., Appel, L. J., Van Horn, L., . . . Tomaselli, G. F. (2010). Defining and setting national goals for cardiovascular health promotion and disease reduction: the American Heart Association's strategic Impact Goal through 2020 and beyond. *Circulation, 121*(4), 586-613.

Lucas-Carrasco, R., Allerup, P., & Bech, P. (2012). The validity of the WHO-5 as an early screening for apathy in an elderly population. *Current gerontology and geriatrics research, 2012*.

Lucas-Carrasco, R. (2012). Reliability and validity of the S panish version of the W orld H ealth O rganization-F ive W ell-B eing I ndex in elderly. *Psychiatry and Clinical Neurosciences, 66*(6), 508-513.

Mallat, S., Geagea, A. G., Jurjus, R., Rizkallah, A., Oueidat, D., Matar, M., . . . Jurjus, A. (2016). Obesity in Lebanon: a national problem. *World Journal of Cardiovascular Diseases, 6*(06), 166.

Mampuya, W. M. (2012). Cardiac rehabilitation past, present and future: an overview. *Cardiovascular diagnosis and therapy, 2*(1), 38.

Matar, D., Frangieh, A. H., Abouassi, S., Bteich, F., Saleh, A., Salame, E., . . . Azar, R. R. (2015). Prevalence, Awareness, Treatment, and Control of Hypertension in L ebanon. *The Journal of Clinical Hypertension, 17*(5), 381-388.

Mayhew, A. J., de Souza, R. J., Meyre, D., Anand, S. S., & Mente, A. (2016). A systematic review and meta-analysis of nut consumption and incident risk of CVD and all-cause mortality. *Br J Nutr, 115*(2), 212-225. doi:10.1017/s0007114515004316

Maziak, W., Rastam, S., Mzayek, F., Ward, K. D., Eissenberg, T., & Keil, U. (2007). Cardiovascular health among adults in Syria: a model from developing countries. *Annals of epidemiology, 17*(9), 713-720.

Mazzaglia, G., Ambrosioni, E., Alacqua, M., Filippi, A., Sessa, E., Immordino, V., . . . Cricelli, C. (2009). CLINICAL PERSPECTIVE. *Circulation, 120*(16), 1598-1605.

McDermott, M. M., Schmitt, B., & Wallner, E. (1997). Impact of medication nonadherence on coronary heart disease outcomes: a critical review. *Archives of internal medicine, 157*(17), 1921-1929.

Medicine, A. C. o. S. (2013). *ACSM's guidelines for exercise testing and prescription*: Lippincott Williams & Wilkins.

Members, W. C., Greenland, P., Alpert, J. S., Beller, G. A., Benjamin, E. J., Budoff, M. J., . . . Hodgson, J. M. (2010). 2010 ACCF/AHA guideline for assessment of cardiovascular risk in asymptomatic adults: executive summary: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *Circulation, 122*(25), 2748-2764.

Mertens, E., Deforche, B., Mullie, P., Lefevre, J., Charlier, R., Knaeps, S., . . . Clarys, P. (2015). Longitudinal study on the association between three dietary indices, anthropometric parameters and blood lipids. *Nutrition & metabolism, 12*(1), 1-9.

Mochari, H., Gao, Q., & Mosca, L. (2008). Validation of the MEDFICTS dietary assessment questionnaire in a diverse population. *Journal of the American Dietetic Association, 108*(5), 817-822.

Mohtadi, K., Msaad, R., Benalioua, N., Jafri, A., Meftah, H., Elkardi, Y., . . . Taki, H. (2020). Sociodemographic and Lifestyle Factors Associated with Adherence to Mediterranean Diet in Representative Adult Population in Casablanca City, Morocco: A Cross-Sectional Study. *Journal of nutrition and metabolism, 2020*.

Monteiro, C. A. (2009). Nutrition and health. The issue is not food, nor nutrients, so much as processing. *Public health nutrition, 12*(5), 729-731. doi:10.1017/S1368980009005291

Monteiro Dos Santos, J. E., Crispim, S. P., Murphy, J., & de Camargo Cancela, M. (2021). Health, lifestyle and sociodemographic characteristics are associated with Brazilian dietary patterns: Brazilian National Health Survey. *PloS one, 16*(2), e0247078.

