LEBANESE AMERICAN UNIVERSITY

The Effects of Social Determinants of Health on Cardiovascular Outcomes in Lebanese with Type 2 Diabetes: A Cross Sectional Study

By

Rita Saadé

A thesis submitted in partial fulfillment of the requirements

for the degree of Master of Science in Nutrition

School of Arts and Sciences

August 2020

LAU
الجامعة اللبنانية الأميركية
Lebanese American University

THESIS APPROVAL FORM

Student Name: **Rita Saade** I.D.#: **201205866**

Thesis Title: **The Effects of Social Determinants of Health on Cardiovascular Outcomes in Lebanese with Type 2 Diabetes: A Cross-Sectional study**

Program: **Nutrition**

Department: **Natural Sciences**

School: **Arts & Science**

The undersigned certify that they have examined the final electronic copy of this thesis and approved it in Partial Fulfillment of the requirements for the degree of:

Master of Science in the major of **Nutrition**

Thesis Advisor's Name: **Maya Bassil, PhD**

Signature: [redacted] Date (Day / Month / Year): 13 / 08 / 2020

Committee Member's Name: **Ola Sukkarieh-Haraty, PhD**

Signature: [redacted] Date (Day / Month / Year): 13 / 08 / 2020

Committee Member's Name: **Nadine Zeeni, PhD**

Signature: [redacted] Date (Day / Month / Year): 13 / 08 / 2020

LAU
الجامعة اللبنانية الأميركية
Lebanese American University

THESIS COPYRIGHT RELEASE FORM

LEBANESE AMERICAN UNIVERSITY NON-EXCLUSIVE DISTRIBUTION LICENSE

By signing and submitting this license, you (the author(s) or copyright owner) grants the Lebanese American University (LAU) the non-exclusive right to reproduce, translate (as defined below), and/or distribute your submission (including the abstract) worldwide in print and electronic formats and in any medium, including but not limited to audio or video. You agree that LAU may, without changing the content, translate the submission to any medium or format for the purpose of preservation. You also agree that LAU may keep more than one copy of this submission for purposes of security, backup and preservation. You represent that the submission is your original work, and that you have the right to grant the rights contained in this license. You also represent that your submission does not, to the best of your knowledge, infringe upon anyone's copyright. If the submission contains material for which you do not hold copyright, you represent that you have obtained the unrestricted permission of the copyright owner to grant LAU the rights required by this license, and that such third-party owned material is clearly identified and acknowledged within the text or content of the submission. IF THE SUBMISSION IS BASED UPON WORK THAT HAS BEEN SPONSORED OR SUPPORTED BY AN AGENCY OR ORGANIZATION OTHER THAN LAU, YOU REPRESENT THAT YOU HAVE FULFILLED ANY RIGHT OF REVIEW OR OTHER OBLIGATIONS REQUIRED BY SUCH CONTRACT OR AGREEMENT. LAU will clearly identify your name(s) as the author(s) or owner(s) of the submission, and will not make any alteration, other than as allowed by this license, to your submission.

Name: Rita Saadé

Signature: [redacted] Date: 29 / 7 / 2020

LAU
الجامعة اللبنانية الأميركية
Lebanese American University

PLAGIARISM POLICY COMPLIANCE STATEMENT

I certify that:

1. I have read and understood LAU's Plagiarism Policy.
2. I understand that failure to comply with this Policy can lead to academic and disciplinary actions against me.
3. This work is substantially my own, and to the extent that any part of this work is not my own I have indicated that by acknowledging its sources.

Name: Rita Saadé

Signature: [redacted]

Date: 29 / 7 / 2020
Day Month Year

Dedication Page

To my loving parents

ACKNOWLEDGMENT

This project would not have been possible without the support of many people. Many thanks to my advisor, Dr. Maya Bassil, who read my numerous revisions and helped make some sense of the confusion. Also thanks to my committee members, Dr. Maya Bassil, Dr. Ola Sukkarieh, and Dr. Nadine Zeeni, who offered guidance and support. And finally, thanks to parents, and numerous friends who endured this long process with me, always offering support and love.

The Effects of Social Determinants of Health on Type 2 Diabetes Outcomes & CVD risk factors: A Cross Sectional Study

Rita Saadé

ABSTRACT

Background: Type 2 Diabetes Mellitus (T2DM) is one of the most prevalent chronic diseases in Lebanon and is known to increase the risks of cardio-metabolic events. Diabetes self-management is essential for glycemic control and prevention of cardiovascular complications. Recent interest has emerged in studying social determinants factors that affect self-care and diabetes outcomes.

Objective: The aim of this study is to assess the effect of different social determinants of health on cardiovascular risk factors in Lebanese people with T2DM.

Design: A sample of 300 Lebanese patients with T2DM (aged 60.30 ± 12y, 48% females) was recruited from different primary health care centers in Lebanon (Beirut, Mount Lebanon and North Lebanon) and surveyed. Data regarding demographics, social determinants of health (subjective diabetes self-care activities, quality of life, depression, fatalism, diabetes knowledge, food security, adverse childhood experience and health literacy) and anthropometric measurements like weight, height, body mass index, blood pressure, waist circumference and A1C were taken.

Results: Waist circumference, a potent cardiovascular risk factor, was set as the primary outcome based on the data and on the literature. Results in the bivariate analyses showed a significant associations ($p<0.05$) between waist circumference and the following variables in the demographics (age, school years, work hours, number of rooms, home owning, generator subscription as a source of electricity, public and car transportation, and diabetes family history), anthropometrics and other characteristics (weight, systolic blood pressure, BMI, A1C) and social determinants of health (health literacy and adverse childhood score ACE). After stepwise multivariate analysis, only work hours ($\beta= -0.187$, $p=0.002$), A1C ($\beta= 0.135$, $p=0.021$), diabetes family history ($\beta= 0.121$, $p=0.039$) and BMI ($\beta= 0.594$, $p=0.00$) predicted waist circumference. A path analyses was conducted based on a hypothetical model from the literature to explore possible mediators affecting this relationship. ACE, diabetes family history, age were found to be significantly and indirectly linked to the primary outcome (waist circumference) through A1C as a mediator, unlike health literacy that was significantly and directly linked to the primary outcome ($\chi2= 8.30$ with $p= 0.1405$, CFI = .94 and RMSEA = .049 with PCLOSE of .44)

Discussion: Patients that were health literate, working fewer hours with positive diabetes family history, and higher BMI and A1C levels were shown to have higher waist circumference and higher risk for cardiovascular risk factors. Additionally, results of the path analyses showed significant direct and indirect interactions affecting waist circumference with A1C as the primary mediator.

Conclusion: Future studies are required to further investigate other social determinants of health, to target modifiable risk factors and educate patients with type 2 diabetes for better disease management and protection against cardiovascular complications.

*Key Words**:** Type 2 Diabetes; Cardiovascular Risk Factors; Social Determinants Of Health; Waist Circumference; Adverse Childhood Experience; and Health Literacy.*

TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

Page

LIST OF ABBREVIATIONS

A1C: Glycosylated Hemoglobin

ACE: Adverse Childhood Experience

ADA: American Diabetes Association

BMI: Body Mass Index

BP: Blood Pressure

CDC: Centers for Disease Control

CHD: Coronary Heart Disease

CITI: Collaborative Institutional Training Initiative

CPA: Childhood Physical Abuse

CSA: Childhood Sexual Abuse

CVD: Cardiovascular Disease

DBP: Diastolic Blood Pressure

DSME: Diabetes Self-Management Education

DSMS: Diabetes Self-Management Support

IDF: International Diabetes Federation

LAU: Lebanese American University

LDL: Low-Density Lipoprotein

MENA: Middle East and North Africa

PHC: Primary Health Care Center

PHQ9: Patient Health Questionnaire

QOL: Quality of Life

SDH: Social Determinants of Health

SDSCA: Subjective Diabetes Self-Care Activities

SMBG: Self-Monitoring of Blood Glucose

SPSS: Statistical Package for the Social Sciences

SYSBP: Systolic Blood Pressure

T2DM: Type 2 Diabetes Mellitus

WHO: World Health Organization

Chapter 1

Introduction to Diabetes

1.1 Diabetes Overview

Diabetes mellitus is the ninth major cause of death worldwide and has emerged as a current global epidemic with numbers quadrupling in the past three decades. According to the International Federation of Diabetes, the number of patients with diabetes, worldwide, is around 463 million with a global prevalence of 9.3%. In the MENA region (Middle East & North Africa) the number of people with diabetes in 2019 was 54.8 million for adults aged 20-79 years and is expected to increase by 110% to reach 82 million in 2045 (International Diabetes Federation, 2019). The majority of those who have diabetes suffer from type 2 diabetes mellitus (90%) and are concentrated mainly in Asia (Zheng, Ley & Hu, 2018). Diabetes is a chronic condition characterized by raised blood glucose levels because of both insulin resistance (increased hepatic glucose production and decreased uptake by muscle and adipose tissue at a set insulin level) and beta cell dysfunction, which impairs sufficient insulin secretion from the pancreas (Zheng, Ley & Hu, 2018, p.89). About half of the diabetes cases in the world go undiagnosed and hence lead to severe complications that impair the lives of these individuals. Number of deaths due to diabetes between the age of 20 and 49 years is estimated to be around 4.0 (3.4-5.0) million persons. Total healthcare expenditure for diabetes is 727 billion USD in 2017 and estimated to reach 776 billion USD in 2045 (International Diabetes Federation, 2017).

There are many risk factors for the development of type 2 diabetes. Some are non-modifiable such as age, gender, ethnicity, and genetics, while others are modifiable such as physical activity, adiposity, diet, and environmental exposures. The most common modifiable risk factor is the adoption of a modern lifestyle, which includes consumption of unhealthy food along with sedentary lifestyles (International Diabetes Federation,

2017). Diabetes can be prevented or delayed through maintaining a healthy diet, being physically active, and abstaining from smoking and excessive alcohol consumption. In addition, proper disease management can prevent a lot of diabetes complications especially the major cardiovascular complications that are currently the leading cause of death in uncontrolled diabetics (Zheng, Ley & Hu, 2018). Diabetes complications are either macrovascular (coronary heart, peripheral vascular and cerebrovascular diseases) or microvascular (retinopathy, neuropathy, and nephropathy). In specific, Diabetes is known to be a risk equivalent for coronary heart disease, increasing the risk of new CHD in 10 years because of its association with other several risk factors. Around 65% of patients with T2DM die from heart disease and stroke. In addition, patients with uncontrolled diabetes are found to be at a high risk of developing high cholesterol, high blood pressure and heart diseases. (Liburd, Jack Jr, Williams, & Tucker, 2005).
Major expenses in T2DM treatment account for management of the complications especially kidney and cardiovascular problems. (International Diabetes Federation, 2019). Monitoring A1C levels in diabetic patients is essential in diabetes control. Uncontrolled levels are at the cornerstone of developing diabetes complications (International Diabetes Federation, 2017).

1.2 Diabetes in Lebanon

According to the Global Nutrition report of the Sustainable Development Goals of United Nations, the prevalence of diabetes in the Lebanese population is increasing with years, from 8.8% in 1999 to 14.5% in 2011 for males and 8.3% in 1999 to 12.2% in 2011 for females (Global Nutrition Report, 2018). Lebanon was ranked among the top 10 countries with the highest prevalence of T2DM in the Middle East with estimates of prevalence in 2019 reaching 12.9% in adults aged 20-79 years (International Diabetes Federation, 2019). In a cross-sectional study recruiting 3,000 Lebanese participants from Greater Beirut assessing prevalence of previously diagnosed and undiagnosed diabetes, results confirmed that prevalence of previously diagnosed diabetes increased with age and was significantly higher in men than in women. These results hold significance for participants less than 50

years of age (Hirbli et al., 2005). Another multivariate epidemiologic analysis in the Lebanese population (55 years and older) (n=8290) was conducted to estimate the prevalence of prediabetes and both undiagnosed and diagnosed diabetes. Results of the study confirmed that Lebanon is characterized by young onset diabetes with a co-occurrence of T2DM & cardiovascular diseases (CVD). Also, in comparison with developed countries, prevalence of obesity/overweight and physical inactivity in Lebanon is considered significantly elevated. In the surveyed sample, peripheral neuropathy and retinopathy were the most complications associated with T2DM. The study concluded that screening for individuals at risk is the hallmark for preventing development of T2DM in individuals with a positive family history. Solutions lie in increasing awareness about the multiple risk factors of diabetes and cardiovascular diseases and finding ways to resolve them (Ghassibe-Sabbagh et al., 2014). In addition, a retrospective observational study assessed the levels of A1C control among a cohort of 551 Lebanese patients with type 2 diabetes in Beirut area. Results showed that only 31.8% of the participants attained A1C control versus 68.2% with uncontrolled A1C levels. There was no statistically significant difference by age, gender or BMI. A1C controlled group had a tendency to be alcohol users compared to uncontrolled group. A1C uncontrolled group were more likely to have a longer duration of T2DM, macrovascular complications, neuropathy, retinopathy and albuminuria as compared to A1C controlled group. Moreover, the uncontrolled group had significantly higher blood pressure values and a worse lipid profile than the controlled group. In regards to cardiovascular risk factors, according to a cohort study of 220 patients with type 2 diabetes, about 40.7% had a blood pressure of ≥ 140/90 mmHg along with macrovascular complications that were 9.3% for coronary artery disease, 18.3% for peripheral vascular disease and 4.1% for cerebrovascular disease (Taleb, Salti, Al-Mokaddam, Merheb, Salti, & Nasrallah, 2008). There is a need for further investigations on how environmental factors interact with risk factors leading to the development of T2DM and its complications in Lebanon. Efforts within health care systems should focus on tackling the barriers of proper control and emphasizing the importance of comprehensive diabetes management. (Ghassibe-Sabbagh et al., 2014).

1.3 Diabetes Self-care & Outcomes

Diabetes self-care comprises a range of activities aimed at proper management and control of the disease. These include adopting a healthy lifestyle, a diet low in trans/saturated fats, high in antioxidants, fibers, unsaturated fats, and protein and individually tailored carbohydrate needs. Physical activity both aerobic and resistance exercises are essential, in addition to weekly foot care and routinely eye care. Medication/Insulin regimen adherences along with self-monitoring of blood glucose (SMBG) are also part of diabetes self-care activities (Toobert, Hampson, & Glasgow, 2000). The American Diabetes Association (ADA) 2018 position statement stressed on the importance of both diabetes self-management education (DSME) & diabetes self-management support (DSMS) for prediabetes and diabetics as part of their diabetes self-care processes. Guided by evidence-based standards, the DSME is an ongoing process that integrates the needs, goals, and life experiences of patients with prediabetes and diabetes. It aims at facilitating the knowledge, skills, and abilities necessary for the self-care of both prediabetes and diabetes. Also, it reinforces informed decision making, problem solving, self-care behaviors, and active collaboration with the health care team to ameliorate quality of life, clinical outcomes, and health status (Funnell et al., 2009). Benefits of age and culturally appropriate DSME & DSMS encompass improved diabetes knowledge, improved self-care behavior, lower A1C levels, lower self-reported weight, & improved quality of life (Norris, Lau, Smith, Schmid, & Engelgau, 2002). It has been shown that a proper multidisciplinary and culturally tailored education interventions lead to better glycemic outcomes mediated by improved diabetes self-care behaviors. Based on a pilot study conducted by Sukkarieh-Haraty et al., 2018, levels of A1C and fasting plasma glucose were ameliorated after 6 months of educational sessions within a sample of 27 Lebanese diabetics of low socio economic status (A1C: -0.6%; Fasting Plasma Glucose: -35 mg/dl; $p<0.05$). Additionally, better diabetes care leads to less cardiovascular risk factors accompanied with this disease. According to the same pilot study conducted by Sukkarieh-Haraty et al., 2018, waist circumference and cholesterol/HDL ratio decreased after 6 months of intervention. Thus, this sheds the light on the significance of educating patients with diabetes about the importance of their diabetes self-care behaviors to improve their glycemic outcomes, decrease their adiposity levels, improve their lipid profile and ultimately decrease their

cardiovascular risk factors. (Sukkarieh-Haraty, Bassil, & Egede, 2018). Similarly, another intervention examined the effect of self-care on CVD risk factors, specifically blood pressure, in patients with type 2 diabetes. Home self-care messages were sent to patients on their smartphones. Results showed a significant decrease in systolic blood pressure by 9.1±15.6 mmHg in the intervention group compared to controls, with 51% achieving a blood pressure <130/90 mmHg compared to 31% in the control group. (Logan et al., 2012).