Morisky, D. E., Ang, A., Krousel-Wood, M., & Ward, H. J. (2008). Predictive validity of a medication adherence measure in an outpatient setting. *The Journal of Clinical Hypertension, 10*(5), 348-354.

Morisky, D. E., Green, L. W., & Levine, D. M. (1986). Concurrent and predictive validity of a self-reported measure of medication adherence. *Medical care*, 67-74.

Mosca, L., Barrett-Connor, E., & Kass Wenger, N. (2011). Sex/Gender Differences in Cardiovascular Disease Prevention: What a Difference a Decade Makes. *Circulation (New York, N.Y.), 124*(19), 2145-2154. doi:10.1161/CIRCULATIONAHA.110.968792

Mozaffarian, D., Benjamin, E. J., Go, A. S., Arnett, D. K., Blaha, M. J., Cushman, M., . . . Fullerton, H. J. (2016). Executive summary: heart disease and stroke statistics—2016 update: a report from the American Heart Association. *Circulation, 133*(4), 447-454.

Naderi, S. H., Bestwick, J. P., & Wald, D. S. (2012). Adherence to drugs that prevent cardiovascular disease: meta-analysis on 376,162 patients. *The American journal of medicine, 125*(9), 882-887. e881.

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.

Napoli, C., D'Armiento, F. P., Mancini, F. P., Postiglione, A., Witztum, J. L., Palumbo, G., & Palinski, W. (1997). Fatty streak formation occurs in human fetal aortas and is greatly enhanced by maternal hypercholesterolemia. Intimal accumulation of low density lipoprotein and its oxidation precede monocyte recruitment into early atherosclerotic lesions. *The Journal of clinical investigation, 100*(11), 2680-2690.

Nasreddine, L., Naja, F., Chamieh, M. C., Adra, N., Sibai, A.-M., & Hwalla, N. (2012). Trends in overweight and obesity in Lebanon: evidence from two national cross-sectional surveys (1997 and 2009). *BMC public health, 12*(1), 798.

Nasreddine, L., Naja, F., 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. *Lebanese Medical Journal, 103*(1151), 1-9.

National Heart, L., & Institute, B. (2015). Lifestyle interventions to reduce cardiovascular risk: Systematic evidence review from the Lifestyle Work Group, 2013. In.

Nicholson, G., Gandra, S. R., Halbert, R. J., Richhariya, A., & Nordyke, R. J. (2016). Patient-level costs of major cardiovascular conditions: a review of the international literature. *ClinicoEconomics and outcomes research: CEOR, 8*, 495.

Niroumand, S., Khajedaluee, M., Khadem-Rezaiyan, M., Abrishami, M., Juya, M., Khodaee, G., & Dadgarmoghaddam, M. (2015). Atherogenic Index of Plasma (AIP): A marker of cardiovascular disease. *Medical journal of the Islamic Republic of Iran, 29*, 240.

Njølstad, I., Arnesen, E., & Lund-Larsen, P. G. (1996). Smoking, serum lipids, blood pressure, and sex differences in myocardial infarction. A 12-year follow-up of

the Finnmark Study. *Circulation (New York, N.Y.), 93*(3), 450-456. doi:10.1161/01.CIR.93.3.450
Nordestgaard, B. G. (2016). Triglyceride-Rich Lipoproteins and Atherosclerotic Cardiovascular Disease: New Insights From Epidemiology, Genetics, and Biology. *Circulation research, 118*(4), 547-563. doi:10.1161/CIRCRESAHA.115.306249
Noubani, A., Nasreddine, L., Sibai, A. M., Tamim, H., & Isma'eel, H. (2018). Prevalence, Awareness, and Control of Hypertension in Greater Beirut Area, Lebanon. *International journal of hypertension, 2018*.
Nystoriak, M. A., & Bhatnagar, A. (2018). Cardiovascular effects and benefits of exercise. *Frontiers in cardiovascular medicine, 5*, 135.
Park, H.-C., & Oh, J. (2021). *Factors Affecting Health-Promoting Behaviors in Patients with Cardiovascular Disease.* Paper presented at the Healthcare.
Park, L. G., Howie-Esquivel, J., Chung, M. L., & Dracup, K. (2013). A text messaging intervention to promote medication adherence for patients with coronary heart disease: A randomized controlled trial. *Patient education and counseling, 94*(2), 261-268. doi:10.1016/j.pec.2013.10.027
Pate, R. R., Pratt, M., Blair, S. N., Haskell, W. L., Macera, C. A., Bouchard, C., . . . King, A. C. (1995). Physical activity and public health: a recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *Jama, 273*(5), 402-407.
Pedersini, R., & Vietri, J. (2014). Comparison of the 4-item and 8-item morisky medication adherence scale in patients with type 2 diabetes. *Value in health, 17*(3), A196-A196. doi:10.1016/j.jval.2014.03.1146
Rasmussen, A. A., Wiggers, H., Jensen, M., Berg, S. K., Rasmussen, T. B., Borregaard, B., . . . Larsen, S. H. (2020). Patient-reported outcomes and medication adherence in patients with heart failure. *European Heart Journal-Cardiovascular Pharmacotherapy*.
Rehman, Z. U., Siddiqui, A. K., Karim, M., Majeed, H., & Hashim, M. (2019). Medication Non-Adherence among Patients with Heart Failure. *Cureus, 11*(8).
Reiner, Ž. (2017). Hypertriglyceridaemia and risk of coronary artery disease. *Nature reviews cardiology, 14*(7), 401-411. doi:10.1038/nrcardio.2017.31
Rimm, E. B., Willett, W. C., Hu, F. B., Sampson, L., Colditz, G. A., Manson, J. E., . . . Stampfer, M. J. (1998). Folate and vitamin B6 from diet and supplements in relation to risk of coronary heart disease among women. *Jama, 279*(5), 359-364.
Rippe, J. M. (2019). Lifestyle strategies for risk factor reduction, prevention, and treatment of cardiovascular disease. *Am J Lifestyle Med, 13*(2), 204-212.
Roger, V. L., Go, A. S., Lloyd-Jones, D. M., Adams, R. J., Berry, J. D., Brown, T. M., . . . Ford, E. S. (2011). Heart disease and stroke statistics—2011 update: a report from the American Heart Association. *Circulation, 123*(4), e18-e209.
Ross, R., Berentzen, T., Bradshaw, A. J., Janssen, I., Kahn, H. S., Katzmarzyk, P. T., . . . Sørensen, T. (2008). Does the relationship between waist circumference, morbidity and mortality depend on measurement protocol for waist circumference? *Obesity reviews, 9*(4), 312-325.
Russell, D., Peplau, L. A., & Cutrona, C. E. (1980). The revised UCLA Loneliness Scale: concurrent and discriminant validity evidence. *Journal of personality and social psychology, 39*(3), 472.

Russell, D. W. (1996). UCLA Loneliness Scale (Version 3): Reliability, validity, and factor structure. *Journal of personality assessment, 66*(1), 20-40.

Rutledge, T., Linke, S. E., Krantz, D. S., Johnson, B. D., Bittner, V., Eastwood, J.-A., . . . Francis, J. (2009). Comorbid depression and anxiety symptoms as predictors of cardiovascular events: results from the NHLBI-sponsored Women's Ischemia Syndrome Evaluation (WISE) study. *Psychosomatic medicine, 71*(9), 958.

Serour, M., Alqhenaei, H., Al-Saqabi, S., Mustafa, A.-R., & Ben-Nakhi, A. (2007). Cultural factors and patients' adherence to lifestyle measures. *British Journal of General Practice, 57*(537), 291-295.

Shahdadian, F., Saneei, P., Milajerdi, A., & Esmaillzadeh, A. (2019). Dietary glycemic index, glycemic load, and risk of mortality from all causes and cardiovascular diseases: A systematic review and dose-response meta-analysis of prospective cohort studies. *The American journal of clinical nutrition, 110*(4), 921-937.