Chapter 2

Social Determinants of Health

2.1 Social Determinants of Health and T2DM Outcomes

Based on the Center for Disease Control (CDC), social determinants of health are the "the circumstances in which people are born, live, work and age, as well as the health care system". Those include socioeconomic circumstances, psychosocial factors, neighborhood environment, as well as political, economic & cultural drives (Center for Disease Control, 2018). They are considered upstream factors of health, i.e. those that occur at the macro level and include global forces and government policies. They are the population based social, economic and environmental origins of health problems. Those overarching factors are largely outside of the control of the individual and have significant trickle-down effects on other, more proximal, determinants of public health. Midstream determinants are intermediate factors such as health behaviors while downstream determinants occur at the micro level and include one's genetics (World Health Organization, 2010). **(Figure 1)**

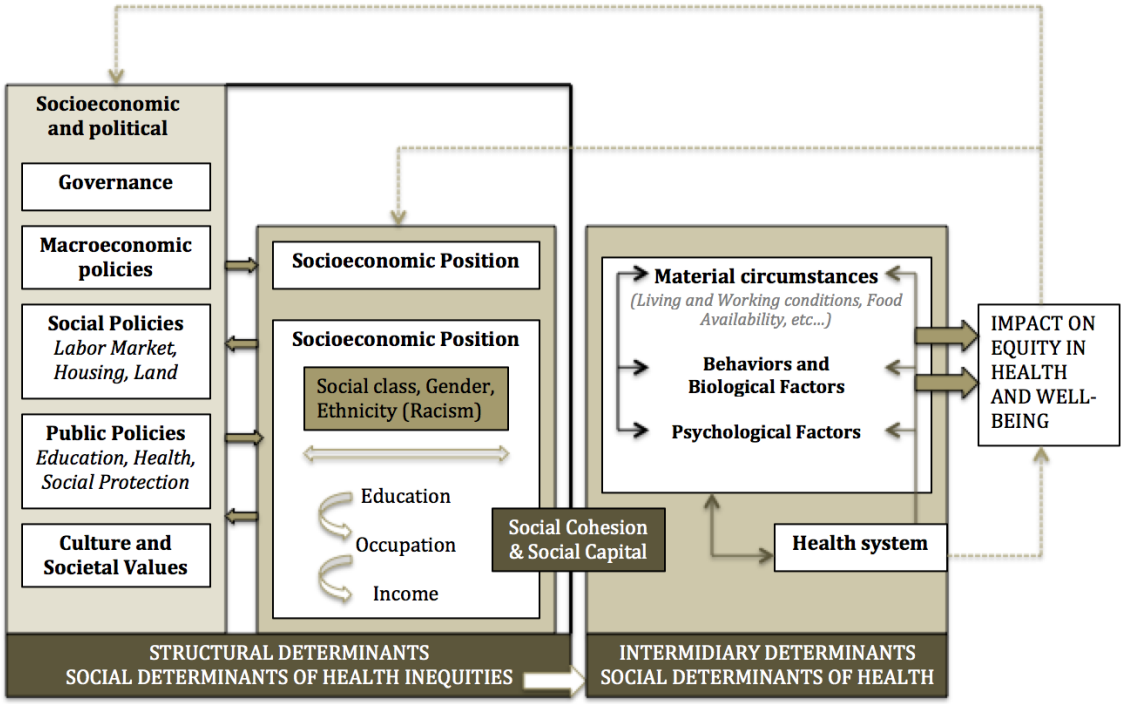

Figure 1: *Final form of the Commission on Social Determinants of Health (CHD): A Conceptual Framework for Action on the Social Determinants of Health. 201, World Health Organization: Geneva*

Social determinants are linked to health outcomes in various diseases including diabetes. Factors like socioeconomic status, income, and education on one hand, and psychological factors like fatalism, depression, distress and self-efficacy on the other hand contribute to the etiology of the disease and affect outcomes, management and control. Poor disease control will ultimately affect health and increase complications, eventually leading to mortality. Neglecting the main role of social and economic factors in health progress and disease prevention are hindering ameliorations on population level. Hence, understanding the causal pathways of social determinants of health that lead to comprehending the root cause for diseases will guide correct and precise population-based interventions (Walker, Gebregziabher, Martin-Harris, & Egede, 2014). Accordingly, much needed culturally appropriate educational interventions will be designed. Brown et al developed a conceptual framework in 2004 combining individual, domiciliary and neighborhood socioeconomic status altogether as predictors of general and specific diabetes outcomes thereby linking health and socioeconomic factors in patients with type 2 diabetes **(figure 2).**

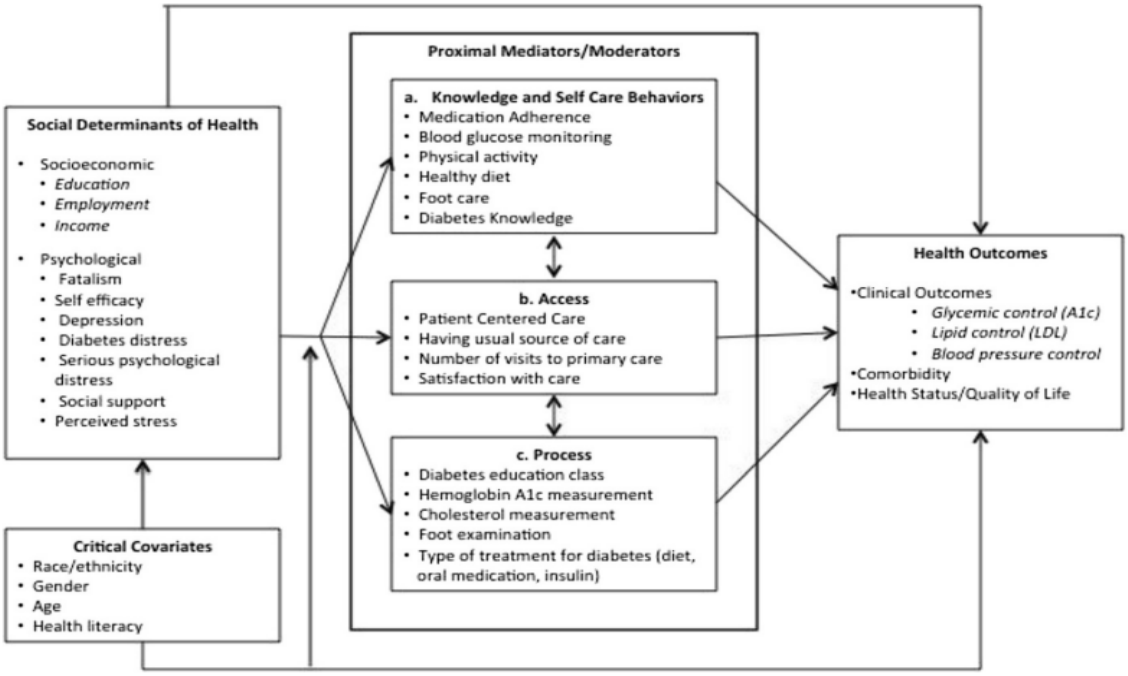

Figure 2. *Modified model adapted from Brown et al. (2004) for the relationship between socioeconomic and psychosocial social determinants of health factors and health outcomes in patients with type 2 diabetes.*

Although socioeconomic status is known to be a major risk factor for diabetes outcomes, other several social determinants must be considered when examining pathways like psychosocial influences (Walker, Gebregziabher, Martin-Harris, & Egede, 2014). Social determinants of health in the context of diabetes management lead to maintainable improvements rather than just short- term improvements. These upstream factors greatly affect self-management behaviors of diseases consequently affecting long-term diabetes and health outcomes (Clark & Utz, 2014). Most of the evidence portray that the underlying cause of ill health are material conditions. However, social status effects on health is not directly related to material conditions; other SDHs mediate this relationship (Kaplan, 2006, p. 376). Rise of diabetes prevalence along with obesity has been markedly seen in low- and middle-income countries and has been linked with excess calorie consumption and physical inactivity. Socioeconomic inequalities increase the gap between individuals within populations and lead to discrepancies in access to health care systems and appropriate quality of care. The World Health Organization (WHO) estimates that by 2030, more than 80% of people with diabetes will live in low and middle-income

(developing) countries (Whiting, Unwin & Roglic, 2010, p.89). Also, urbanization and ageing of the population increase the risks of obesity and chronic diseases like T2DM and shift lifestyles into obesogenic ones that promote obesity and diabetes.
A large proportion of individuals with T2DM go undiagnosed and the level of diagnosed diabetics is inversely proportional to the level of socioeconomic development within the population. Controlling diabetes especially A1C levels is critical for managing the disease, preventing complications, and increasing quality of life and life expectancy. Additionally, it has been shown that lack of health insurance is associated with worse glycemic control and A1C levels. Correct interventions are crucial for decreasing incidence and prevalence of this global epidemic disease and achieving optimal glycemic control in those who already have it. While promoting a healthy lifestyle and physical activity are important, vulnerable populations should have access to health care systems and good quality of care as a step to further control the incidence and prevalence of diabetes (Whiting ,Unwin & Roglic, 2010). There are very big and gross inequalities when it comes to health between countries; the first inequality is life expectancy at birth. It ranges from 34 years in Sierra Leone to 81.9 years in Japan. Another inequality is poverty affecting many health outcomes and eventually leading to mortality. In order to solve these discrepancies and inequalities between people around the world, there should be more actions addressing social determinants of health, such that actions will be taken aiming not only to relieve poverty, but mainly to improve the circumstances in which people are living in. As for the effect on cardio-metabolic outcomes, a cross-sectional study was conducted to assess the level of socioeconomic status and its effect on cardiovascular risk factors on 1,553 patients with type 2 diabetes. Results revealed that 47% of the most socioeconomically deprived patients had a BMI >30 kg/m^2 compared to 30% for those with most affluent socioeconomic status ($P<0.002$). As for the patients having three to four cardiac risk factors, their proportion significantly increased from 8.6% in the most socioeconomically affluent group to 20.2% in the most socioeconomically deprived group. (Connolly, & Kesson, 1996). In addition, a large French survey included a total of 32,435 men and 16,378 women with diabetes who had a health checkup. Results showed that several cardiovascular risk markers significantly increased in the socioeconomically deprived group of patients with type 2 diabetes. Waist circumference, BMI, systolic blood pressure

and diastolic blood pressure were significantly higher in both gender within the deprived group compared to the non-deprived group ($P<0.0001$). Thus, patients with diabetes having low socioeconomic status are at higher risk of risk of cardiovascular disease. (Jaffiol, Thomas, Bean, Jégo, & Danchin, 2013). Studying social determinants of health in diabetes is a key factor in better clinical based practice to achieve better clinical outcomes and lower the risk of complications, including CVD. (Bravemen, Egeter, Woolf , & Marks, 2011). It is also important to note that the American Diabetes Association (ADA) acknowledges the importance of assessing social determinants of health as and their impacts on diabetes control and complications. Indeed, ADA has assigned a review committee to study the literature and find knowledge gaps regarding social determinants of health effect on T2DM. This committee will guide evidence-based recommendations for action in both community and clinical settings and stresses on the importance of assessing social determinants of health in diabetes (Hill-Briggs, 2019).

2.2 Policies & Social Determinants of Health

Some countries are currently aware of the importance of incorporating policies and intervention programs that tackle health inequities and understand their effect on health outcomes. Nevertheless, lots of countries are still unaware of the importance of this strategy to decrease disease occurrence and prevalence. Health care focus in policy making should not overshadow the role of social health determinants but on the contrary these factors should be integrated within health policies. Nevertheless, this approach is limited by the fact that policy making relies greatly on clear cause-effect relationships and hence more studies and further research is needed to better understand the causal pathways of social determinants of health and their impact on health and disease outcomes (Bonnefoy, Morgan, Kelly, Butt, & Bergman, 2007). Policy making and monitoring also requires collection of long term epidemiological and health data systems which many countries lack. Another barrier is globalization that is shifting policy making from national governments to supranational organizations such as the European Union, World Trade Organization, International Monetary Fund and World Bank (Bonnefoy, Morgan, Kelly, Butt, & Bergman, 2007). Nevertheless, social determinants of health should be used to

shape public health policies on a population level. Public health has been developed in different countries in different ways, since each population has diverse health needs. This requires ongoing research and follow up for maintaining and dealing with the population's health requirements. Therefore, applying evidence-based medicine (EBM) is critical to shape policies and interventions thus having a great impact on clinical care (Heller, 2005). Social determinants of health greatly affect diabetes control, management and health complications (glycemic control, LDL and blood pressure) (Walker, Smalls, Campbell, Williams & Egede, 2014). These upstream factors should be considered when focusing on improving diabetes health outcomes. Thereafter, the following social determinants of health reported in the literature to impact type 2 diabetes, its care and outcomes (with a focus on cardiometabolic outcomes) will be discussed: Food Insecurity, Quality of Life, Fatalism, Depression, Health Literacy and Adverse Childhood Experience.

Chapter 3

Relationship between social determinants of health and diabetes

3.1 Food Insecurity and Diabetes

Food insecurity is defined as "limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways." (Bickel, Nord, Price, Hamilton & Cook, 2000, p.6). It is a measure of household and personal well-being. The lack of basic human needs can cause a lot of problems on a nutritional and health basis. Hence, it is essential to identify food insecure groups within populations and monitor those at risk. Many national and local programs have been found to tackle this problem and try to implement policies aiming at abolishing hunger and food insecurity (Bickel, Nord, Price, Hamilton & Cook, 2000). Whenever food insecure individuals are unable to afford adequate amounts of food, they tend to either reduce intake, or shift to non-healthy cheaper alternatives or even both. Thus, special attention is crucial for people with diabetes as food insecurity might impair diabetes self-management through 3 possible ways: 1) low income causes individuals to buy cheap energy dense nutritionally poor foods, 2) when food availability is compromised, blood glucose levels are unpredictable, and 3) the cost of food competes with cost of diabetes medication and supplies (Seligman, Davis, Schillinger, & Wolf, 2010). Based on a nested case-control study, 40 low-income patients with type 2 diabetes were assessed for levels of food insecurity on one hand, and indicators of diabetes self-management on the other hand. No statistically significant differences were found between food-secure and insecure participants. In addition, the sample studied had low household income, whereby results showed no significant difference between food-secure and insecure participants in terms of household income. In regard to self-efficacy score, food insecure participants had a

lower mean score of 34.4 compared to 41.2 in food secure participants (mean score 38.9, SD 8.6; p=0.02). Self-efficacy is defined as a person's ability and self-confidence in relying on their own necessary actions to control their disease and its outcomes. Moreover, associations between diabetes self-management indicators and food insecurity were found to be statistically significant. Results also showed that food insecure participants restrict paying for diabetes medications (38.9% vs. 9.1%, RR 2.19, p=.01) and testing supplies (44.4% vs. 4.6%, RR 2.76, p<.001) in order to have more money to buy their food. They were also found to be restricting paying money on food in order to spend more money for diabetes medications (55.6% vs. 18.2%, RR 2.32, p=.01) and testing supplies (33.3% vs. 9.1%, RR 2.00, p=.03). Mean A1C was 9.1% among food insecure participants and 7.7% among food secure ones (p= 0.08). This proves that food insecure patients with type 2 diabetes are more at risk of impairment of disease control and self-management. On one hand, it is important to stress on the impact of skipping meals and decreasing caloric intake caused by absence or inadequacy of appropriate medications taken in place of food and/or food supplies leading to hypoglycemia. On the other hand, hyperglycemia can also occur from lack of adherence to medications (eating food instead of medication), overconsumption of bad quality foods, and incapacity to buy diabetes-specific foods. (Seligman, Davis, Schillinger, & Wolf, 2010). The current increase in food prices and products has led low-income communities and individuals with compromised socio-economic status to be at risk of food insecurity. This highlights the urge of governments to enhance country level food security and focus on protecting at risk low socio-economic communities from this phenomenon (Ghattas, Barbour, Zurayk & Sahyoun, 2013). Food insecurity and household instability are also directly associated with poor access to care and higher incidences of hospitality with longer lengths of stay(Bierman & Dunn , 2006). In regard to CVD risk factors, a cross-sectional study assessed the prevalence of food security and whether cardiometabolic risk factors differ with different levels of food insecurity. Patients with diabetes (n= 5900) were found to have higher low-density lipoprotein (LDL), higher cholesterol and higher obesity levels among food insecure females compared to males. Diastolic blood pressure (DBP) were also higher among food insecure females compared to food secures ones. Thus, food insecurity has a negative effect and might deteriorate CVD risk factors among people with diabetes, while

improving food security can reduce the risk (Mahmoodi, Najafipour, Mohsenpour, & Amiri, 2017).

In the Middle East, especially in low to middle income countries, food security is prevalent in marginalized communities and is associated with poor health outcomes. Indeed, a cross-sectional study including 378 households from Beirut, Lebanon investigated the association between household food insecurity and obesity prevalence among mothers of the household. Results showed a significant association between obesity and mothers of food insecure households compared to those of food secure households (OR: 2.43, $p<0.00$). In addition, mothers of food insecure household were also found to be at higher risk of waist circumference (≥80 cm) (OR:1.77, $p=0.012$). (Jomaa, Naja, Cheaib & Hwalla, 2017).

3.2 Quality of Life and Diabetes

"Quality of life is measured as physical and social functioning, and perceived physical and mental well-being". People with diabetes have reported poorer quality of life compared to those people free of chronic illness (Rubin & Peyrot 1999, p. 205). Social support reflects a good quality of life. In a cross-sectional observational study including a sample of 89 African Americans with type 2 diabetes, social support (positive/negative) was assessed as independent variable in relation to both outcome variables: diabetes-specific quality of life, and self-care behavior. Satisfaction with support was the only predictor for diabetes related quality of life, the more the satisfaction with social support, the better the quality of life. Positive support was a predictor of following a healthy eating plan, spacing out carbohydrates and physical activity for at least 30 minutes. Satisfaction with support was associated with better blood glucose monitoring frequencies. On the other hand, the lower the support, the lower the adherence to medication within the studied population. (Tang, Brown, Funnell, & Anderson, 2008). Similarly, social support has been linked to better glycemic control, medication adherence, less stress and better self-care management while negative support was associated with higher diabetes complications, diabetes mismanagement and increased mortality (Strom & Egede, 2012). There are different kinds of social support, including emotional support, instrumental support

(aiding in self-management, diabetes related needs, and medication financial support), informational support (advice and education), and finally affirmational support related to self-care-related behavior. A poor quality of life and lack of social support can lead to exacerbation of chronic diseases because of the resulting poor management (Tang, Brown, Funnell, & Anderson, 2008). It is worthy to note that whenever an acute disease is present, and the family would be dealing with it, the changes would be brief and transitory. Nevertheless, in the case of diabetes, a chronic non-communicable disease, changes are long term and they would take much effort and stress from the whole family. (Pereira, Berg-Cross, Almeida, & Machado, 2008). In this way the family becomes the major contributor of support, by monitoring meal planning, glucose monitoring, insulin administration if needed and promoting healthy lifestyles. (Pereira, Berg-Cross, Almeida, & Machado, 2008). In a study by Pereira et al. (2008), adherence to diabetes treatment was predicted by family support for lower class patients and for females. Additionally, based on a review by Strom & Egede (2012), a positive association was found between higher levels of social support and improved diabetes-related clinical outcomes (A1C) regardless of the source of support received. Also, behavioral changes (including both diet and exercise) after support was given resulted in improved diabetes clinical outcomes especially A1C levels. Regarding CVD risk factors, within this systematic review, McNell and colleagues showed no significant relationship between perceived social support and CVD risk. Conversely, Epple et al., 2003 showed a significant association between active family nutritional support with control of TG and cholesterol in people with type 2 diabetes (Strom & Egede, 2012). Moreover, in a prospective cohort study assessing the effect of quality of life in patients with T2DM on CVD risk factors development, physical functioning was significantly predictive for cardiovascular disease development, while general health perception was predictive of both coronary heart disease and cerebrovascular disease. (De Visser, Bilo, Groenier, & Meyboom-de Jong, 2002). Therefore, a good quality of life is a reflection of a better disease management in patients with T2DM having risk of CVD development.

3.3 Diabetes Fatalism

Fatalism is when a person believes that health outcomes are predetermined by a higher power mainly God. As a consequence, this person becomes totally dependent on the higher power and loses all means of self-control (Sukkarieh-Haraty, Egede, Kharma, & Bassil, 2018). Diabetes fatalism is defined as "a complex psychological cycle characterized by perceptions of despair, hopelessness, and powerlessness" and is associated with poor glycemic control (Walker et al., 2012). In specific, this belief would lead to poor compliance to medication and diet, lack of blood sugar testing and lack of adequate foot care in patients with diabetes (Sukkarieh-Haraty, Egede, Kharma, & Bassil, 2018). According to a cross sectional survey conducted on 183 Jewish adults with diabetes results showed that fatalism belief was significantly associated with A1C levels, whereby the higher the fatalism belief the higher the A1C levels. Fatalism might be sometimes confounded with religiosity and spiritual beliefs and attitudes, thus affecting the relationship between fatalism and A1C. Whenever religiosity was included in the model, the magnitude of the association between fatalism and A1C decreased by 33% leading to a non-significant association (Berardi, Bellettiere, Nativ, Ladislav, Hovell, & Baron-Epel, 2016). In addition, results showed that education level and number of diabetes problems were inversely associated with diabetes fatalism, but BMI was positively linked to diabetes fatalism. (Sukkarieh-Haraty, Egede, Kharma, & Bassil, 2018). According to Sukkarieh-Haraty et al. (2017), many socio-cultural factors affect achieving a good glycemic control in Lebanese patients with type 2 diabetes, including diabetes fatalism. In fact, a sample of 280 Lebanese patients with type 2 diabetes aged 18 years and older was recruited and revealed elevated fatalism attitudes. Among the different diabetes fatalism subscales (low spiritual coping, emotional distress and low perceived self-efficacy), the emotional subscale was the only scale significantly associated with A1C levels, where those who had higher scores on emotional distress presented higher levels of A1C ($P = 0.018$). (Sukkarieh-Haraty, Egede, Abi Kharma, & Bassil, 2017). In line with this, previous studies on other populations have also shown that diabetes fatalism is strongly linked to uncontrolled blood glucose levels, decreased quality of life and poor outcomes (Ashur, Shah, Bosseri, Fah, Shamsuddin, 2016)

3.4 Depression and Diabetes

Depression is a very common disease in primary care patients with chronic disease in general, and in patients with diabetes in specific (Egede, Zheng & Simpson, 2002). It was found that presence of depression in diabetes leads to poor glycemic control, poor adherence to medication and diet, poor metabolic control, a decrease in quality of life and an increase in healthcare costs (Egede, Zheng & Simpson, 2002). Based on a survey review (Medical Expenditure Panel Survey, MEPS), depressed patients with diabetes showed a statistically significant increase in ambulatory care visits and prescriptions compared to those without depression, while no significant difference was observed for the emergency visits and inpatients hospital stay (Egede, Zheng & Simpson, 2002). Results showed that families with obstructive behaviors were associated with more stressors and depressive symptoms unlike supportive family behaviors (Mayberry, Egede, Wagner & Osborn, 2015). Furthermore, even after adjusting for depressive symptoms, stressors had a strong association with low medication adherence thus rendering it a major cause of low self-care in patients with T2DM. (Mayberry, Egede, Wagner & Osborn, 2015). In addition, According to a meta-analysis checking the prevalence of depression among adults with type 2 diabetes, depression in patients with diabetes and other chronic illnesses has been proven to have detrimental effects on the quality of life, and both social and physical functioning that are independent of the medical effects of the illness presented. Increased morbidity and mortality have been linked to both major and minor depressions even after adjusting for health behaviors and status. Also, major depressive disorder was found in 11.4% of patients with diabetes, while depressive symptoms were present in 31.0% of patients with diabetes (Anderson, Freedland, Clouse, & Lustman, 2001). To add, depression was found to be significantly higher in women than in men in general and in women with diabetes than in men with diabetes in specific. Thus, the presence of diabetes might double the risk of comorbid depression (Anderson, Freedland, Clouse, & Lustman, 2001). According to Brown, Majumdar, Newman, & Johnson, 2005, people diagnosed with type 2 diabetes were found to have experienced depression previously in their life especially between 20-50 years of age and also in individuals aged ≥51 years compared to people without diabetes. Even after controlling for potential confounders such as sex and age, a history of depression was found to be a cause for increasing the risk of developing diabetes later in life. Individuals who are depressed tend

to have body weight issues and do not follow healthy lifestyle, including physical activity. (Brown, Majumdar, Newman, & Johnson, 2005). The mechanism behind depression being a risk a factor could also be related to the use of anti-depressants with several side effects like weight gain and sedentarity, which will be eventually contributing to the development of diabetes later in life. Thus, having depression might accelerate the onset of diabetes especially in people at risk (Brown, Majumdar, Newman, & Johnson, 2005). The pathway study was conducted on 4225 participants investigating the incidence of CVD risk factors on patients diagnosed with type 2 diabetes showing depressive symptoms. It was shown that participants with depression were more likely to have ≥4 CVD risk factors compared to those showing no depressive symptoms. Also, participants with depression had higher A1C (>8%), higher hypertension, higher BMI (>30 kg/m^2) and higher triglycerides levels. After adjusting for confounders in logistic regression only BMI ≥30 kg/m^2, high triglyceride levels and low exercise levels were found to be statistically significant (<0.001) showing that participants with depression are more likely found to have higher triglycerides, higher BMI and lower exercise levels compared to participants without depression (Katon et al., 2004). In the MENA region, higher depression rates are reportedamong patients with cardiovascular diseases. A systematic review analysis showed that among 2038 participants diagnosed with CVD , 4.5% reported having depressive symptoms (Donnelly et al., 2015).

3.5 Health Literacy and Diabetes

Health literacy is defined as a person's ability to receive and comprehend basic health information that are necessary to maintain a healthy lifestyle and take the optimal health decisions, accordingly (American Diabetes Association, 2014). Low health literacy has been linked with greater risks of chronic diseases, longer hospital stay & higher mortality rates. Many studies confirmed an indirect associated between health literacy and A1C levels, mediated by diabetes knowledge and self-efficacy (Osborn, Cavanaugh, Wallston, & Rothman, 2010). Most patients with a low health literacy struggle in understanding their disease and how to effectively control it. Some do not even have knowledge of A1C meaning or significance. Indeed, these patients may think that they are managing their disease but in fact they are at poor control because of their low health literacy and

misconceptions about diabetes control (Ferguson et al., 2015). It is worthy to note that almost 48% of patients with diabetes are unable to control their A1C levels and maintain it <7% despite abundance of pharmacologic agents that lower A1C, leading to devastating complications including retinopathy, chronic kidney disease and myocardial infarction or even death (Ferguson et al., 2015). Therefore, detecting factors contributing to misperception of control within this population can guide management policies and interventions to improve A1C levels (Osborn, Cavanaugh, Wallston & Rothman, 2010). Stressing on poor control awareness would lead to amelioration of individual's protective behavior and self-management due to higher acknowledgment in disease severity, in accordance with the health belief model. (Ferguson et al., 2015). A cross sectional study on 280 patients with type 2 diabetes assessed the association between perceived control and health literacy. Multivariable analysis showed that well and very well perceived control responses were found to be linked to health literacy of seventh- to eighth-grade health literacy level (OR: 2.68) compared to high school or above, and to higher self-efficacy (OR: 1.38), higher diabetes diet self-care (OR: 1.08), higher diabetes exercise self-care (OR: 1.05) and lower diabetes foot self-care (OR: 0.93). Findings of this study stressed on the fact that low health literacy, common in patients with type 2 diabetes, is a crucial contributor to misperceptions of diabetes control and a misperceived ability to handle the disease. Therefore, it is critical for health care practitioners to consider and assess health literacy especially in poorly controlled patients with diabetes (Ferguson et al., 2015). Moreover, in a cross-sectional study conducted by Schillinger et al. 2003, aiming at investigating the association between health literacy and diabetes outcomes (A1C levels) & complications, a significant inverse association was reported between health literacy and glycemic control ($p<0.02$). Those with inadequate health literacy were also more likely to have higher rates of reported retinopathy. It was concluded that it is important to address health literacy and increase awareness and knowledge as this social determinant may underlie a main cause of poor diabetes outcomes in unprivileged communities (Schillinger et al., 2003). Reading ability is an important component and mediator of health literacy and its relationship with health outcomes has been studied in several reviews. In a systematic review (DeWalt, Berkman, Sheridan, Lohr & Pignone, 2004) assessing the association between literacy and health outcomes, most included

studies confirmed a positive and significant relationship between reading ability and participants' knowledge of these health services and outcomes. Also, those with lower health literacy appeared to have lower chances of having had a Pap smear or mammogram in the past 2 years and influenza and pneumococcal immunizations compared to their counterparts. Adding to the above, a lower literacy level was significantly associated with increased risk of complications and hospitalization. (DeWalt, Berkman, Sheridan, Lohr & Pignone, 2004) Schillinger et al. measured the association between reading ability and glycemic control and self-reported diabetes complications among 408 patients from a public hospital clinic. After adjusting for confounders, 33% of patients with type 2 diabetes had "tight" glycemic control (A1C < 7.2) within the higher literacy group versus 20% in the low literacy group. In further adjusted models, patients with type 2 diabetes in the lower literacy were more likely to report retinopathy (OR, 2.33; 95% CI, 1.2 to 4.6) and cerebrovascular disease (OR, 2.71; 95% CI, 1.1 to 7.0) compared to those with higher literacy (DeWalt, Berkman, Sheridan, Lohr & Pignone, 2004). Accordingly, studying the relationship between reading ability and health is important to better comprehend the exact etiology of poor health outcomes especially in those populations at risk of having low health literacy levels and to guide the development of correct interventions. (DeWalt, Berkman, Sheridan, Lohr & Pignone, 2004). Additionally, people with low health literacy are known to have difficulties in reading and understanding both drug label instructions and warnings. (Osborn et al., 2011). Thus, low health literacy is a barrier towards proper disease management partly through incorrect medication adherence and thus can be easily targeted. (Osborn et al., 2011).

For the effect on CVD risk factors, according to a cross-sectional study on 343 African Americans with type 2 diabetes, no significant association was found between health literacy and body mass index 0.41 (0.11, 1.55) or blood pressure 0.58 (0.30, 1.10). (Al Sayah, Majumdar, Egede, & Johnson, 2015).

3.6 Adverse Childhood Experience and Diabetes

Adverse childhood experiences (ACEs) are generally defined as stressful events that occur throughout the child's developmental stages. These experiences can lead to trauma that affects health behavior and outcomes in adult life. ACE include four domains; psychological, physical, sexual, and household dysfunction (Campbell, Farmer, Nguyen-Rodriguez, Walker, & Egede, 2018). Many studies have stressed on the importance of examining the relationship between ACEs and diabetes since certain ACEs and their different intensities have a great impact on the development of diabetes more than others (Campbell, Farmer, Nguyen-Rodriguez, Walker, & Egede, 2018). Three types of childhood abuse exit: childhood physical abuse, childhood sexual abuse and childhood exposure to intimate violence abuse (Shields, Hovdestad, Pelletier, Dykxhoorn, O'Donnell & Tonmyr, 2016). In a cross-sectional study, (n=48,526), based on theoretical relationships, path analysis was used to investigate depression and obesity as pathways between childhood sexual abuse, and diabetes in adulthood. In a mediation model after adjusting for many covariates, it was found that sexual abuse was significantly associated with depression and obesity, but the relationship was insignificant with diabetes. Therefore, there is a need to manage depression, obesity and low physical activity that are found to be mediators between childhood sexual abuse and risk of developing diabetes later in life (Campbell, Farmer, Nguyen-Rodriguez, Walker, & Egede, 2018). Moreover, research has shown that both childhood physical and sexual abuse when severe, frequent and present together, are risk factors for developing diabetes later in life in a dose-dependent fashion (OR= 2.6; 95% CI [1.4-4.9], reference group: no childhood physical abuse (CPA) and no childhood sexual abuse (CSA)). Also, whenever other diabetes risk factors are controlled for, childhood physical abuse was considered the major risk factor for diabetes development in adulthood. (Shields, Hovdestad, Pelletier, Dykxhoorn, O'Donnell & Tonmyr, 2016). Consistently, and according to a meta-analysis by Huang et al., 2015 it was shown that exposure to abuse in early stages in life was significantly and positively associated with the development of diabetes later in adulthood. Neglect had the highest influence while physical abuse had the least influence (Huang et al., 2015). This sheds the light on the importance of tackling adverse childhood experience in general and childhood physical abuse in specific in the management of T2DM.

3.7 Combined Effects of Social Determinants on Type 2 Diabetes

In order to validate the modified version of Brown et al. model (described above), a study by Walker et al., 2014 theorized that glycemic control is significantly linked to social determinants involving socioeconomic and psychological factors in specific by self-care, access, and processes of care. Results showed presence of significant and direct associations between fewer work hours, higher fatalistic mindsets, higher self-efficacy, and less diabetes distress with lower A1C levels. In addition, people that had higher income were significantly found to have better access and lower processes of care. Also, an indirect influence of social support mediated through both access and process of care was found on A1C; and social support had a 100% direct effect on care and process of care. In addition, results showed that lower diabetes distress and perceived stress were both significantly associated with higher self-care (medication adherence). Furthermore, higher access to care (patient centered care) was significantly associated with higher social support, higher income, and lower diabetes distress. Finally, it was found that lower income, higher perceived stress, and higher social support was directly associated to higher processes of care (diabetes education). Results of the study were in line with Brown et al conceptual framework showing that glycemic control is directly or indirectly associated with both psychological and socioeconomic social determinants of health and this relationship is mediated through self-care, access to care and processes of care. (Walker, Gebregziabher, Martin-Harris, & Egede, 2014).

Chapter 4

Aim of the Study

4.1 Knowledge gap

To our knowledge, no prior study examined the direct and indirect effects of social determinants of diseases in Lebanon. Given the importance of assessing the roles of these determinants in a culturally tailored approach, this cross-sectional study will be the first to provide preliminary data on social determinants of type 2 diabetes among Lebanese adults, with the main outcome being cardiometabolic risk factors. This will set the stage for a population-based study to determine the burden of T2DM, and effective strategies for treatment.

4.2 Research Question

Is there an association between social determinants of health in Lebanon and Cardio-metabolic Outcomes in type 2 diabetes?

4.3 Objectives

Objective 1: To examine the association between social determinants of health and cardiovascular risk factors (Blood Pressure [BP], Body Mass Index [BMI], waist circumference) in Type 2 Diabetes in Lebanon

Objective 2: To examine the association between social determinants of health and cardiovascular risk factors in Type 2 Diabetes mediated by self-care and other mediators in Lebanon

4.4 Hypothesis

Among a diverse sample of patients with type 2 diabetes, low socioeconomic status, impaired psychosocial factors (including diabetes fatalism, food insecurity, poor diabetes knowledge and health literacy, depression, and adverse childhood experience), and lower quality of life will be significantly associated with poor clinical cardiovascular outcomes mediated through poor self-care and other mediators.

Chapter 5

Study Design

5.1 Methods: Study population & Procedure

A cross sectional design was used with a convenience sample of Lebanese adults with type 2 diabetes (N = 300). Sample size calculation is based on the rule of thumb by Jackson, 2003 for structural equation modeling (SEM), whereby a 10:1 ratio for calculation of sample size is suggested, i.e. a minimum of 10 participants for every covariate. Therefore, consistent with the study of Walker and colleagues (2014) and given that we have around 20 covariates; the total sample required is 200. After accounting for missing data and drop-out rate, the sample size is inflated by 1.5; equivalent to a total sample of 300 participants. The study population was recruited from various primary health care center (PHC) located in Beirut, Mount Lebanon and North following their approval. Training sessions for appropriate withdrawal of blood samples and A1C testing were conducted by the representative of BioHermes Company in Lebanon that provided us with the Glycohemoglobin Analyzer and test strips. In addition, the study investigators, Dr. Bassil and Dr. Sukkarieh trained the researchers for proper questionnaire data collection. In addition, research personnel underwent appropriate training on universal precautions and safety measures during blood sample collection. Participants were interviewed and questionnaires filled by the investigators of the study. After filling out all surveys, researchers measured both A1C & waist circumference. Following this step, the registered nurse at the PHC measured & reported blood pressure, weight & height.

Participants were included in the study if they were above the age of 18 years old, Lebanese, clinically diagnosed with T2DM and able to communicate in Arabic. Subjects

were excluded if they suffer from mental confusion on interview suggesting significant dementia, alcohol or drug abuse/dependency and reported active psychosis or acute mental disorder.

Participants were recruited from patients that were present at the PHCs at the time of data collection, or were scheduled through appointments made by phone calls. Subjects who agreed to participate were asked to provide written consent, followed by collection of survey data, blood withdrawal for A1C testing and measurements to assess blood pressure, weight, height (to calculate body mass index (BMI)) and waist circumference.

A pilot study was conducted by LAU Nutrition senior students to check for the feasibility of the study and the comprehension of the surveys. A sample size of 10 participants from the initial sample was recruited for the pilot. The questionnaires took around 30 minutes to complete. Following the pilot study, surveys were further edited to make them more comprehensible after accounting for the feedback of the participants & reported barriers (long duration, unclear questions & sensitive ones left unanswered). Researchers underwent CITI training and received the "Biomedical Responsible Conduct of Research" certificate. The study was approved by LAU institutional review board (IRB) (#LAU.SAS.MB2.24/Sep/2018)

5.2 Outcome Measures

Primary Outcome: Cardiovascular Risk Factors: blood pressure was measured and reported by registered nurse at the PHCs. Also, weight and height were measured and reported by a registered nurse and used to calculate the body mass index BMI: as weight (kg)/ height (m^2), and finally waist circumference was measured by investigators via a measuring tape using standard procedures.

Other measures: A1C levels were obtained by prick tests after training of the researchers. The machine used for A1C measurements is the A1C EZ 2.0 Glycohemoglobin Analysis System (BioHermes, Wuxi, China) (Boronate Affinity Chromatography). This machine is accurate and valid. It has received both NGSP (National Glycohemoglobin Standardization Program) & IFCC (International Federation of Clinical Chemistry) certificates. Moreover, the Boronate Affinity Technology secures no interference from

Hemoglobin. The machine provides accurate results with CV< 3 %. Also, the machine is convenient where all components are stored at room temperature and operates with only 3 easily steps. It only requires about 3 microliters of capillary or venous blood sample.

5.3 Independent Variables

Variables were collected using the following questionnaires **(Appendix 1 & 2)**:

1. **Demographics**- "Participant Information Form" developed by the research team & present in the Arabic version. Demographics include age, gender, socioeconomic status, education level, parents' education level, employment status, weekly working hours, monthly income, and salary satisfaction. In addition, number of household members and level of their economic dependency, how many household members reside within one room in the household, residence status (rent or owned), and presence of household facilities (electricity, water, transportation) were collected. Health insurance status, years of diabetes diagnosis, diabetes family history, previous diabetes knowledge, level of health care trust, degree of compliance to doctor's visits, access to diabetes medication, presence of diabetes complications, and smoking status were also assessed.

2. **Quality of Life:** World Health Organization Quality of Life-BREF (WHOQOL-BREF), which is the shorter version of the WHOQOL-100 structure developed by the World Health Organization (WHO) was used to assess 4 domains related to the quality of life. These include 7 items on physical health, 6 items on psychological wellbeing, 3 items on social relationships, and 8 items on environment. A set of 26 Likert scale questions (from 1 to 5), summed up to give total Quality of Life (QOL) maximum score of 130 points. The questionnaire was translated into Arabic and validated in an Arab general population by Ohaeri and colleagues in 2009 (Ohaeri & Awadalla, 2009). The intra-class correlation for the test-retest statistic and the internal consistency values for the full questionnaire and the domains had a Cronbach's alpha≥0.7. Hence the questionnaire has been well-validated and demonstrated sound psychometric properties.

3. **Food insecurity:** This six-item scale constitutes the full set of adult items within the intermediate range of severity captured by the full scale of food insecurity (Bickel et al 2000). This English questionnaire was validated in USA. The questionnaire was translated-back translated to Arabic. A scale that was derived from the same questionnaire that we are using was validated in Lebanon AFFSS (Arab Family Food Security Scale). The psychometric assessment confirmed that the 7 items of the AFFSS had good internal validity and reasonable reliability with item in-fits from 0.73 to 1.16 (Sahyoun et al., 2014)

4. **Depression:** The original PHQ-9 is a brief questionnaire that scores each of the 9 DSM-IV criteria for depression as "0" (not at all) to "3" (nearly every day). PHQ-9 scores of 5, 10, 15, and 20 represent mild, moderate, moderately severe, and severe depression, respectively (Kroenke 2001). The scale is shown to have high internal consistency (Cronbach's alpha between .86 and. 88) (Kroenke et al., 2001) and high test-retest reliability (Cronbach's alpha between .84 and .95) (Kroenke et al., 2001, Löwe et al., 2004). The items of the PHQ-9 Arabic translated scale were highly consistent based on reliability analyses (Chronbach's alpha =.88). The item-total correlations were high for most items (.62 –.77) and moderately high for two items (>0.53). To calculate the convergent validity, total scores on the PHQ-9 were correlated with total scores on the PDSQ-MDD subset (r=.75). To calculate discriminant validity, correlations (n=107) of the PHQ-9-PDSQ-MDD (r=.76) and the GAD-7-PDSQ-MDD (r=.51), z=4.75, p<0.00001 were compared using Steiger's z. This result shows that the PHQ-9 is significantly more related to another measure of depression than the GAD-7 (Sawaya et al, 2016).