Shalansky, S. J., Levy, A. R., & Ignaszewski, A. P. (2004). Self-reported Morisky score for identifying nonadherence with cardiovascular medications. *Annals of Pharmacotherapy, 38*(9), 1363-1368.

Sharara, E., Akik, C., Ghattas, H., & Obermeyer, C. M. (2018). Physical inactivity, gender and culture in Arab countries: a systematic assessment of the literature. *BMC public health, 18*(1), 1-19.

Sharrett, A. R., Ballantyne, C., Coady, S., Heiss, G., Sorlie, P., Catellier, D., & Patsch, W. (2001). Coronary heart disease prediction from lipoprotein cholesterol levels, triglycerides, lipoprotein (a), apolipoproteins AI and B, and HDL density subfractions: The Atherosclerosis Risk in Communities (ARIC) Study. *Circulation, 104*(10), 1108-1113.

Shaw, J. E., Sicree, R. A., & Zimmet, P. Z. (2010). Global estimates of the prevalence of diabetes for 2010 and 2030. *Diabetes research and clinical practice, 87*(1), 4-14.

Shin, Y., & Kim, Y. (2019). Association between Psychosocial Stress and Cardiovascular Disease in Relation to Low Consumption of Fruit and Vegetables in Middle-Aged Men. *Nutrients, 11*(8), 1915.

Sibai, A., Tohme, R., Mahfoud, Z., Chaaya, M., & Hwalla, N. (2009). Non-communicable diseases and behavioral risk factor survey: comparison of estimates based on cell phone interviews with face to face interviews. *WHO Lebanon office. Beirut, Lebanon: Final report submitted to World Health Organization-Lebanon office*.

Sibai, A.-M., Obeid, O., Batal, M., Adra, N., El Khoury, D., & Hwalla, N. (2008). Prevalence and correlates of metabolic syndrome in an adult Lebanese population. *CVD Prevention and Control, 3*(2), 83-90.

Sibai, A. M., Chaaya, M., Tohme, R. A., Mahfoud, Z., & Al-Amin, H. (2009). Validation of the Arabic version of the 5-item WHO Well Being Index in elderly population. *Int J Geriatr Psychiatry, 24*(1), 106-107.

Sibai, A. M., Fletcher, A., Hills, M., & Campbell, O. (2001). Non-communicable disease mortality rates using the verbal autopsy in a cohort of middle aged and older populations in Beirut during wartime, 1983–93. *Journal of Epidemiology & Community Health, 55*(4), 271-276.

Sibai, A. M., Nasreddine, L., Mokdad, A. H., Adra, N., Tabet, M., & Hwalla, N. (2010). Nutrition transition and cardiovascular disease risk factors in Middle East and