5. **Adverse Childhood Experience:** The Adverse Childhood Experiences scale is a 10-item scale that assesses the degree to which the respondent experienced childhood maltreatment (Felitti et al 1998). This set of questions captures seven categories of childhood maltreatment including psychological, physical, or sexual abuse, violence against mother, or living with household members who were substance abusers, mentally ill or suicidal, or ever imprisoned. The measures used

to assess ACEs were highly interrelated and correlated. Four or more ACEs was typically observed as the threshold marking high ACE exposure linked to significantly increased likelihoods of adverse adult health outcomes. In a study with 75 respondents, Cronbach's was .88 for the 10 discrete binary items (no/yes) (Murphy et al., 2014). The English questionnaire was translated to Arabic and then back translated to English by experts to ensure the consistency between the 2 versions.

6. **Health Literacy:** The 3-item Chew literacy scale (Chew et al. 2008) is used to assess health literacy. The scale measures respondents' capacity to obtain, process, and understand basic health-related decisions. (median Cronbach's a = 0.78). The English questionnaire was translated to Arabic and then back translated to English by experts to ensure the consistency between the 2 versions.

7. **Diabetes Knowledge:** The 24-item Diabetes Knowledge Questionnaire (DKQ) (Garcia et al, 2001) has reliability coefficient of 0.78 and showed sensitivity to a diabetes knowledge intervention when tested in an ethnic minority group. The English questionnaire was translated to Arabic and then back translated to English by experts to ensure the consistency between the 2 versions.

8. **Behavioral Skills:** Summary of Diabetes Self-care Activities is a 12 item-scale that measures all diabetes related self-care activities (diet, special diet, glucose self-monitoring, foot care, exercise, medication adherence) (Toobert et al., 2000). This scale was validated by the research team (Sukkarieh-Haraty, et. al. 2016).

9. **Diabetes Fatalism:** Diabetes Fatalism Scale consists of 12 items measuring fatalism in diabetes. It has 3 subscales: emotional distress, spiritual coping and perceived self-efficacy (Egede et al, 2012). This scale is validated by the research team (Sukkarieh-Haraty et. al., 2017). The 12-item Diabetes Fatalism Arabic Scale (DFS-Ar) analysis revealed a Cronbach's alpha of 0.86. The item analyses of the three subscales revealed Cronbach's alphas of 0.87 for subscale 1(emotional

distress), 0.85 for subscale 2 (spiritual coping) and 0.89 for subscale 3 (perceived self-efficacy) respectively (Sukkarieh-Haraty, Egede, Kharma, & Bassil, 2018).

Chapter 6

Statistical Analysis

Analysis was performed using SPSS Statistics 24.0 (IBM Corporation, Armonk, NY, USA) and significance was set at $p<0.05$. For descriptive statistics, data was reported as means ± SD or media (IQR) for continuous variables and n, % for categorical variables. The primary independent variables are the scores (continuous variables) for social determinant of health variables and demographic characteristics (continuous and categorical). The mediator variable is self-care. The dependent outcome variables are BP, BMI & waist circumference. In primary analyses, the data was split in gender for all the variables to evaluate the significant difference between females and males using independent t-test for continuous normally distributed variables, Mann-Whitney test for continuous skewed variables, Chi-Square for dichotomized categorical variables and simple logistic regression for (> 2 groups) categorical variables. In bivariate analyses, the unadjusted (univariate) associations between the dependent outcomes and each primary independent variable were evaluated using Pearson correlations for continuous normally distributed independent variables, Mann-Whitney for continuous skewed independent variables, independent t-test for dichotomized independent variables and One-Way Anova test for categorical (> 2 groups) independent variables. One primary outcome was selected based on the strongest associations in the bivariate analyses. In multivariable analyses, the adjusted associations between the primary outcome with each of the primary independent variables were evaluated after adjusting for confounders. Following bivariate and multivariate analysis, a path analysis was conducted to check for direct or indirect relationships between the independent variables and the outcomes. Path analysis is conducted because variations in independent variables account for variations in mediators; variations in mediators account for variations in the outcomes and when both independent variables and mediators are controlled, a previous significant relationship between independent variables and outcomes might no longer remain significant. Path analysis was conducted using structural equation modeling in Stata Version 15. To test causal models

of the primary dependent outcome, one path analysis was hypothesized and conducted using STATA 13. The analysis was specified to indicate variables that would affect hemoglobin A1C that in turn would affect the primary outcome. The ordering of variables in the model was consistent with the previously reviewed literature. Standardized β coefficients for the pathways were estimated using maximum likelihood estimation. One full model was estimated with all possible direct and indirect pathways to test the mediating effect in line with the abovementioned hypothesis. Three goodness-of-fit indices were used to evaluate the adequacy of the models' fit: the $\chi 2$ test with a non-significant *p-value* (>.05), the Comparative Fit Index (CFI) with >.90 and .95 for acceptable and excellent fit, respectively; and the Root Mean Square Error of Approximation (RMSEA); with <.05 and <.80 for close and reasonable fit, respectively, along with its corresponding PCLOSE; best if above 0.05.

Chapter 7

Results

Our recruited sample (n = 300) had a mean age of 60.30 ± 12.00, with females (n=144) and males (n=156) having almost similar mean ages (60.64 ± 12.83, 59.98 ± 11.37 years, respectively). There was a significant between-group difference for the variables: school years (higher in males; p=0.001), work hours (higher in males; p=0.00), financial dependence (higher in males; p=0.00), number of house facilities (higher in males, p=0.020), single marital status (higher in males; p=0.00), married marital status (higher in males, p=0.00), employed (higher in males; p=0.00), unemployed (higher in females; p=0.00). Moreover, the absence of sources of income was significantly higher in females (p=0.024), whereas an income range of 0-2999$ was significantly higher in males (p=0.024). Furthermore, males were more likely to use cars and motorcycles (p=0.00), compared to females who were more likely to use public means of transportation (p=0.00). In addition, availability of diabetes medication and therapy was significantly higher in females compared to males (p=0.039) (**Tables 1.a & 1.b)**

Table 1.a *Demographics: Continuous Variables*

Demographics (Continuous Variables)				
	Total **N=300**	**Female** **n=144**	**Male** **n=156**	**p-value**
Variables	**Mean ± SD**			
Age	60.30 ± 12.00	60.64 ± 12.83	59.98 ± 11.37	0.638
	Median (IQ) *			

School years	9 (6)	8 (6)	11 (6)	0.001**
Work hours	20 (48)	0 (27)	40 (44)	0.000**
Family size	4 (2)	4 (3)	4 (2)	0.110
Financial dependence	2 (3)	0 (2)	2 (3)	0.000**
Number of persons per bedroom	2 (1)	2 (1)	2 (0)	0.231
Number of rooms	3 (2)	3 (2)	3 (1)	0.171
Number of house facilities	10 (3.75)	9 (4)	10 (4)	0.020**
Number of diabetes complications	2 (2)	2 (2)	2 (2)	0.933

Note: Continuous variables that are normally distributed were reported as mean ± standard deviation (SD).

*Continuous skewed variables were reported as median and interquartile range (IQ).

Population was stratified based on gender between females and males

For continuous and normally distributed variables, independent t-test was used.

For continuous and non-normally distributed variables, Mann-Whitney was used.

**Significant values $p<0.05$

Table 1.b *Demographics: Categorical Variables*

Demographics (Categorical Variables)				
	Total N=300	**Female n=144**	**Male n=156**	**P value**
Variables	**(n ,valid %)**			
Sex	Female (144, 48)			NA
Marital status	Single (32, 10.7)	(12, 8.3)	(20, 12.8)	0.000**
	Married (219, 73)	(91, 63.2)	(128, 82.1)	
	Divorced (18,6)	(12, 8.3)	(6, 3.8)	
	Widowed (28, 9.3)	(27, 18.8)	(1, 0.6)	
	Separated (3, 1)	(2, 1.4)	(1, 0.6)	
Employment	Employed (134, 44.7)	(32, 22.2)	(102, 65.4)	0.000**
	Unemployed (122, 40.7)	(91, 63.2)	(31, 19.9)	
	Unable to work due to health problems (5, 1.7)	(4, 2.8)	(1, 0.6)	
	Fulltime homemaker, caregiver, parent (12, 4)	(12, 8.3)	NA	
	Retired (27, 9)	(5, 3.5)	(22, 14.1)	

Income	0 (91, 42.7)	(51, 53.1)	(40, 34.2)	0.024**
	0-499$ (92, 43.2)	(37, 38.5)	(55, 47)	
	500-1,499$ (19, 8.9)	(5, 5.2)	(14, 12)	
	1,500$-2,999$ (11, 5.2)	(3, 3.1)	(8, 6.8)	
Financial status	Comfortable; have more than enough to make ends meet (31, 10.4)	(12, 8.5)	(19, 12.2)	0.536
	Have enough to make ends meet (83, 27.9)	(39, 27.5)	(44, 28.2)	
	Do not have enough to make ends meet (184, 61.7)	(91, 64.1)	(93, 59.6)	
Accommodation	Owned (100, 33.3)	(53, 36.8)	(47, 30.1)	0.291
	Rented (192, 64)	(86, 59.7)	(106, 67.9)	

	Others (8, 2.7)	(5, 3.5)	(3, 1.9)	
Source of electricity	Public (291, 97)	(410, 97.2)	(151, 96.8)	0.828
	Generator subscription (172, 57.3)	(79, 54.9)	(93, 59.6)	0.406
	Others (1, 0.3)	(1, 0.7)	NA	0.297
Source of drinking water	Public tap (117, 39)	(55, 38.2)	(62, 39.7)	0.783
	Purchased bottle water/ tanker truck (221, 73.7)	(106, 73.6)	(115, 73.7)	0.983
	Others (11, 3.7)	(4, 2.8)	(7, 4.5)	0.431
Source of service water	Public tap (225, 75)	(104, 72.2)	(121, 77.6)	0.286
	Purchased bottle water/ tanker truck (96, 32)	(40, 27.8)	(56, 35.9)	0.132
	Others (29, 9.7)	(17, 11.8)	(12, 7.7)	0.228
Means of transportation	Public transportation (102, 34)	(70, 48.6)	(32, 20.5)	0.000**
	Car (153, 51)	(57, 39.6)	(96, 61.5)	0.000**
	Motorcycle (23, 7.7)	NA	(23, 14.7)	0.000**

	Bicycle no (300, 100)	(144, 100)	(156, 100)	NA
	Walking (38, 12.7)	(20, 13.9)	(18, 11.5)	0.541
	Others (12, 4)	(8, 5.6)	(4, 2.6)	0.187
Health insurance	(142, 46.8)	(62, 43.4)	(77, 50)	0.252
Diabetes duration	Less than 5 years (97, 32.30)	(52, 36.1)	(45, 28.8)	0.378
	5-10 years (100, 33.3)	(44, 30.6)	(56, 35.9)	
	At least 11 years (103, 34.3)	(48, 33.3)	(55, 35.3)	
Diabetes family history	(211, 70.3)	(104, 72.2)	(107, 68.6)	0.491
Previous information about diabetes from healthcare providers	(951, 83.6)	(11, 83.2)	(131, 84)	0.860
Trust in health care providers	(286, 95.3)	(138, 96.5)	(147, 94.2)	0.353
Medical visits prescribed by	(244, 81.3)	(119, 82.6)	(125, 80.1)	0.577

health care providers				
Availability of medication and therapy	(265, 88.3)	(132, 92.3)	(132, 84.6)	0.039**
Smoking status	No (123, 41)	(60, 41.7)	(63, 40.4)	0.825
	Yes (140, 46.7)	(68, 47.2)	(72, 46.2)	
	Quit smoking (37, 12.3)	(16, 11.1)	(21, 13.5)	

Note: Categorical variables were reported as frequency n and valid percentage
Population was stratified based on gender between females and males
For categorical variables (dichotomized), Chi square test was used.
For categorical variables (>2 groups), simple logistic regression test was used.
**Significant values $p<0.05$

Regarding the social determinants of health scores, the SDSCA mean score for the population was low [38.25 (SD 13.96)] compared to the maximum score of 77. Mean sQOL score was 83.057 (SD 11.981) and considered moderately high compared to 130, which is the maximum score. PHQ9 classifies depression as non-to minimal (0-4), mild (5-9), moderate (10-14), moderately severe (15-19), and severe (20-27) PHQ9. Thus, the population's median PHQ9 score [7 (IQ 10)] reflected mild depression with a significantly higher score for females [7 (IQ 8)] compared to males [5 (IQ 7)] ($p=0.003$). As for SDSCA subscales scores, they were considered average for diet [9 (IQ 8)] (maximum score 28), average for SMBG [7 (IQ 14)] (maximum score 14), poor for foot care [0 (IQ 1)], and average for medication and/or insulin therapy [7 (IQ 8)] (maximum score 14). In addition, SDSCA physical activity score was low [2(IQ 10)] with a significantly higher score for males [4 (IQ 12)] compared to females [0 (IQ 7)] ($p=0.004$). Additionally, total diabetes

fatalism score [43 (IQ 13)] was moderate (maximum score 77), with a moderately high score for the subscale religious coping [16 (IQ 4)] (maximum score 24), and moderate scores for the subscales emotional distress [15 (IQ 8)] (maximum score 30) and perceived self-efficacy [12 (IQ 2)] (maximum score 24). As for the participants' health literacy, it was considered moderately high [8 (IQ 4)] (maximum score 12), while diabetes knowledge was moderate [10 (IQ 4)] (maximum score 20). The participants reported having no adverse childhood experience [0 (IQ 4)] and the majority had a high to marginal food security (75.6%) (**Tables 2.a & 2.b).**

Table 2.a *Social Determinants of Health score: Continuous Variables*

Social Determinants of Health (Continuous Variables)				
	Total N=300	**Female n=144**	**Male n=156**	**P value**
Variables	**Mean ± SD**			
Subjective Diabetes Self-Care Activities (SDSCA)	36.17 ± 13.43	34.25 ± 11.32	37.55 ± 14.67	0.075
Quality Of Life Score (QOL)	81.18 ± 12.595	79.71 ± 11.66	82.25 ± 13.16	0.136
	Median (IQ)*			
Patient Health Questionnaire 9 (PHQ9)	6 (7)	7 (8)	5 (7)	0.003**
SDSCA Diet	15 (11)	15 (12)	15 (10.5)	0.874

SDSCA Physical Activity	2 (9.75)	0 (7)	4 (12)	0.004**
SDSCA SMBG	4 (9)	3 (8.75)	6 (9)	0.126
SDSCA Foot Care	0 (4)	0 (3.75)	0 (5)	0.520
SDSCA Medication and/or Insulin	7 (0)	7 (0)	7 (0)	0.665
Fatalism Total Score	47.5 (9)	47 (8)	48 (9.5)	0.406
Fatalism Emotional Distress	18 (5)	18 (5)	18 (5)	0.995
Fatalism Religious Coping	16 (3)	16 (2)	16 (4)	0.280
Fatalism Perceived Self-efficacy	12 (3)	12 (3)	12 (3)	0.269
Health Literacy	6 (4)	6 (4)	6 (4)	0.111
Diabetes Knowledge (DKQ)	10 (3)	10 (4)	10 (3)	0.536
Adverse Childhood Experience (ACE)	0 (1)	0 (1)	0 (2)	0.136

Note: Continuous variables that are normally distributed were reported as mean ± standard deviation (SD).
*Continuous skewed variables were reported as median and interquartile range (IQ).
Population was stratified based on gender between females and males
For continuous and normally distributed variables, independent t-test was used.
For continuous and non-normally distributed variables, Mann-Whitney was used.
**Significant values p<0.05

Table 2.b *Social Determinants of Health scores: Categorical Variables*

Social determinants of health (categorical)				
	Total N=300	**Female n=144**	**Male n=156**	**P value**
Variables	**(n, valid %)**			
Food Insecurity	High/Marginal Food security (226,75.6)	(101, 70.6)	(125, 80.1)	0.086
	Low Food security (50, 16.7)	(31, 21.7)	(19, 12.2)	
	Very Low Food security (23, 7.7)	(11, 7.7)	(12, 7.7)	

Note: Categorical variables were reported as frequency n and valid percentage
Population was stratified based on gender between females and males
For categorical variables (>2 groups), simple logistic regression test was used.
**Significant values p<0.05

Regarding anthropometrics of the population, there was a significant between-group difference for the variables: height (higher for males; p=0.00), weight (higher for males; p=0.00), and body mass index (higher for females; p=0.021). Mean waist circumference was almost the same for the population, females and males (103.259 ± 14.4, 103.738 ±

14.95, 102.815 ± 13.89, respectively) and was considered elevated as per the recommendations (women < 88 cm and men <102 cm) (Lean, Han & Morrison, 1995). Median A1C was considered borderline controlled in relation to diabetics' recommendations (A1C ≤ 7) (American Diabetes Association, 2020), whereby it was similar for the population 7 (IQ 2.10), females 7 (IQ 2.15) and males 7 (IQ 2.13). Median systolic blood pressure was considered borderline high and it was the same for the population, and both groups 130 (IQ 20). Last, BMI of the population 28.78 (IQ 6.02), females 29.49 (IQ 7.18) and males 28.37 (IQ 5.45) were all considered to be in the overweight category according to BMI recommendations (World Health Organization, 2000) (**Table 3)**.

Table 3 *Anthropometrics and other Characteristics: Continuous Variables*

Anthropometrics and other characteristics (Continuous Variables)				
	Total N=300	**Female n=144**	**Male n=156**	**P value**
Variables	**Mean ± SD**			
Height (cm)	166.663 ± 10.54	159.79 ± 8.15	173.33 ± 8.00	0.000**
Waist circumference (cm)	103.286 ± 14.54	103.738 ± 14.95	102.815 ± 13.89	0.582
Median (IQ)*				
Weight (kg)	81 (20)	75 (22)	85 (17)	0.000**
Systolic Blood Pressure (mm/Hg)	130 (20)	130 (20)	130 (20)	0.220

Body Mass Index (kg/m^2)	28.78 (6.02)	29.49 (7.18)	28.37 (5.45)	0.021**
Glycosylated Hemoglobin A1C (%)	7 (2.10)	7 (2.15)	7 (2.13)	0.389

Note: Continuous variables that are normally distributed were reported as mean ± standard deviation (SD).
*Continuous skewed variables were reported as median and interquartile range (IQ).
Population was stratified based on gender between females and males
For continuous and normally distributed variables, independent t-test was used.
For continuous and non-normally distributed variables, Mann-Whitney was used.
**Significant values $p<0.05$

After conducting bivariate analyses between the study variables and the three different cardiovascular disease (CVD) risk factors in our sample (BMI, waist circumference and systolic blood pressure), the strongest associations were found for waist circumference. Accordingly, the latter was set as the primary outcome of the study. Thus, we describe thereafter the bivariate analyses obtained between the independent variables and waist circumference.

There were significant associations ($p < 0.05$) between various demographic and the study's primary outcome. Waist circumference was lower among participants who had a generator subscription as a source of electricity ($p=0.025$), higher among those using public transportation ($p=0.038$), lower among those using a car for transportation ($p=0.058$), higher among people with diabetes family history ($p<0.001$), higher among current smokers ($p=0.038$), and lower among those renting their home ($p=0.034$). As for continuous demographic variables, a significant negative correlation was found between waist circumference and age ($p=0.044$), school year ($p=0.022$), work hours ($p<0.001$), and number of rooms ($p=0.001$). In addition, a significant positive correlation was found between waist circumference and weight ($p<0.001$), BMI ($p<0.001$), systolic blood pressure ($p=0.013$) and A1C ($p=0.021$). Finally, out of the social determinants of health a significant positive correlation was found between waist circumference and health literacy

score (p=0.006), while a significant negative correlation was found with adverse childhood experiences (ACE) score (p=0.024) (**Tables 4.a, 4.b, 4.c, 4.d & 4.e).**

Table 4.a *Bivariate analysis: Demographics (categorical, binary)*

Demographics (categorical, binary)				
Variables			**Mean ± SD**	**P value**
Sex		Female	103.738 ± 14.95	0.582
		Male	102.815 ± 13.89	
Source of electricity	Public	No	108.444 ± 9.26	0.273
		Yes	103.097 ± 14.51	
	Generator subscription	No	105.421 ± 12.90	0.025**
		Yes	101.644 ± 15.25	
	Other	No	103.206 ± 14.39	0.274
		Yes	119.000 ± NA	
Means of transportation	Public transportation	No	102.005 ± 14.08	0.038**
		Yes	105.657 ± 14.75	
	Car	No	104.870 ± 14.09	0.058
		Yes	101.702 ± 14.56	
	Motorcycle	No	103.113 ± 14.60	0.547
		Yes	105.000 ± 11.71	
	Bicycle	No	103.259 ± 14.39	
		Yes		

	Walking	No	103.548 ± 13.94	0.367
		Yes	101.289 ± 17.27	
	Other	No	103.171 ± 14.44	0.592
		Yes	105.545 ± 13.56	
Health insurance		No	104.516 ± 13.58	0.143
		Yes	102.054 ± 15.18	
Diabetes family history		No	98.382 ± 14.06	0.000**
		Yes	105.346 ± 14.05	
Previous information about diabetes from healthcare providers		No	101.347 ± 12.06	0.318
		Yes	103.599 ± 14.82	
Trust in health care providers		No	108.357 ± 12.20	0.172
		Yes	102.961 ± 14.47	
Medical visits prescribed by healthcare providers		No	103.093 ± 13.05	0.925
		Yes	103.296 ± 14.70	
Availability of medication and therapy necessary for your diabetes		No	105.382 ± 12.68	0.350
		Yes	102.924 ± 14.59	

Note: The dependent outcome variable is waist circumference.
Bivariate associations were performed between the dependent outcome (continuous) and each primary independent variable.
For Categorical binary variables, independent t-test was used.
**Significance value $p<0.05$

Table 4.b *Bivariate analysis: Demographics (categorical)*

Demographics (categorical)					
Variables		**N**	**Mean ± SD**	**P-value**	**Bonferroni**
Marital status	Single	32	98.063 ± 13.28	0.253	NA
	Married	216	103.924 ± 14.48		
	Divorced	18	105.889 ± 11.79		
	Widowed	28	102.625 ± 16.40		
	Separated	3	101.000 ± 5.56		
Employment	Employed	132	102.326 ± 13.47	0.471	NA
	Unemployed	122	104.066 ± 15.27		
	Unable to work due to health problems	4	96.000 ± 12.51		
	Fulltime homemaker, caregiver, parent	12	108.500 ± 13.19		
	Retired	27	102.926 ± 15.45		
Income	0	90	106.744 ± 13.04	0.273	NA
	0-499$	92	102.837 ± 12.74		

	500$ - 1499$	19	103.368 ± 18.77		
	1500$ - 2999$	11	105.091 ± 15.88		
Financial status	Comfortable; have more than enough to make ends meet	30	103.217 ± 16.62	0.286	NA
	Have enough to make ends meet	83	101.193 ± 17.73		
	Do not have enough to make ends meet	182	104.223 ± 14.33		
Home owning	Owned	99	106.212 ± 12.65	0.041**	
	Rented	190	101.705 ± 15.11		0.034**
	Other	8	103.625 ± 13.05		
Diabetes history	Less than 5 years	96	102.557 ± 14.77	0.139	
	5 – 10 years	98	105.571 ± 12.76		
	At least 11 years	103	101.714 ± 15.33		
Smoking status	No	122	101.918 ± 14.50	0.038**	NA
	Yes	138	104.779 ± 15.18		
	Quit smoking	37	102.014 ± 10.14		

Note: The dependent outcome variable is waist circumference
Bivariate associations were performed between the dependent outcome (continuous) and each primary independent variable.
For Categorical variables with more than 2 groups, one way anova test was used
**Significance value p<0.05

Table 4.c *Bivariate analysis: Demographics (continuous)*

Demographics (continuous)			
	N	**Pearson correlation**	**P value**
Age	297	-0.117	0.044**
School years	294	-0.134	0.022**
Work hours	192	-0.259	0.000**
Family size	297	-0.050	0.388
Financial dependence	290	0.049	0.402
Number of persons per bedroom	297	0.050	0.389
Number of rooms	295	-0.188	0.001**
Number of house facilities	300	-0.030	0.611
Number of diabetes complications	300	0.089	0.127

The dependent outcome variable is waist circumference.
Bivariate associations were performed between the dependent outcome (continuous) and each primary independent variable.
For continuous variables, Pearson correlation test was used
**Significant value p<0.05

Table 4.d *Bivariate analysis: Social Determinants of Health scores (continuous variables)*

Social determinants of health (continuous)			
	N	**Pearson correlation**	**p value**
Quality of Life (QOL)	246	0.042	0.517
Subjective Diabetes Self-Care Activities (SDSCA)	293	0.084	0.152
SDSCA diet	296	0.041	0.480
SDSCA Physical activity	296	0.075	0.196
SDSCA SMBG	296	0.038	0.510
SDSCA Foot Care	296	-0.020	0.736
SDSCA Medication and/or Insulin therapy	293	0.040	0.491
Emotional distress	295	-0.031	0.595
Religious coping	295	0.015	0.803
Perceived self-efficacy	296	-0.056	0.337
Fatalism score	292	-0.008	0.893
Patient Health Questionnaire (PHQ9)	293	-0.045	0.440
Diabetes Knowledge Questionnaire (DKQ) score	297	-0.055	0.341
Health literacy	296	0.159	0.006**
Adverse Childhood Experience (ACE) score	291	-0.132	0.024**
Note: The dependent outcome variable is waist circumference. Bivariate associations were performed between the dependent outcome (continuous) and each primary independent variable.			

For continuous variables, Pearson correlation test was used **Significance value p<0.05

Table 4.e *Bivariate analysis: anthropometric and other characteristics (continuous variables)*

Vital signs (continuous)			
	N	**Pearson correlation**	**p value**
Weight	295	0.544	0.000**
Height	294	-0.078	0.184
BMI (Body Mass Index)	294	0.665	0.000**
SYSBP (Systolic Blood Pressure)	290	0.145	0.013**
A1C (Glycosylated Hemoglobin)	284	0.137	0.021**
Note: The dependent outcome variable is waist circumference. Bivariate associations were performed between the dependent outcome (continuous) and each primary independent variable. For continuous variables, Pearson correlation test was used **Significant value p<0.05			

After bivariate analysis, all associations with a significance <0.2 were included in a multivariate analysis, using stepwise multiple linear regression (**table 5**). The variables inserted were the following: age, school, work hours, room number, home owning, source of electricity (generator subscription), means of transportation (public transportation, car), health insurance, diabetes family history, trust in health care provider, diabetes history, number of diabetes complications, smoking, weight, height, BMI, SYSBP, A1C, SDSCA score, SDSCA physical activity, health literacy and ACE score. Results showed that BMI (p=0.00, β=0.594), A1C (p=0.021, β=0.135), work hours (p=0.002, β= -0.187) and

diabetes family history (p=0.039, β=0.121) were significantly associated with waist circumference, whereby BMI and work hours showed the strongest associations. For every 1-unit increase in BMI (kg/m^2) and A1C (%), waist circumference increased by 0.594 and 0.135, respectively. Also having diabetes family history increased waist circumference by 0.121. As for work hours, for every 1 hour increase, waist circumference decreased by 0.187. The model had an R^2 of 0.45 thus BMI, A1C, work hours and diabetes family history explained 45% of the variation in the outcome (waist circumference).

Table 5 *Stepwise Multiple Linear Regression*

Variables	**Standardized coefficient β**	**P value**	**Adjusted R square**
BMI (Body Mass Index)	0.594	0.00**	0.45
A1C (Glycosylated Hemoglobin)	0.135	0.021**	
Work hours	-0.187	0.002**	
Diabetes family history	0.121	0.039**	
Note: The dependent outcome variable is waist circumference. Stepwise multiple linear regression was performed between the dependent outcome (continuous) and each primary independent variable with a p-value <0.2 in the bivariate analysis. **Significance value p<0.05			

Table 6 and Figure 3 represent the significant pathways for waist circumference through Hemoglobin A1C. ACE score and age had direct negative effects on waist circumference (β = -.12 and -.019, respectively), whereas diabetes history had a direct positive effect on the latter which in turn predicted waist circumference. Health literacy had a direct positive effect on waist circumference (β = .81) not through Hemoglobin A1C. The link between ACE score, diabetes history, age and smoking status was partially mediated by hemoglobin A1C. The full model provided an acceptable fit to the data: $\chi 2$= 8.30 with p= 0.1405, CFI = .94 and RMSEA = .049 with PCLOSE of .44.

Table 6 *Standardized Coefficients for Pathways in Causal Model of Waist Circumference through Hemoglobin A1C*

Pathway-Waist Circumference through Hemoglobin A1C (N=278)	**β**
Hemoglobin A1C-Waist Circumference	1.23*
ACE Score-Hemoglobin A1C	-.12**
Diabetes History-Hemoglobin A1C	.62**
Age-Hemoglobin A1C	-.02**
Smoking Status-Hemoglobin A1C	.2
Health literacy-Waist Circumference	.81*
Note: * p < .05, **p < .01	

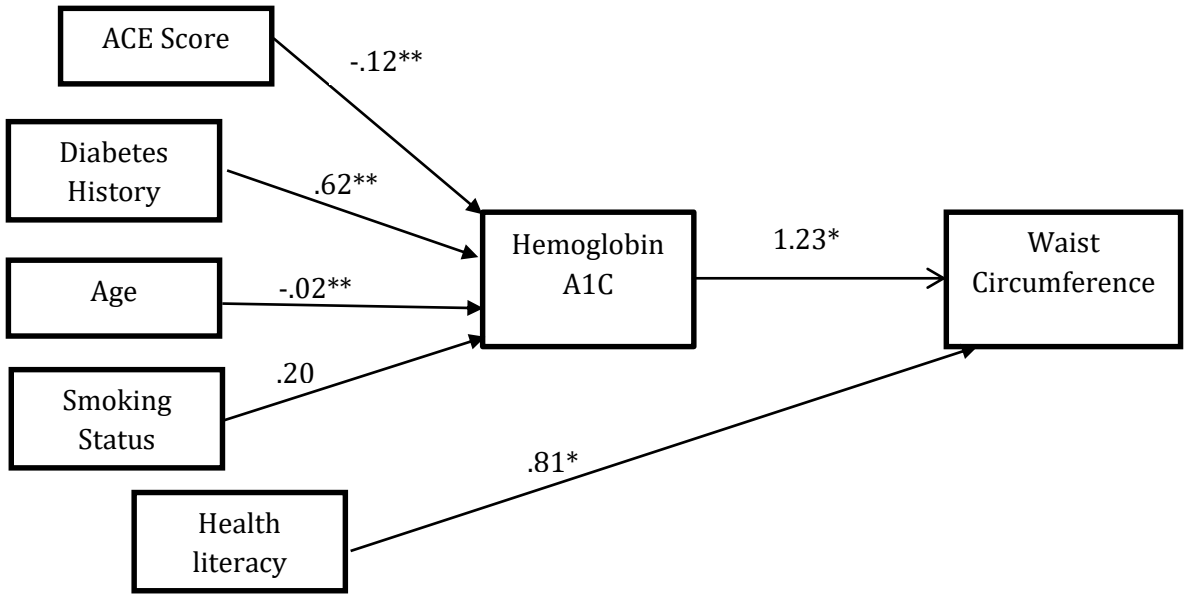

Figure 3: Structural model with standardized path coefficients of Waist Circumference via Hemoglobin A1C *$p < .05$. **$p < .01$.

Chapter 8

Discussion

Social determinants of health are defined as the culturally specific conditions where individuals are born, sustain a life, work, and grow older. With time, their relationship with type 2 diabetes (T2DM) incidence and management is becoming recognized, in addition to the biological and lifestyle risk factors like diet and physical activity (Hill, Nielsen, & Fox, 2013). In the current study, we investigated social determinants of health (SDHs) in Lebanese adults with T2DM and their links with waist circumference as a marker of cardio-metabolic risk factors. These SDHs included socio demographic characteristics such as age, gender, income, education, household facilities, and diabetes family history, history of diabetes, access and trust in health care, diabetes complications and smoking status. Also, quality of life (QOL), depression (PHQ9), food insecurity, diabetes knowledge questionnaire (DKQ), adverse childhood experience (ACE), fatalism score and its subscales (emotional distress, religious and spiritual coping, and perceived self-efficacy), diabetes self-care activities (SDSCA) and its subscales (diet, physical activity, SMBG, foot care and medication/insulin therapy) were assessed.

Although other cardiovascular risk factors (BMI and blood pressure) were collected in the present study, waist circumference was selected as the primary outcome, since it showed the strongest associations with the independent variables. Indeed, abdominal obesity is known to be a risk factor for cardio-metabolic diseases such as hypertension, diabetes, and coronary heart disease. It is well established that a waist circumference higher than 102 cm and 88 cm for men and women, respectively, is directly and highly linked to cardio-metabolic diseases development. (Klein, Allison, Heymsfield, Kelley, Leibel, Nonas & Kahn, 2007). The latter is also observed in patients with T2DM. (Xing et al., 2020). In a post hoc analysis of the ACCORD (Action to Control Cardiovascular Risk in Diabetes) study the effect of waist circumference in the development of cardiovascular (CVD) events was investigated in 6299 men and 3522 women with type 2 diabetes. After

9 years of follow up, 1804 patients developed major adverse cardiovascular events, whereby for each 1 standard deviation (SD) increase in waist circumference, the hazard ratio (HR) risk of major adverse cardiovascular events increased by 1.10 in men ($P<0.01$). (Xing et al., 2020).

Results in the present study showed an inverse relationship between age and waist circumference, such that the higher the age the lower the waist circumference. Conversely, according to the World Health Organization (WHO) both waist-to-hip ratio and waist circumference increase with age in healthy adults. (Stevens, Katz & Huxley, 2010). Similarly, patients with type 2 diabetes with higher age are known to become at a higher risk of developing cardiovascular diseases. According to the American Heart Association, 68% of people aged 65 or older having type 2 diabetes die from certain heart diseases and around 16% die from stroke (Cardiovascular Disease and Diabetes, 2020), whereas patients aging less than 40 years with a short period of time being diagnosed with type 2 diabetes are considered to be in lowest risk group for development of cardiovascular diseases. (Bertoluci & Rocha, 2017). Furthermore, a large retrospective cohort study including 379,003 patients with type 2 diabetes investigated the role of age as a transition factor from moderate to high risk for development of cardiovascular diseases. Results showed that transitioning from low to moderate risk occurred at 35-45 years for both men and women respectively, meaning that men should be at an age lower than 35 years and women lower than 45 years to have a 10 years lower risk of developing cardiovascular diseases. (Bertoluci & Rocha, 2017). The reason behind the discrepancy in our results could be related to the fact that older individuals with T2DM are at increased cardiovascular risk due to a mechanism different than increased waist circumference. Another explanation could be related to the cultural difference in our population, whereby patients with diabetes tend to improve their self-care with age. Indeed, this was observed in a study by Sukkarieh-Haraty et al. (2019), in which older Lebanese people with T2DM had a better glycemic control compared to younger ones. (Sukkarieh-Haraty, Egede, Abi Kharma & Bassil, 2019).

In addition, a significant negative association was obtained between waist circumference and a cluster of variables reflecting socioeconomic status, namely number of rooms in the household, school years, work hours and home owning. This was in line with Yoon et al.,

that examined BMI and waist circumference in relation to the level of income and level of education in the 1998 Korean National Health And Nutrition Examination Survey on 3597 men and 4365 women. Results showed an inverse trend in women between obesity, including abdominal obesity and the level of education. For women with 7 to 12 years of schooling ORs were 0.66 for obesity and 0.40 for abdominal obesity compared to 0.27 and 0.15 in women with 13 years or more of schooling respectively. (Yoon, Oh, & Park, 2006).

Moreover, family history of diabetes was found to be positively associated with waist circumference in our study. Consistently, a large cohort of 8749 middle-aged non-diabetic men from the "Metabolic Syndrome In Men (METSIM)" study examined the relation between diabetes risk (defined as family history of first-degree or second-degree relatives) with diabetes and the distribution of body fat. Results showed that people that were initially diagnosed with diabetes were significantly obese compared to those without diabetes. In addition, it was also shown that individuals without diabetes at baseline with first-degree relatives having diabetes had significantly higher waist circumference ($p<0.001$) compared to those with second-degree relatives having diabetes (Cederberg, Stančáková, Kuusisto, Laakso, & Smith, 2015).

Regarding smoking status, it had a significant positive association with waist circumference. An observational study including 283 participants examined the relationship between obesity and different types of body fatness with cigarette smoking. Results showed a significant dose-dependent association between smoking packs-year and visceral and abdominal obesity ($p<0.001$) such that the more the packs smoked per year the higher the visceral and the abdominal obesity (Kim, Shim, Yoon, Lee, Kim & Oh, 2012). The mechanism behind cigarette smoking causing an increase in body fatness could be due to heightening the activity of lipoprotein lipase of gluteal adipose tissue, which will lead to an upregulation in the uptake and storage of triglycerides by the adipose tissues and therefore an increase in body fatness takes place. Another possible mechanism is related to cigarette smoking having an anti-estrogenic effect by increasing 2-hydroxylation of estradiol and thus leading to an imbalance in the work of estrogen in both men and women, which will increase body fatness. (Canoy et al., 2005).

Regarding BMI, it had a significantly positive association with waist circumference in the present study, which shows that obesity in our sample was mostly abdominal in nature. in line with the literature (Adegbija, Hoy & Wang, 2015). It has been suggested that there is a link between abdominal obesity, development of insulin resistance and diabetes. The mechanism behind it is partly related to the release of free fatty acids into the portal vein, which in turn will be affecting and decreasing the hepatic clearance of insulin leading to high insulin levels or hyperinsulinemia that is a precursor to type 2 diabetes. (Despres, 2006).