North Africa countries: reviewing the evidence. *Annals of Nutrition and Metabolism, 57*(3-4), 193-203.
Sibai, A. M., Nuwayhid, I., Beydoun, M., & Chaaya, M. (2002). Inadequacies of death certification in Beirut: who is responsible? *Bulletin of the World Health Organization, 80*, 555-561.
Silavanich, V., Nathisuwan, S., Phrommintikul, A., & Permsuwan, U. (2019). Relationship of medication adherence and quality of life among heart failure patients. *Heart & Lung, 48*(2), 105-110.
Sims, M., Glover, L. S. M., Gebreab, S. Y., & Spruill, T. M. (2020). Cumulative psychosocial factors are associated with cardiovascular disease risk factors and management among African Americans in the Jackson Heart Study. *BMC public health, 20*, 1-11.
Sims, M., Kershaw, K. N., Breathett, K., Jackson, E. A., Lewis, L. M., Mujahid, M. S., . . . Research, O. (2020). Importance of housing and cardiovascular health and well-being: a scientific statement from the American Heart Association. *Circulation: Cardiovascular Quality and Outcomes, 13*(8), e000089.
Sjostram, M., Ainsworth, B., Bauman, A., Bull, F., Craig, C., & Sallis, J. (2009). Guidelines for data processing and analysis of the International Physical Activity Questionnaire (IPAQ)–short and long forms: Nov 2005. *Available at wwwipaqkise/scoring Accessed, 5*(11).
Stamler, J., Stamler, R., & Neaton, J. D. (1993). Blood pressure, systolic and diastolic, and cardiovascular risks : US population data. *Archives of internal medicine (1960), 153*(5), 598-615. doi:10.1001/archinte.153.5.598
Stary, H. C., Chandler, A. B., Glagov, S., Guyton, J. R., Insull Jr, W., Rosenfeld, M. E., . . . Wissler, R. W. (1994). A definition of initial, fatty streak, and intermediate lesions of atherosclerosis. A report from the Committee on Vascular Lesions of the Council on Arteriosclerosis, American Heart Association. *Circulation, 89*(5), 2462-2478.
Stewart, R. A., Held, C., Hadziosmanovic, N., Armstrong, P. W., Cannon, C. P., Granger, C. B., . . . Lonn, E. (2017). Physical activity and mortality in patients with stable coronary heart disease. *Journal of the American College of Cardiology, 70*(14), 1689-1700.
Stone, N. J., & Van Horn, L. (2002). Therapeutic lifestyle change and adult treatment panel III: Evidence then and now. *Current atherosclerosis reports, 4*(6), 433-443. doi:10.1007/s11883-002-0047-x
Strath, S. J., Kaminsky, L. A., Ainsworth, B. E., Ekelund, U., Freedson, P. S., Gary, R. A., . . . Swartz, A. M. (2013). Guide to the assessment of physical activity: clinical and research applications: a scientific statement from the American Heart Association. *Circulation, 128*(20), 2259-2279.
Stratton, I. M., Adler, A. I., Neil, H. A. W., Matthews, D. R., Manley, S. E., Cull, C. A., . . . Holman, R. R. (2000). Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): prospective observational study. *Bmj, 321*(7258), 405-412.
Strazzullo, P., D'Elia, L., Kandala, N.-B., & Cappuccio, F. P. (2009). Salt intake, stroke, and cardiovascular disease: meta-analysis of prospective studies. *Bmj, 339*.

Strong, K., Mathers, C., Epping-Jordan, J., & Beaglehole, R. (2006). Preventing chronic disease: a priority for global health. *International Journal of Epidemiology, 35*(2), 492-494.

Sweileh, W. M., Abu-Hadeed, H. M., Al-Jabi, S. W., & Sa'ed, H. Z. (2014). Prevalence of depression among people with type 2 diabetes mellitus: a cross sectional study in Palestine. *BMC public health, 14*(1), 163.

T. Jackson, Z. A.-M., Montaha Al-Raqua, Prasanna Prakash, Ali Muhanna, Robert. (2001). Prevalence of coronary risk factors in healthy adult Kuwaitis. *International journal of food sciences and nutrition, 52*(4), 301-311.

Tailakh, A., Evangelista, L. S., Mentes, J. C., Pike, N. A., Phillips, L. R., & Morisky, D. E. (2014). Hypertension prevalence, awareness, and control in A rab countries: A systematic review. *Nursing & health sciences, 16*(1), 126-130.

Tanasescu, M., Leitzmann, M. F., Rimm, E. B., Willett, W. C., Stampfer, M. J., & Hu, F. B. (2002). Exercise Type and Intensity in Relation to Coronary Heart Disease in Men. *JAMA : the journal of the American Medical Association, 288*(16), 1994-2000. doi:10.1001/jama.288.16.1994

Taylor, A. J., Wong, H., Wish, K., Carrow, J., Bell, D., Bindeman, J., . . . O'Malley, P. G. (2003). Validation of the MEDFICTS dietary questionnaire: a clinical tool to assess adherence to American Heart Association dietary fat intake guidelines. *Nutrition Journal, 2*(1), 1-6.

Teal, C. R., Baham, D. L., Gor, B. J., & Jones, L. A. (2007). Is the MEDFICTS rapid dietary fat screener valid for premenopausal African-American women? *Journal of the American Dietetic Association, 107*(5), 773-781.