Moreover, a significant positive association was obtained between systolic blood pressure, and waist circumference. This is in line with a study by Dalvand et al., (2015), whereby having high systolic and diastolic blood pressure ($p=0.001$) and being diabetic ($p=0.001$) were significant predictors of elevated waist circumference and obesity. (Dalvand et al., 2015). Similarly, a cross sectional survey conducted on 5,042 Jamaican men and women showed that waist circumference was significantly related to both blood pressure and type 2 diabetes ($p<0.05$). Also, an increase in waist circumference quartiles was linked to higher risk of blood pressure on one hand and a 10-fold increased risk of type 2 diabetes in men on another hand. (Okosun, Cooper, Rotimi, Osotimehin & Forrester, 1998). It is well established that the three disorders co-occur in the metabolic syndrome and share common underlying mechanisms. In a prospective cohort, 10-year follow up study in Taiwan, predictors of incidence of both type 2 diabetes and metabolic syndrome were examined. A total of 3629 were included in the study out of which 7.8% developed type 2 diabetes and 24.2% developed metabolic syndrome after 10 years of follow up. After adjusting for all covariable factors, results showed that high triglyceride levels and greater waist circumference measurements were found to be independent risk factors in men predicting incidence of both type 2 diabetes and metabolic syndrome. (Sheu, Chuang, Lee, Tsai, Chou & Chen, 2006).

Regarding social determinants of health, a significantly positive association was found between health literacy and waist circumference. Contrary to our results, a study conducted among Korean immigrants found an inverse association between type 2 diabetes risk and health literacy. Moreover, good health literacy was negatively correlated with both low waist-to-hip ratios ($p<0.05$) and low blood glucose levels ($p<0.001$). (Choi,

Rush & Henry, 2013). We suggest that the discrepancy in our results could be cultural in nature and could be due to a reverse causation; meaning that the higher the waist circumference and the risk of chronic diseases, the more the person is compelled to be health literate to be able to better manage their diseases.

As for adverse childhood experience (ACE), a significant negative association was found with waist circumference. This finding should be interpreted with caution due a potential response bias, given that this scale included sensitive questions related to childhood abuse and violence, which are considered taboo topics in Arab countries. (Haboush & Alyan, 2013). ACE is usually associated with increased risk of chronic diseases later in life. The underlying mechanism is related to releasing glucocorticoids as a response to acute stressors leading to improved short-term immunity but maladaptive long term damages to brain areas (hippocampus, amygdala and prefrontal cortex) with high concentrations of receptors to glucocorticoids. These changes will lead to a stable state of pro-inflammation damaging arterial circulation, an altered glucocorticoid metabolism and insulin resistance which will eventually progress into cardio-metabolic diseases development. (Basu, McLaughlin, Misra & Koenen, 2017).

Following stepwise multivariate analyses, the only predictors of waist circumference were body mass index (β=0.594), A1C (β=0.135), work hours (β= -0.187) and diabetes family history (β=0.121). The model was a robust one as it explained 45% of the variation in waist circumference.

In line with these findings, a cross-sectional study on 3,068 men and women with type 2 diabetes examined whether parenteral history of diabetes would affect the relationship between hyperglycemia and abdominal obesity. Results showed that the association between abdominal obesity and high levels of plasma glucose were significantly greater in participants having parenteral family history of diabetes compared to those without the same history (p=0.002). To add, waist circumference measure were also found to be greater in participants with parenteral family history of diabetes compared to those without (p=0.05). (van Dam, Boer, Feskens & Seidell, 2001).

Working for long hours was another predictor of waist circumference in our population and it was inversely associated with it. Conversely, according to the Korea National Health and Nutrition Examination Survey (NKHANES), a significant positive association

was found between long work hours and both 10-year risk of CHD and stroke in non-diabetic women (p=0.01). The odds ratio for women who worked 50-60 h/week was 1.49 compared to 2.32 in women who worked >80h/week. (Lee, Hong, Min, Kim, Kim & Kang, 2016). Such finding might not be reproduced in a population with T2DM, as it is the case in the present study.

Furthermore, BMI and A1C levels independently and positively predicted our outcome meaning that the higher the BMI and the worse the diabetes control, the higher the cardiovascular risk.

Our path analyses revealed significant indirect associations between the outcome, waist circumference, and the following variables: ACE score (β= -0.12, $p<0.01$), diabetes family history (β= 0.62, $p<0.01$) and age (β= -0.019, $p<0.01$). These latter associations with the outcome were all mediated through A1C (β= 1.23, $p<0.05$) unlike health literacy (β= 0.812, $p<0.05$) that was significantly and directly associated with waist circumference.

Taken together, these results suggest that most factors increase the risk of cardiovascular diseases in Lebanese people with T2DM by worsening HbA1C, which is consistent with previous reports. For instance, a study by Dizdarevic-Bostandzic et al., on 110 participants compared cardiovascular risk factors between poorly controlled and well controlled patients with type 2 diabetes. Results showed that the majority of patients with poorly controlled type 2 diabetes belong to the high to very high group of cardiovascular risk while those having a well-controlled type 2 diabetes belong to the low to medium cardiovascular risk group (p=0.05). It was also found that obesity, positive family history of diabetes, systolic and diastolic blood pressure was significantly higher among patients with poorly controlled type 2 diabetes. (Dizdarevic-Bostandzic et al., 2018).

Thus, any intervention (addressing SDHs or other variables) aiming at reducing cardiovascular risk in T2DM should include an improvement to the glycemic control.

As for health literacy, our path analysis finding confirms our bivariate correlation and shows that having a more health literate Lebanese patient with T2DM does not necessarily mean he/she is a healthier one. Indeed, it has been reported in Arab populations with diabetes that diabetes related knowledge does not always translate into a healthy practice (Abougalambou et al., 2019)

To our knowledge, no prior study was conducted to examine social determinants of health in Lebanese patients with type 2 diabetes. Our study is the first one of its kind in providing preliminary data on social determinants of health in Lebanon and their interaction with cardiovascular risk in T2DM, therefore providing more knowledge on future effective management strategies and treatments for the latter issue. A large sample size (n=300) was interviewed using validated questionnaires to collect data needed. Registered nurses and a research team of trained individuals collected anthropometrics measurements, blood pressure and A1C.

Limitations in our study included the cross-sectional study design not permitting for the establishment of a cause-effect relationship between variables. Also, our convenience sample was collected from certain primary care centers in selected areas in Lebanon thus not allowing for generalization of our results. Interviewer bias is another limitation in our study since questionnaires were filled by investigators asking the questions and not by participants. In addition, response bias might be present since some questionnaires included sensitive questions preventing participants from giving accurate answers. Finally, our questionnaires were considered to be lengthy taking around 20 minutes to be filled, so some older adult participants were fatigued by the end of the questionnaire, which might have affected their answers.

Finally, our study has several implications for practice for healthcare professionals. First, it sheds the light on the importance of tackling social determinants of health in general and health literacy in specific. Knowledge-based diabetes education should not be the approach during DSME ,especially to decrease the risk of cardiovascular diseases. Education may include experiential learning so that patients acquire hands-on skills to improve their self-care and ameliorate their CVD risk.. Second, interventions aiming to reduce cardiovascular diseases risk in T2DM Lebanese patients should include targeting glycemic control (A1C). Lastly, any intervention should be interdisciplinary in nature, involving all members of the health care team. For the role of the dietitians, it should focus on behavior modification techniques to foster and maintain healthy eating habits and physical activity. In line with the study findings, it should incorporate hands-on practice like live cooking and exercise sessions needed for better diabetes control and lower CVD risk.

Chapter 9

Conclusion and Future Recommendations

In conclusion, our study is the first study shedding lights on the importance of studying causal pathways, upstream and downstream factors affecting T2DM and its cardio-metabolic risk factors in Lebanon. The social determinants of health along with other risk factors (direct and indirect) studied were found to be interlinked forming a clear path, which helps in setting novel diabetes management and preventive strategies. This would not only facilitate addressing direct causes of the disease but also helps in formulating population-based policies to better tackle it. Further research must investigate other SDHs, target modifiable risk factors, stress on disease management education, and focus on policy making in targeting SDHs.

References

Abougalambou, S. S. I., AbaAlkhail, H., & Abougalambou, A. S. (2019). The knowledge, attitude and practice among diabetic patient in central region of Saudi Arabia. Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 13(5), 2975-2981.

Adegbija, O., Hoy, W., & Wang, Z. (2015). Predicting absolute risk of type 2 diabetes using age and waist circumference values in an aboriginal Australian community. PloS one, 10(4), e0123788.

Al Sayah, F., Majumdar, S. R., Egede, L. E., & Johnson, J. A. (2015). Associations between health literacy and health outcomes in a predominantly low-income African American population with type 2 diabetes. Journal of Health Communication, 20(5), 581-588.

American Diabetes Association. (2020). Understanding A1C. Retrieved from https://www.diabetes.org/a1c

Anderson, R. J., Freedland, K. E., Clouse, R. E., & Lustman, P. J. (2001). The prevalence of comorbid depression in adults with diabetes: a meta-analysis. Diabetes care, 24(6), 1069-1078.

Ashur, S. T., S. A. Shah, S. Bosseri, T. S. Fah, and K. Shamsuddin. 2016. “Glycaemic Control Status among Type 2 Diabetic Patients and the Role of Their Diabetes Coping Behaviours: A Clinicbased Study in Tripoli, Libya.” Libyan Journal of Medicine 11 (1): 1–9.

Basu, A., McLaughlin, K. A., Misra, S., & Koenen, K. C. (2017). Childhood maltreatment and health impact: the examples of cardiovascular disease and type 2 diabetes mellitus in adults. Clinical psychology: science and practice, 24(2), 125-139.

Berardi, V., Bellettiere, J., Nativ, O., Ladislav, S., Hovell, M. F., & Baron-Epel, O. (2016). Fatalism, diabetes management outcomes, and the role of religiosity. Journal of religion and health, 55(2), 602-617.

Bertoluci, M. C., & Rocha, V. Z. (2017). Cardiovascular risk assessment in patients with diabetes. Diabetology & metabolic syndrome, 9(1), 25. ISO 690

Bickel, G., Nord, M., Price, C., Hamilton, W., & Cook, J. (2000). Guide to measuring household food security.

Bierman AS, Dunn JR. Swimming upstream: access, health outcomes, and the social determinants of health. J Gen Internal Med 2006;21(1)99-100.

Bonnefoy, J., Morgan, A., Kelly, M. P., Butt, J., & Bergman, V. (2007). Constructing the evidence base on the social determinants of health: a guide. Measurement and Evidence Knowledge Network (MEKN).

Bravemen PA, Egeter SA, Woolf SH, Marks JS. When do we know enough to recommend action on the social determinants of health? Am J Prev Med. 2011;40(1 Suppl 1):S58-66.

Brown, L. C., Majumdar, S. R., Newman, S. C., & Johnson, J. A. (2005). History of depression increases risk of type 2 diabetes in younger adults. Diabetes care, 28(5), 1063-1067.

Campbell, J. A., Farmer, G. C., Nguyen-Rodriguez, S., Walker, R., & Egede, L. (2018). Relationship between individual categories of adverse childhood experience and diabetes in adulthood in a sample of US adults: Does it differ by gender?. Journal of diabetes and its complications, 32(2), 139-143.

Canoy, D., Wareham, N., Luben, R., Welch, A., Bingham, S., Day, N., & Khaw, K. T. (2005). Cigarette Smoking and Fat Distribution in 21, 828 British Men and Women: A Population- based Study. Obesity research, 13(8), 1466-1475. ISO 690

Cardiovascular Disease and Diabetes. (n.d.). Retrieved July 27, 2020, from https://www.heart.org/en/health-topics/diabetes/why-diabetes-matters/cardiovascular-disease--diabetes

Cederberg, H., Stančáková, A., Kuusisto, J., Laakso, M., & Smith, U. (2015). Family history of type 2 diabetes increases the risk of both obesity and its complications: is type 2 diabetes a disease of inappropriate lipid storage?. Journal of internal medicine, 277(5), 540-551.

Center for Disease Control (2018). Social Determinants of health https://www.cdc.gov/socialdeterminants/index.htm

Chew, L. D., Griffin, J. M., Partin, M. R., Noorbaloochi, S., Grill, J. P., Snyder, A., . . . VanRyn, M. (2008). Validation of Screening Questions for Limited Health Literacy in a Large VA Outpatient Population. Journal of General Internal Medicine, 23(5), 561-566. doi: 10.1007/s11606-008-0520-5

Choi, S. E., Rush, E., & Henry, S. (2013). Health literacy in Korean immigrants at risk for type 2 diabetes. Journal of immigrant and minority health, 15(3), 553-559.

Clark, M. L., & Utz, S. W. (2014). Social determinants of type 2 diabetes and health in the United States. World journal of diabetes, 5(3), 296.

Connolly, V. M., & Kesson, C. M. (1996). Socioeconomic status and clustering of cardiovascular disease risk factors in diabetic patients. Diabetes care, 19(5), 419-422.

Dalvand, S., Koohpayehzadeh, J., Karimlou, M., Asgari, F., Rafei, A., Seifi, B., ... & Bakhshi, E. (2015). Assessing factors related to waist circumference and obesity: Application of a latent variable model. Journal of environmental and public health, 2015.

De Visser, C. L., Bilo, H. J. G., Groenier, K. H., De Visser, W., & Meyboom-de Jong, B. (2002). The influence of cardiovascular disease on quality of life in type 2 diabetics. Quality of Life Research, 11(3), 249-261.

Despres, J. P. (2006). Intra-abdominal obesity: an untreated risk factor for Type 2 diabetes and cardiovascular disease. Journal of endocrinological investigation, 29(3), 77.

DeWalt, D. A., Berkman, N. D., Sheridan, S., Lohr, K. N., & Pignone, M. P. (2004). Literacy and health outcomes. Journal of general internal medicine, 19(12), 1228-1239.

Dizdarevic-Bostandzic, A., Begovic, E., Burekovic, A., Velija-Asimi, Z., Godinjak, A., & Karlovic, V. (2018). Cardiovascular risk factors in patients with poorly controlled diabetes mellitus. Medical Archives, 72(1), 13. ISO 690

Donnelly, T. T., Al Suwaidi, J. M., Al-Qahtani, A., Asaad, N., Qader, N. A., Singh, R., ... & Omar, S. (2015). Depression in Cardiovascular Patients in Middle Eastern Populations: A Literature Review. Journal of immigrant and minority health, 17(4), 1259-1276. ISO 690

Egede, L. E., Zheng, D., & Simpson, K. (2002). Comorbid depression is associated with increased health care use and expenditures in individuals with diabetes. Diabetes care, 25(3), 464-470.

Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., & Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. American journal of preventive medicine, 14(4), 245-258.

Ferguson, M. O., Long, J. A., Zhu, J., Small, D. S., Lawson, B., Glick, H. A., & Schapira, M. M. (2015). Low health literacy predicts misperceptions of diabetes control in patients with persistently elevated A1C. The Diabetes Educator, 41(3), 309-319.

Funnell, M. M., Brown, T. L., Childs, B. P., Haas, L. B., Hosey, G. M., Jensen, B., ... & Siminerio, L. M. (2009). National standards for diabetes self-management education. Diabetes care, 32(Supplement 1), S87-S94.

Garcia, A. A., Villagomez, E. T., Brown, S. A., Kouzekanani, K., & Hanis, C. L. (2001). The Starr County Diabetes Education Study: development of the Spanish-language diabetes knowledge questionnaire. Diabetes care, 24(1), 16-21.

Ghassibe-Sabbagh, M., Deeb, M., Salloum, A. K., Mouzaya, F., Haber, M., Al-Sarraj, Y., ... & Ahdab, R. (2014). Multivariate epidemiologic analysis of type 2 diabetes mellitus risks in the Lebanese population. Diabetology & metabolic syndrome, 6(1), 89.

Ghattas, H., Barbour, J. M., Nord, M., Zurayk, R., & Sahyoun, N. R. (2013). Household Food Security Is Associated with Agricultural Livelihoods and Diet Quality in a Marginalized Community of Rural Bedouins in Lebanon–. The Journal of nutrition, 143(10), 1666-1671.

Global Nutrition Report- 2018 Nutrition Country Profile: Lebanon

Haboush, K. L., & Alyan, H. (2013). "Who can you tell?" Features of Arab culture that influence conceptualization and treatment of childhood sexual abuse. Journal of child sexual abuse, 22(5), 499-518.

Heller, R. F. (2005). Evidence for population health. Oxford University Press, USA.

Hill-Briggs, F. (2019). The American Diabetes Association in the era of health care transformation. Diabetes Spectrum, 32(1), 61-68.

Hill, J., Nielsen, M., & Fox, M. H. (2013). Understanding the social factors that contribute to diabetes: a means to informing health care and social policies for the chronically ill. The Permanente Journal, 17(2), 67. ISO 690

Hirbli, K. I., Jambeine, M. A., Slim, H. B., Barakat, W. M., Habis, R. J., & Francis, Z. M. (2005). Prevalence of diabetes in greater Beirut. Diabetes care, 28(5), 1262-1262.

Huang, H., Yan, P., Shan, Z., Chen, S., Li, M., Luo, C., ... & Liu, L. (2015). Adverse childhood experiences and risk of type 2 diabetes: A systematic review and meta-analysis. Metabolism, 64(11), 1408-1418.

International Diabetes Federation. IDF Diabetes Atlas, 8th edn. Brussels, Belgium: International Diabetes Federation, 2017. http://www.diabetesatlas.org

International Diabetes Federation. IDF Diabetes Atlas, 9th edn. Brussels, Belgium: International Diabetes Federation, 2019. https://www.diabetesatlas.org/en/

Jaffiol, C., Thomas, F., Bean, K., Jégo, B., & Danchin, N. (2013). Impact of socioeconomic status on diabetes and cardiovascular risk factors: results of a large French survey. Diabetes & metabolism, 39(1), 56-62. Chicago

Jomaa, L., Naja, F., Cheaib, R., & Hwalla, N. (2017). Household food insecurity is associated with a higher burden of obesity and risk of dietary inadequacies among mothers in Beirut, Lebanon. BMC public health, 17(1), 1-14. ISO 690

Kaplan, G. A. (2006). Social Determinants of Health, M Marmot and R Wilkinson (eds). Oxford: Oxford University Press, 2006, pp. 376, $57.50. ISBN: 9780198565895.

Katon, W. J., Lin, E. H., Russo, J., Von Korff, M., Ciechanowski, P., Simon, G., ... & Young, B. (2004). Cardiac risk factors in patients with diabetes mellitus and major depression. Journal of general internal medicine, 19(12), 1192-1199.

Kim, J. H., Shim, K. W., Yoon, Y. S., Lee, S. Y., Kim, S. S., & Oh, S. W. (2012). Cigarette smoking increases abdominal and visceral obesity but not overall fatness: an observational study. PloS one, 7(9), e45815.