The Emerging Risk Factors, C., & Emerging Risk Factors, C. (2010). Diabetes mellitus, fasting blood glucose concentration, and risk of vascular disease: a collaborative meta-analysis of 102 prospective studies. *The Lancet (British edition), 375*(9733), 2215-2222. doi:10.1016/S0140-6736(10)60484-9

Thombs, B. D., Bass, E. B., Ford, D. E., Stewart, K. J., Tsilidis, K. K., Patel, U., . . . Ziegelstein, R. C. (2006). Prevalence of depression in survivors of acute myocardial infarction. *Journal of general internal medicine, 21*(1), 30-38.

Topp, C. W., Østergaard, S. D., Søndergaard, S., & Bech, P. (2015). The WHO-5 Well-Being Index: a systematic review of the literature. *Psychotherapy and psychosomatics, 84*(3), 167-176.

Vafeiadou, K., Weech, M., Sharma, V., Yaqoob, P., Todd, S., Williams, C. M., . . . Lovegrove, J. A. (2012). A review of the evidence for the effects of total dietary fat, saturated, monounsaturated and n-6 polyunsaturated fatty acids on vascular function, endothelial progenitor cells and microparticles. *British Journal of Nutrition, 107*(3), 303-324.

Van der Sande, M., Milligan, P., Nyan, O., Rowley, J., Banya, W., Ceesay, S., . . . Walraven, G. (2000). Blood pressure patterns and cardiovascular risk factors in rural and urban Gambian communities. *Journal of human hypertension, 14*(8), 489-496.

Van Horn, L., Carson, J. A. S., Appel, L. J., Burke, L. E., Economos, C., Karmally, W., . . . Thomas, R. J. (2016). Recommended dietary pattern to achieve adherence to the American Heart Association/American College of Cardiology (AHA/ACC) guidelines: a scientific statement from the American Heart Association. *Circulation, 134*(22), e505-e529.

Van Horn, L., Carson, J. A. S., Appel, L. J., Burke, L. E., Economos, C., Karmally, W., . . . and Stroke, C. (2016). Recommended Dietary Pattern to Achieve Adherence to the American Heart Association/American College of Cardiology (AHA/ACC) Guidelines: A Scientific Statement From the American Heart Association. *Circulation (New York, N.Y.), 134*(22), e505-e529. doi:10.1161/CIR.0000000000000462

Vasan, R. S., Sullivan, L. M., Wilson, P. W., Sempos, C. T., Sundström, J., Kannel, W. B., . . . D'agostino, R. B. (2005). Relative importance of borderline and elevated levels of coronary heart disease risk factors. *Annals of internal medicine, 142*(6), 393-402.

Vazzana, N., Santilli, F., Sestili, S., Cuccurullo, C., & Davi, G. (2011). Determinants of increased cardiovascular disease in obesity and metabolic syndrome. *Current medicinal chemistry, 18*(34), 5267-5280.

Vinluan, C. M., Wittman, D., & Morisky, D. (2015). Effect of pharmacist discharge counselling on medication adherence in elderly heart failure patients: a pilot study. *Journal of pharmaceutical health services research, 6*(2), 103-110. doi:10.1111/jphs.12093

Virani, S. S., Alonso, A., Aparicio, H. J., Benjamin, E. J., Bittencourt, M. S., Callaway, C. W., . . . Delling, F. N. (2021). Heart disease and stroke statistics—2021 update: a report from the American Heart Association. *Circulation, 143*(8), e254-e743.

Virani, S. S., Alonso, A., Benjamin, E. J., Bittencourt, M. S., Callaway, C. W., Carson, A. P., . . . Delling, F. N. (2020). Heart disease and stroke statistics-2020 update: a report from the American Heart Association. *Circulation, 141*(9), e139-e596.

Viswanathan, M., Golin, C. E., Jones, C. D., Ashok, M., Blalock, S., Wines, R. C. M., . . . Lohr, K. N. (2012). Closing the quality gap: revisiting the state of the science (vol. 4: medication adherence interventions: comparative effectiveness). *Evidence report/technology assessment (Full report)*(208.4), 1-685.

Wang, D. D., & Hu, F. B. (2017). Dietary fat and risk of cardiovascular disease: recent controversies and advances. *Annual review of nutrition, 37*, 423-446.

WHO. (2000). Obesity: preventing and managing the global pandemic. *World Health Organization technical report series, 894*.