Klein, S., Allison, D., Heymsfield, S., Kelley, D., Leibel, R., Nonas, C., & Kahn, R. (2007, June 01). Waist Circumference and Cardiometabolic Risk. Retrieved July 18, 2020, from https://care.diabetesjournals.org/content/30/6/1647

Kroenke K, Spitzer RL, Williams JB. (2001) The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 16:606-613

Lean, M. E. J., Han, T. S., & Morrison, C. E. (1995). Waist circumference as a measure for indicating need for weight management. Bmj, 311(6998), 158-161.

Lee, D. W., Hong, Y. C., Min, K. B., Kim, T. S., Kim, M. S., & Kang, M. Y. (2016). The effect of long working hours on 10-year risk of coronary heart disease and stroke in the Korean population: the Korea National Health and Nutrition Examination Survey (KNHANES), 2007 to 2013. Annals of occupational and environmental medicine, 28(1), 64. ISO 690

Liburd, L. C., Jack Jr, L., Williams, S., & Tucker, P. (2005). Intervening on the social determinants of cardiovascular disease and diabetes. American journal of preventive medicine, 29(5), 18-24.

Logan, A. G., Irvine, M. J., McIsaac, W. J., Tisler, A., Rossos, P. G., Easty, A., ... & Cafazzo, J. A. (2012). Effect of home blood pressure telemonitoring with self-care support on uncontrolled systolic hypertension in diabetics. Hypertension, 60(1), 51-57.

Mahmoodi, M. R., Najafipour, H., Mohsenpour, M. A., & Amiri, M. (2017). The relationship between food insecurity with cardiovascular risk markers and metabolic syndrome components in patients with diabetes: A population-based study from Kerman coronary artery disease risk study. Journal of research in medical sciences: the official journal of Isfahan University of Medical Sciences, 22.

Mayberry, L. S., Egede, L. E., Wagner, J. A., & Osborn, C. Y. (2015). Stress, depression and medication nonadherence in diabetes: Test of the exacerbating and buffering effects of family support. Journal of Behavioral Medicine, 38(2), 363–371.

Murphy, A., Steele, M., Dube, S. R., Bate, J., Bonuck, K., Meissner, P., ... & Steele, H. (2014). Adverse childhood experiences (ACEs) questionnaire and adult attachment interview (AAI): Implications for parent child relationships. Child abuse & neglect, 38(2), 224-233.

Norris, S. L., Lau, J., Smith, S. J., Schmid, C. H., & Engelgau, M. M. (2002). Self-management education for adults with type 2 diabetes: a meta-analysis of the effect on glycemic control. Diabetes care, 25(7), 1159-1171.

Ohaeri, J. U., & Awadalla, A. W. (2009). The reliability and validity of the short version of the WHO Quality of Life Instrument in an Arab general population. Annals of Saudi Medicine, 29(2), 98-104. doi: 10.4103/0256-4947.51790

Okosun, I. S., Cooper, R. S., Rotimi, C. N., Osotimehin, B., & Forrester, T. (1998). Association of waist circumference with risk of hypertension and type 2 diabetes in Nigerians, Jamaicans, and African-Americans. Diabetes care, 21(11), 1836-1842.

Osborn, C. Y., Cavanaugh, K., Wallston, K. A., & Rothman, R. L. (2010). Self-efficacy links health literacy and numeracy to glycemic control. Journal of health communication, 15(S2), 146-158.

Osborn, C. Y., Cavanaugh, K., Wallston, K. A., Kripalani, S., Elasy, T. A., Rothman, R. L., & White, R. O. (2011). Health literacy explains racial disparities in diabetes medication adherence. Journal of health communication, 16(sup3), 268-278

Pereira, M. G., Berg-Cross, L., Almeida, P., & Machado, J. C. (2008). Impact of family environment and support on adherence, metabolic control, and quality of life in adolescents with diabetes. International journal of behavioral medicine, 15(3), 187-193.

Rubin, R. R., & Peyrot, M. (1999). Quality of life and diabetes. Diabetes/metabolism research and reviews, 15(3), 205-218.

Sahyoun, N. R., Nord, M., Sassine, A. J., Seyfert, K., Hwalla, N., & Ghattas, H. (2014). Development and validation of an Arab family food security scale. The Journal of nutrition, 144(5), 751-757.

Sawaya, H., Atoui, M., Hamadeh, A., Zeinoun, P., & Nahas, Z. (2016). Adaptation and initial validation of the Patient Health Questionnaire - 9 (PHQ-9) and the Generalized Anxiety Disorder - 7 Questionnaire (GAD-7) in an Arabic speaking Lebanese psychiatric outpatient sample. [Research Support, Non-U S Gov't Validation Studies]. Psychiatry Res, 239, 245-252.

Schillinger, D., Piette, J., Grumbach, K., Wang, F., Wilson, C., Daher, C., ... & Bindman, A. B. (2003). Closing the loop: physician communication with diabetic patients who have low health literacy. Archives of internal medicine, 163(1), 83-90.

Seligman, H. K., Davis, T. C., Schillinger, D., & Wolf, M. S. (2010). Food insecurity is associated with hypoglycemia and poor diabetes self-management in a low-income sample with diabetes. Journal of health care for the poor and underserved, 21(4), 1227.

Sheu, W. H. H., Chuang, S. Y., Lee, W. J., Tsai, S. T., Chou, P., & Chen, C. H. (2006). Predictors of incident diabetes, metabolic syndrome in middle-aged adults: a 10-year

follow-up study from Kinmen, Taiwan. Diabetes research and clinical practice, 74(2), 162-168.

Shields, M. E., Hovdestad, W. E., Pelletier, C., Dykxhoorn, J. L., O'Donnell, S. C., & Tonmyr, L. (2016). Childhood maltreatment as a risk factor for diabetes: findings from a population-based survey of Canadian adults. BMC public health, 16(1), 879.

Stevens, J., Katz, E. G., & Huxley, R. R. (2010). Associations between gender, age and waist circumference. European journal of clinical nutrition, 64(1), 6-15.

Strom, J. L., & Egede, L. E. (2012). The impact of social support on outcomes in adult patients with type 2 diabetes: a systematic review. Current diabetes reports, 12(6), 769-781.

SUKKARIEH-HARATY, O. L. A., BASSIL, M., & EGEDE, L. E. (2018). Results of a Culturally Tailored Multidisciplinary Intervention on Diabetes Self-Care and Glycemic Outcome in Lebanese Patients with Type 2 Diabetes.

Sukkarieh-Haraty, O., & Howard, E. (2016). Psychometric Properties of the Arabic Version of the Summary of Diabetes Self-Care Activities Instrument. Research and Theory for Nursing Practice, 30(1), 60. doi: 10.1891/1541-6577.30.1.60

Sukkarieh-Haraty, O., Egede, L. E., Abi Kharma, J., & Bassil, M. (2019). Diabetes fatalism and its emotional distress subscale are independent predictors of glycemic control among Lebanese patients with type 2 diabetes. Ethnicity & Health, 24(7), 767-778.

Sukkarieh-Haraty, O., Egede, L. E., Abi Kharma, J., & Bassil, M. (2017). Diabetes fatalism and its emotional distress subscale are independent predictors of glycemic control among Lebanese patients with type 2 diabetes. Ethnicity & health, 1-12.

Sukkarieh-Haraty, O., Egede, L. E., Kharma, J. A., & Bassil, M. (2018). Predictors of Diabetes Fatalism Among Arabs: A Cross-Sectional Study of Lebanese Adults with Type 2 Diabetes. Journal of religion and health, 57(3), 858-868.

Sukkarieh-Haraty, O., Egede, L. E., Kharma, J. A., & Bassil, M. (2018). Psychometric properties of the Arabic version of the 12-item diabetes fatalism scale. PloS one, 13(1).

Taleb, N., Salti, H., Al-Mokaddam, M., Merheb, M., Salti, I., & Nasrallah, M. (2008). Vascular complications of diabetes in Lebanon: experience at the American University of Beirut. The British Journal of Diabetes & Vascular Disease, 8(2), 80-83. Chicago

Tang, T. S., Brown, M. B., Funnell, M. M., & Anderson, R. M. (2008). Social support, quality of life, and self-care behaviors among African Americans with type 2 diabetes. The Diabetes Educator, 34(2), 266-276.

Toobert, D. J., Hampson, S. E., & Glasgow, R. E. (2000). The summary of diabetes self-care activities measure: results from 7 studies and a revised scale. Diabetes care, 23(7), 943-950.

van Dam, R. M., Boer, J. M., Feskens, E. J., & Seidell, J. C. (2001). Parental history of diabetes modifies the association between abdominal adiposity and hyperglycemia. Diabetes care, 24(8), 1454-1459. ISO 690

Walker, R. J., Gebregziabher, M., Martin-Harris, B., & Egede, L. E. (2014). Relationship between social determinants of health and processes and outcomes in adults with type 2 diabetes: validation of a conceptual framework. BMC endocrine disorders, 14(1), 82.

Walker, R. J., Smalls, B. L., Campbell, J. A., Williams, J. L. S., & Egede, L. E. (2014). Impact of social determinants of health on outcomes for type 2 diabetes: a systematic review. Endocrine, 47(1), 29-48.

Walker, R. J., Smalls, B. L., Hernandez-Tejada, M. A., Campbell, J. A., Davis, K. S., & Egede, L. E. (2012). Effect of diabetes fatalism on medication adherence and self-care behaviors in adults with diabetes. General hospital psychiatry, 34(6), 598-603.

Whiting, D., Unwin, N., & Roglic, G. (2010). Diabetes: equity and social determinants. Equity, social determinants and public health programmes, 77, 94.

World Health Organization. (2000). Obesity: preventing and managing the global epidemic (No. 894). World Health Organization.

World Health Organization. (2010). A conceptual framework for action on the social determinants of health.

Xing, Z., Peng, Z., Wang, X., Zhu, Z., Pei, J., Hu, X., & Chai, X. (2020). Waist circumference is associated with major adverse cardiovascular events in male but not female patients with type-2 diabetes mellitus. Cardiovascular diabetology, 19(1), 1-8.

Yoon, Y. S., Oh, S. W., & Park, H. S. (2006). Socioeconomic status in relation to obesity and abdominal obesity in Korean adults: a focus on sex differences. Obesity, 14(5), 909-919. ISO 690

Zheng, Y., Ley, S. H., & Hu, F. B. (2018). Global aetiology and epidemiology of type 2 diabetes mellitus and its complications. Nature Reviews Endocrinology, 14(2), 88

Appendix 1

الجامعة اللبنانية الاميركية

نموذج موافقة للمشاركة في دراسة بحث
عنوان الدراسة: **تأثير المحددات الاجتماعية للصحة في الحصول على الرعاية والمعرفة والمعتقدات والمواقف والرعاية الذاتية والنتائج الطبية لدى البالغين المصابين بمرض السكري في لبنان**

الباحث الرئيسي رقم 1: د. مايا باسيل
الهاتف والبريد الالكتروني: *01-786456 مقسم2469*
mbassil@lau.edu.lb

الباحث الرئيسي رقم 2: د. علا سكرية

الهاتف والبريد الالكتروني: *01-786456 مقسم2496*
ola.sukkarieh@lau.edu.lb

الموقع حيث سيتم إجراء دراسة:

لماذا يُطلب منك أن تشارك في هذه الدراسة؟

يرجى قراءة هذه المعلومات بعناية لانك تعاني من مرض السكري (النوع الثاني). يمكنك ان تطلب المزيد من التوضيح أو المعلومات بشأن هذه الدراسة من الباحثون الواردة اسمائهم في الاعلى

لماذا يجري هذا البحث؟
ان الغرض من هذه الدراسة هو أن نفهم . **تأثير المحددات الاجتماعية للصحة على الحصول على الرعاية والمعرفة والمعتقدات والمواقف والرعاية الذاتية والنتائج الطبية لدى البالغين المصابين بمرض السكري في لبنان**

إلى متى ستستمر هذه الدراسة؟
سوف تستمر الدراسة لمدة سنتين. و سوف تكون مشاركتكم **مرة** وا **حدة**

ماذا سيحدث أثناء الدراسة؟
إذا وافقت على على المشاركة في هذه الدراسة سيطلب منك:

- ان تكمل 9 استبيانات موجزة. يطرح الاستبيان الاول اسئلة عن خلفيتك وعن وضعك الصحي. يطرح الاستبيان الثاني اسئلة عن رأيك من نوعية حياتك اليومية . يتناول الاستبيان الثالث اسئلة عن عنايتك الشخصية بمرض السكر. اما الاستبيان الرابع . يطرح اسئلة عن الايمان بالقدر المتعلق بمرض السكري .يطرح الأستبيان الخامس أسئلة عن نوعية الطعام . اما الاستبيان السادس فيطرح اسئلة عن الكآبة. الاستبيان السابع يطرح اسئلة عن معرفتك عن الصحة. اما الاستبيان الثامن فيطرح اسئلة عن معلوماتك حول مرض السكري. الاستبيان التاسع يطرح اسئلة عن احداث جرت خلال طفولتك. اجابتك عن مجموعة الاستبيانات ستاخذ حوالي 50 دقيقه. اذا كان لديك اية صعوبة في القراءة او ايضاح عن الاسئلة, سيكون الباحث متواجد لمساعدتك.

- كذلك سيأخذ عينات دم صغيرة عبر وخز اصبع اليد لفحص سكر الدم و مخزون السكر و سيؤخذ الضغط اضافة الى الوزن والطول ومحيط الخصر.

ماذا سيحدث للعينات الخاصة بي؟
ستأخذ التحاليل لاغراض البحث دون معرفة هوية المشارك. أما المشارك فسيحصل على النتيجة كاملة دون قيد أو شرط. سيتكفل الباحثون بكل التكاليف المادية المستوجبة. ستكون البيانات التي ستدلي عنها في سرية تامه. الباحث فقط هو الذي سيطلع عليها. لن ترد اية تقارير او منشورات بمعلومات التي يمكن ان تعرف عنك باي شكل من الاشكال

ما هي البدائل الأخرى؟

ان مشاركتك تطوعية في هذة الدراسة ويمكنك التوقف متى تشاء حتى لو بدأت بالمشاركة. قرارك بالتوقف او عدم المشاركة في الدراسة لن يؤثر على العناية الطبية التي لطالما حصلت عليها

ما هي الفوائد المحتملة إذا كنت تشارك في الدراسة؟
إن المعلومات التي تم الحصول عليها في هذه الدراسة سوف تساعد الباحثين في فهم. **تأثير المحددات الاجتماعية للصحة على الحصول على الرعاية والمعرفة والمعتقدات والمواقف والرعاية الذاتية والنتائج الطبية لدى البالغين المصابين بمرض السكري في لبنان**

ما هي المخاطر المحتملة والمضايقات إذا كنت تشارك في الدراسة؟
لا يوجد أي خطر أو ضرر جراء مشاركتك في هذه الدراسة. من المحتمل ان تشعر بتعب خلال اكمال الاستبيانات. اذا شعرت بالتعب الرجاء اعلام الباحث ويمكنك اخذ استراحة. أيضا من المحتمل الشعور باللأنزعاج جراء سحب الدم لأجراء التحاليل. لكن سوف يكون تحت إشراف ممرض متمرس والباحث
سوف يحرص على سلامتك التامة.

نوصي ان إذا شعرت بأي نوع من الضيق أثناء إكمال الاستبيان أن تطلب المساعدة من خدمات الصحة / أو خدمات الاستشارة أو اتصل بالباحث.

ما هي تكلفة مشاركتك في الدراسة؟
لن تكون مسؤول عن كلفة أي تحليل ستقوم به

هل سوف يُدفع لك للمشاركة في هذه الدراسة؟
لن يُدفع لك للمشاركة في هذه الدراسة.

كيف سيتم الحفاظ على سرية المعلومات الخاصة بي؟
سوف نقوم بعناية بحماية المعلومات التي تطلعنا عليها بشأنك وعائلتك. وما نتعرف عليه من المسائل استبيان, نتائج الطبية ونتائج عينات الدم. سيتم وصفه فقط بالطريقة التي لا تعرّف بك. ولحماية خصوصيتك، سوف يتم تسجيل النتائج مع رمز سري. سوف يتم تسجيل فقط اسمك في نموذج الموافقة. سيتم الإبقاء على الرمز السري المعين في

ملف مغلق ومحمي بعناية. سيتم تخزين الملفات الإلكترونية أو الورقية من هذا المسح في خزائن مقفلة إلا إذا طلبت تدميرها بعد اكتمال الدراسة. والوصول اليها يتم فقط من قبل الباحث الرئيسي للدراسة والأفراد المرخص لهم. ومع ذلك، قد تتم مراجعة سجلات الدراسة من قبل الجنة الأخلاقية التي تجري على البشر في الجامعة اللبنانية الاميركية. ستتم مراقبة السجلات الخاصة بك ويمكن مراجعتها دون انتهاك السرية. وأية بيانات يمكن ان تنتج عن هذه الدراسة لن تذكر أسماء المشاركين في الدراسة.

المشاركة الطوعية / الانسحاب

ان المشاركة طوعية تماما. يمكنك سحب موافقتك في أي وقت. إذا اخترت عدم مشاركتك في الدراسة أو انسحابك في وقت لاحق من هذه الدراسة، وفلن تتأثر بأي شكل من الأشكال. إذا كنت ترغب في سحب من الدراسة، يمكنك الاتصال بالباحثي الواردة اسمائهم في الصفحة الاولى. يجوز للباحثين ان يقرروا وقف مشاركتك في هذه الدراسة دون الحصول على إذنك إذا شعروا أنها قد تكون سيئة لك.

بمن سيتم الاتصال للحصول على أجوبة على أسئلتك ومخاوفك وشكواك؟

إذا كان لديك أي أسئلة ، مخاوف أو شكاوى، يرجى الاتصال بالباحث الرئيسي للدراسة، والمدرجة على الصفحة الأولى من هذه موافقة

إذا كان لديك أي أسئلة حول حقوقك أو مصلحتك كمشارك في هذا المشروع، يرجى الاتصال بمكتب الجنة الأخلاقية التي تجري على البشر في الجامعة اللبنانية الأميركية (*786456-01 مقسم 2546)* للاستفهام حول حقوق كمشارك في البحث أو مشاركتك في هذه الدراسة.

إذا كان لديك أي أسئلة بخصوص هذه الدراسة، يرجى الاتصال بأي من الأطباء المدرجة اسماءهم على الصفحة الأولى من وثيقة الموافقة المستنيرة هذه.

<u>الموافقة على المشاركة في الدراسة</u>

لقد قرأت الوصف أعلاه من هذه الدراسة. وقد تمت الاجابة على جميع أسئلتي. وأنا أعلم أنه يمكنني ان ارفض المشاركة في أو الانسحاب من الدراسة في أي وقت. **أعطي موافقتي بحرية على المشاركة في هذه الدراسة**. أنا أفهم أنه من خلال التوقيع على هذا النموذج قد أوافق على المشاركة في الدراسة. وقد تلقيت نسخة من هذا النموذج لاخذها معي.

_____

اسم المريض

_____ _____

توقيع المريض التاريخ

<u>بيان موافقة الشخص الحاصل على الموافقة</u>

أشهد بأنه تم الشرح للمريض بشكل كامل ومناسب عن طبيعة الدراسة البحثية المذكورة أعلاه وقد قدمت الاجابة على أي سؤال كان لديه.