WHO. (2020, 09/22/

2020 Sep 22). Tobacco responsible for 20% of deaths from coronary heart disease: Just a few cigarettes a day, occasional smoking, or exposure to second-hand smoke increase the risk of heart disease. *African Press Organisation. Database of Press Releases Related to Africa*.

Wilson, P. W., Kannel, W. B., Silbershatz, H., & D'Agostino, R. B. (1999). Clustering of metabolic factors and coronary heart disease. *Archives of internal medicine, 159*(10), 1104-1109.

Woodward, M. (2019). Cardiovascular Disease and the Female Disadvantage. *International journal of environmental research and public health, 16*(7), 1165. doi:10.3390/ijerph16071165

World Health Organization. (2010). Global recommendations on physical activity for health. Retrieved from http://www.ncbi.nlm.nih.gov/books/NBK305057/

World Health Organization. (2011). Validity and comparability of out-of-pocket health expenditure from household surveys: a review of the literature and current survey instruments.

World Health Organization. (2014). Increasing fruit and vegetable consumption to reduce the risk of noncommunicable diseases. Retrieved from https://www.who.int/elena/titles/bbc/fruit_vegetables_ncds/en/

World Health Organization. (2017). Cardiovascular diseases (CVDs). Retrieved from https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds)

World Health Organization. (2018a). *Noncommunicable Diseases (NCD) Country Profiles-Lebanon*. Retrieved from https://www.who.int/nmh/countries/lbn_en.pdf

World Health Organization. (2018b). Noncommunicable diseases country profiles 2018.

World Life Expectancy. (2016). World Health Rankings. Retrieved from https://www.worldlifeexpectancy.com/country-health-profile/lebanon

Wozniak, A., Krótki, M., Anyzewska, A., Górnicka, M., & Wawrzyniak, A. (2017). Adherence to nutrition guidelines in patients with cardiovascular diseases as a secondary prevention. *Roczniki Państwowego Zakładu Higieny, 68*(4).

Wu, C.-Y., Hu, H.-Y., Chou, Y.-J., Huang, N., Chou, Y.-C., & Li, C.-P. (2015). High Blood Pressure and All-Cause and Cardiovascular Disease Mortalities in Community-Dwelling Older Adults. *Medicine (Baltimore), 94*(47), e2160-e2160. doi:10.1097/MD.0000000000002160

Wu, J.-R., Moser, D. K., Chung, M. L., & Lennie, T. A. (2008). Predictors of medication adherence using a multidimensional adherence model in patients with heart failure. *Journal of cardiac failure*, *14*(7), 603-614.

Yang, Q., Zhang, Z., Gregg, E. W., Flanders, W. D., Merritt, R., & Hu, F. B. (2014). Added sugar intake and cardiovascular diseases mortality among US adults. *JAMA internal medicine*, *174*(4), 516-524.

Yassine, M., Al-Hajje, A., Awada, S., Rachidi, S., Zein, S., Bawab, W., . . . Salameh, P. (2016). Evaluation of medication adherence in Lebanese hypertensive patients. *Journal of epidemiology and global health*, *6*(3), 157-167.

Yates, B. C., Pozehl, B., Kupzyk, K., Epstein, C. M., & Deka, P. (2016). Are heart failure and coronary artery bypass surgery patients meeting physical activity guidelines? *Rehabilitation Nursing*.

Yousufuddin, M., & Young, N. (2019). Aging and ischemic stroke. *Aging (Albany NY), 11*(9), 2542.

Yusuf, S., Hawken, S., Ôunpuu, S., Dans, T., Avezum, A., Lanas, F., . . . Varigos, J. (2004). Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *The lancet, 364*(9438), 937-952.

Yusuf, S., Wood, D., Ralston, J., & Reddy, K. S. (2015). The World Heart Federation's vision for worldwide cardiovascular disease prevention. *Lancet, 386*(9991), 399-402. doi:10.1016/s0140-6736(15)60265-3

Zimmet, P. (2005). Magliano D, Matsuzawa Y, Alberti G, Shaw J. *The metabolic syndrome: a global public health problem and a new definition. J Atheroscler Thromb, 12*, 295-300.