_____ _____

توقيع الباحث الرئيسي/المعين التاريخ

عنوان الدراسة:
تأثير المحددات الاجتماعية للصحة في الحصول على الرعاية والمعرفة والمعتقدات والمواقف والرعاية الذاتية والنتائج الطبية لدى البالغين المصابين بمرض السكري في لبنان

أسئلة عامة عن المشارك
الرجاء الاجابة عن الاسئلة التالية:

1. ما هو عمرك؟_____

2.ما هو جنسك؟
- ☐ مذكر
- ☐ مؤنث

3. ما هو الوضع الاجتماعي؟
- ☐ عازب / عزباء
- ☐ متزوج(ة)
- ☐ مطلق(ة)
- ☐ ارمل(ة)
- ☐ منفصل(ت)

.4 كم سنة من التعليم أكملت؟
(ما بعد الروضة)؟_____

5.كم سنة من التعليم قد اكمل والدك؟ (ما بعد الروضة)؟_____

6.كم سنة من التعليم قد اكملت والدتك؟ (ما بعد الروضة)؟_____

7.ما هو وضعك المهني الحالي؟
- ☐ اعمل
- ☐ لا اعمل
- ☐ غير قادر على العمل بسبب مشكلة صحية
- ☐ ربة منزل, مقدم رعاية لمريض
- ☐ متقاعد

8.كم ساعة تعمل في الاسبوع؟_____

9.ما هو مدخولك الشهري من كل المصادر(سؤال اختياري) ؟
- ☐ 500$ >
- ☐ 500$ -1499$
- ☐ 1500$ -2999$
- ☐ 3000$ ≤

10.هل تعتبر أن الدخل المالي لعائلتك:

- مريح ، لدي أكثر من مما يكفي لتغطية النفقات
- يكفي لتغطية النفقات
- لم يكن لدي ما يكفي لتغطية النفقات

11. ما هو عدد افراد عائلتك؟_____

12.كم فرد من عائلتك متكل عليك ماديا؟_____

13.كم فرد ينام في كل غرفة في منزلك؟_____
كم غرفة لديك في منزلك (ما عدى المطبخ و الحمام)؟_____

14.هل منزلك؟
□اجار
□ ملك
□آخر

15.هل في منزلك؟(اختر كل ما ينطبق)
□الكهرباء
□مياه الشرب
□خدمة المياه
□التلفزيون
□الاشتراك كابل
□الهاتف المحمول
□الهاتف غير المحمول
□مكيفات الهواء / السخانات
□سخان
□اشتراك الإنترنت اللاسلكي
□الكمبيوتر
□ثلاجة
□لا شيء مما سبق

16.ما هو مصدر الكهرباء؟
- الدولة
- اشتراك مولد كهرباء
- آخر

17.ما هو مصدر مياه الشرب؟
- مياه الدولة
- مياه مشترى
- اخرى

18ما هو مصدر مياه الخدمه ؟
- مياه الدولة
- مياه مشترى

□ اخرى

19.ما هي وسائل النقل الخاصة بك؟ (اختر كل ما ينطبق)
□النقل العام
□سيارة
□دراجة نارية
□دراجة
□المشي
□أخرى، حدد_____

20. هل لديك ضمان صحي؟
□ نعم
□ لا

21.لكم سنة عانيت من مرض السكري؟
□ اقل من خمس سنوات
□ 5-10 سنوات
□ 11 وما فوق

22.هل يعاني أحد من أفراد عائلتك من مرض السكري؟
□ نعم
□ لا

23. هل تلقيت في السابق معلومات عن مرض السكري من الطبيب, أخصائي(ة) تغذية ا و ممرض(ة)؟
□ نعم
□لا

24. هل تثق بطبابة مقدمي الرعاية الصحية لك؟
□نعم
□لا, حدد_____

25.هل تقوم بإجراء عدد الزيارات الطبية لمرض السكري كما هو محدد من قبل مقدمي الرعاية الصحية؟
□ نعم
□لا, حدد_____

26.هل يتم تزويدك بجميع الأدوية والعلاج اللازم لمرض السكري؟
□ نعم
لا, حدد_____

27. اية من المشاكل التالية المتعلقة بمرض السكرى قد عانيت منها
□ فرط في نسبة انخفاض السكر(اقل من 80mg/dl)
□ فرط في ارتفاع نسبة السكر(اكثر من 300 mg/dl)
□ مشاكل في القلب

□ مشاكل في النشاط الجنسي
□ مشاكل في العيون
□ تلف الاعصاب (الشعور بتخدير او وخز في القدمين و أو اليدين أو تقرحات القدم)
□ مشاكل في الكلى
□ ليس لدي اية من المشاكل المذكورة اعلاه

28. هل تدخن؟ نعم___ لا___ كنت أدخن___

The World Health Organization Qualify of Life Assessment Instrument, Short Version (Arabic WHOQOL Bref)

مقياس جودة الحياة المختصر المعدل

التعليمات:

هذا الإستبيان يتعلق بمدى صحتك وا لجوانب المحيطة بحياتك. من فضلك أجب على كل الأسئلة.
إننا نسألك أن تفكر فى حياتك خلال الأسبوعين الماضيين.

	ضعيف جداً غير مقتنع تمامًا	ضعيف غير مقتنع	متوسط متوسط	جيد مقتنع	جيد جداً مقتنع تماماً
1- كيف تقيم جودة حياتك؟	1	2	3	4	5
2- إلى أى مدى أنت مقتنع بصحتك؟	1	2	3	4	5

	ليس البتة	قليلاً	إلى حد متوسط	كثيرا جداً	إلى أبعد الحدود
3- إلى أى مدى تشعر أن الألم الجسمانى يمنعك من القيام بأداء شيء تحب تأديته؟	1	2	3	4	5
4- إلى أى مدى تحتاج إلى العلاج الطبى حتى تؤدى وظيفتك اليومية؟	1	2	3	4	5
5- إلى أى مدى تستمتع بالحياة؟	1	2	3	4	5
6- إلى أى مدى تشعر أن حياتك ذات قيمة؟	1	2	3	4	5

الأسئلة التالية تستفسر عن مدى حجم أشياء معينة تعرضت لها خلال الإسبوعين الماضيين :

	ليس البتة	قليلاً	إلى حد متوسط	كثيراً جداً	إلى أبعد الحدود
7- إلى أى مدى أنت قادر على التركيز؟	1	2	3	4	5
8- إلى أى مدى تشعر بالأمان فى حياتك اليومية؟	1	2	3	4	5
9- إلى أى مدى تشعر أن البيئة المحيطة بك صحية ؟	1	2	3	4	5

	لا يوجد	قليلاً	متوسط	فـــــوق المتوسط	تماماً
10- هل لديك الطاقة الكافية لممارسة حياتك اليومية؟	1	2	3	4	5
11- هل أنت قادر على قبول مظهرك الجسمانى؟	1	2	3	4	5
12- هل لديك المال الكافى لتلبية إحتياجاتك؟	1	2	3	4	5
	لا يوجد	قليلاً	متوسط	فوق المتوسط	تماماً
13- إلى أى مدى تتاح لديك المعلومات التى تحتاجها فى حياتك اليومية ؟	1	2	3	4	5
14- إلى أى مدى تتاح لديك الفرصة للأنشطة الترويحية عند الفراغ؟	1	2	3	4	5

	قليلا جداً	قليلاً	متوسط	جيد	جيد جداً
15- ما هى مقدرتك الصــحية على التحرك ؟	1	2	3	4	5

الأسئلة التالية تستفسر عن مدى شعورك بالإستحسان أو الرضا عن جوانب متعددة فى حياتك خلال الإسبوعين الماضيين :

	غير مرتاح تماماً	غير مرتاح	متوسط	مرتاح	مرتاح جداً
16- إلى أى مدى تشعر بالإرتياح فى نومك؟	1	2	3	4	5
17- إلى أى مدى أنت راض عن مقدرتك فى أداء أنشطتك اليومية؟	1	2	3	4	5
18- إلى أى درجة أنت راض عن مقدرتك فى أداء عملك؟	1	2	3	4	5
19- إلى أى مدى أنت راض عن نفسك؟	1	2	3	4	5
20- إلى أى مدى أنت راض عن علاقاتك الشخصية؟	1	2	3	4	5
21- إلى أى مدى أنت راض عن حياتك الجنسية؟	1	2	3	4	5
22- إلى أى مدى أنت راض عن المساندة التى تجدها من أصدقائك؟	1	2	3	4	5
23- إلى أى مدى أنت راض عن حالة المكان الذى تعيش فيه؟	1	2	3	4	5

24- إلى أى مدى أنت راض عن حصولك على الخدمات الصحية؟	1	2	3	4	5
25- إلى أى مدى أنت راض عن توفر وسائل النقل لديك؟	1	2	3	4	5

السؤال التالى يستفسر عن مدى شعورك أو تجربتك للقيام بأشياء معينة خلال الإسبوعين الماضيين :

	أبدا	نادرا	أحيانا	فى معظم الأحيان	دائما
26- إلى أى مد ىتنتابك مشاعرسلبية مثل الحزن واليأس والقلق والإكتئاب؟	1	2	3	4	5

استبيان عن صحة المرضى ـ 9

(P H Q -9)

خلال الأسبوعين الماضيين ، كم مرة عانيت من أي من المشاكل التالية؟

(ضع علامة " ✓" للإشارة لجوابك)

	ولا مرة	عدة أيام	أكثر من نصف الايام	تقريبا كل يوم
1. قلة الاهتمام او قلة الاستمتاع بممارسة بالقيام بأي عمل	0	1	2	3
2. الشعور بالحزن او ضيق الصدر او اليأس	0	1	2	3
3. صعوبة في النوم او نوم متقطع او النوم اكثر من المعتاد	0	1	2	3
4. الشعور بالتعب او بامتلاك القليل جداً من الطاقة	0	1	2	3
5. قلة الشهية او الزيادة في تناول الطعام عن المعتاد	0	1	2	3
6. الشعور بعدم الرضا عن النفس او الشعور بأنك قد أخذلت نفسك او عائلتك.	0	1	2	3
7. صعوبة في التركيز مثلاً أثناء قراءة الصحيفة او مشاهدة التلفزيون .	0	1	2	3
8. بطء في الحركة او بطء في التحدث عما هو معتاد لدرجة ملحوظة من الآخرين /أو على العكس من ذلك التحدث بسرعة وكثرة الحركة أكثر من المعتاد .	0	1	2	3
9. راودتك أفكار بأنه من الأفضل لو كنت ميتا أو افكار بأن تقوم بأيذاء النفس .	0	1	2	3

_____ +_____ +_____ + __0__ = Total Score : _____ (FOR OFFICE CODING)

إذا أشرت الى أية من المشاكل أعلاه ، فإلى أية درجة صعّبت عليك هذه المشاكل القيام بعملك ، الاعتناء بالأمور المنزلية ، او الانسجام مع أشخاص آخرين ؟

ليست هناك أي صعوبة	هناك بعض الصعوبات	هناك صعوبات شديدة	هناك صعوبات بالغة التعقيد
☐	☐	☐	☐

ملخص عن الانشطة المتعلقه بالعناية الشخصية لمرض السكري

الاسئلة الواردة ادناه هي عن الانشطة المتعلقة بعنايتك الشخصية لمرض السكري خلال السبعة الايام الماضية. اذا كنت مريضا خلال السبعة الايام الماضية , يرجى اعادة التفكير الى السبعة الايام الاخيرة التي لم تكن فيها مريضا.

	عدد الايام							
الغذاء :								
●كم يوم من الايام السبعة الماضية اتبعت نظاما غذائيا صحيا ؟	0	1	2	3	4	5	6	7
●على مدى الشهر الماضي ,وبمعدل كم يوم في الاسبوع, اتبعت نظاما غذائيا صحيا خاصا بك؟	0	1	2	3	4	5	6	7
●كم من الايام السبعة الماضية تناولت خمس حصص او اكثر من الفاكهة او الخضار؟	0	1	2	3	4	5	6	7
●كم من الايام السبعة الماضية تناولت الاطعمة ذات الدهون العالية مثل اللحوم الحمراء او منتجات الالبان الكاملة الدسم؟	0	1	2	3	4	5	6	7
ممارسة الرياضة :								
●كم من الايام السبعة الماضية مارست نشاط رياضي لمدة 30 دقيقة على الاقل (مجموع الدقائق من النشاط المتواصل, بما فية المشي)؟	0	1	2	3	4	5	6	7
●كم من الايام السبعة الماضية مارست تمرينا رياضيا معينا (مثل السباحة, المشى, ركوب الدراجة,) غير الذى تفعله في المنزل او كجزء من عملك؟	0	1	2	3	4	5	6	7
اختبار نسبة السكر في الدم:								
●كم من الايام السبعة الماضية فحصت نسبة السكر في الدم؟	0	1	2	3	4	5	6	7
●كم من الايام السبعة الماضية فحصت نسبة السكر في الدم اي عدد المرات التي اوصى بها الفريق الصحي؟	0	1	2	3	4	5	6	7
العناية بالقدم:								
●كم من الايام السبعة الماضيه قمت بفحص قدميك؟	0	1	2	3	4	5	6	7
●كم من الايام السبعة الماضية تفقدت ما بداخل حذائك؟	0	1	2	3	4	5	6	7
الدواء :								
● كم من الايام السبعة الماضية تناولت الدواء الخاص بالسكري الموصوف لك؟	0	1	2	3	4	5	6	7
او								
●كم من الايام السبعة الماضية اخذت حقن الانسولين الموصوفة لك؟	0	1	2	3	4	5	6	7

مقياس الايمان بالقدر المتعلق بمرض السكري: الرجاء اللأجابة على الأسئلة أدناه

موافق بشدة	موافق بعض الشي	موافق	أعارض	أعارض بعض الشيء	أعارض بشدة	مقياس الايمان بالقدر المتعلق بمرض السكري
						أشعر بالانزعاج عندما أفكر بمرض السكري
						أشعر بالحزن عندما أفكر بمرض السكري
						أشعربالاحباط للتعايش مع مرض السكري
						مرض السكري يجعل الحياة أكثر صعوبة
						مرض السكري يسبب لي الكثير من المعاناة
						الثقة بالله ساعدتني على التعامل بشكل أفضل مع مرض السكري
						أعتقد أن الله لا يعطيني أكثر مما يمكن أن اتحمل
						أعتقد أن الله يستطيع أن يشفيني تماماً من مرض السكري
						لقد صليت من أجل مرض السكري لذا لن أقلق بشأنه بعد اللآن
						أعتقد انني قادر على التحكم على مرض السكري كما يتوقع طبيبي
						إذا قمت بكل ما يقوله طبيبي، يمكنني أن أتجنب مضاعفات مرض السكري مثل العمى، بتر الأطراف، الفشل الكلوي، العجز الجنسي،إلخ
						أعتقد أن مرض السكري يمكن التحكم به

التجارب السلبية في الطفولة

تتعلّق الأسئلة التالية بالأحداث التي تحصل خلال مرحلة الطفولة. تسمح لنا هذه المعلومات بأن نفهم بشكل أفضل المشاكل التي قد تحدث في مرحلة مبكرة من حياة الإنسان ومن شأنها أن تساعد الآخرين في المستقبل. إنه موضوع حساس جدًا وقد ينزعج بعض الناس من هذه الأسئلة. تشير كافة الأسئلة إلى مرحلة ما قبل سنّ الثامنة عشرة.

ارجع بذاكرتك إذًا إلى ما قبل سن الثامنة عشرة.

سوء المعاملة في مرحلة الطفولة

الأذى الجسدي

1. كم مرّة قام أحد والديك أو أي شخص بالغ في منزلك بضربك أم بإيذائك جسديًا بأي طريقة كانت؟

o مرّة o أكثر من مرّة o أبدًا

الأذى الجنسي

2. كم مرّة قام أي شخص بالغ أو أكبر منك بخمس سنوات على الأقل بلمسك جنسيًا؟

o مرّة o أكثر من مرّة o أبدًا

3. كم مرّة حاول أي شخص بالغ أو أكبر منك بخمس سنوات على الأقل أن يجعلك تلمسه جنسيًا؟

o مرّة o أكثر من مرّة o أبدًا

4. كم مرّة أجبرك أي شخص بالغ أو أكبر منك بخمس سنوات على الأقل على ممارسة الجنس؟

o مرّة o أكثر من مرّة o أبدًا

الأذى اللفظي

5. كم مرّة قام أحد والديك أو أي شخص بالغ في منزلك بشتمك أو إهانتك أو إذلالك؟

o مرّة o أكثر من مرّة o أبدًا

الخلل الأسري

مرض عقلي

6. هل كنت تعيش مع شخص مكتئب أو مريض عقليًا أو انتحاري؟

o نعم o كلا

الإدمان

7. هل كنت تعيش مع شخص ثمل أو مدمن على الكحول؟

o نعم o كلا

8. هل كنت تعيش مع شخص يتعاطى المخدرات أو يسيء استخدام الوصفات الطبية؟

o نعم o كلا

الانفصال / الطلاق

9. هل كان والداك منفصلين أو مطلّقين؟

o نعم o كلا

العنف بين الكبار

10. كم مرّة قام والديك أو الأشخاص البالغون في منزلك بصفع أو ضرب أو ركل أو لكم بعضعما البعض؟

o مرّة o أكثر من مرّة o أبدًا

السجن

11. هل كنت تعيش مع شخص حُكِمَ عليه بالسجن أو أمضى وقتًا في السجن أو في أي مرفق إصلاحي؟

o نعم o كلا

الافتقار إلى الأمن الغذائي

رجاءً اختر الإجابة الأفضل

1.لم يبقَ أي شيء من الطعام الذي اشتريناه ولا نملك المال لشراء المزيد	o في الكثير من الأحيان o أحيانًا o أبدًا o لا أعرف / أرفض الإجابة
2.لم نكن قادرين على تناول وجبات متوازنة	o في الكثير من الأحيان o أحيانًا o أبدًا o لا أعرف / أرفض الإجابة
3. خلال آخر 12 شهرًا، منذ (تاريخ قبل 12 شهرًا) هل قمت/ قام أي أحد من أفراد عائلتك البالغين بتصغير حجم وجبتك أو بإلغاء وجبات لعدم توافر المال الكافي لشراء الطعام؟	o نعم o كلا
[إذا كانت إجابة السؤال رقم 3 نعم] 4. كم مرّة حصل ذلك؟ - كل شهر تقريبًا، في بعض الأشهر لكن ليس دائمًا، ذات شهر أو شهرين فقط؟	o كل شهر تقريبًا o في بعض الأشهر لكن ليس دائمًا o ذات شهر أو شهرين فقط o لا أعرف / أرفض الإجابة
5. خلال آخر 12 شهرًا، هل أكلت أقل من اللزوم لعدم توافر المال الكافي لشراء للمال؟	o نعم o كلا
6. خلال آخر 12 شهرًا، هل شعرت بالجوع ولم تأكل لأنك لا تستطيع شراء كمية كافية من الطعام؟	o نعم o كلا

مستوى المعرفة الصحية

رجاءً اختر الإجابة الأفضل

	دائمًا / في كافة الأوقات	غالبًا / في أكثر الأوقات	أحيانًا / في بعض الأوقات	نادرًا / في القليل من الأوقات	أبداً
1.كم مرّة ساعدك أحد (كوالديك، صديقك، عامل في المستشفى/ المستوصف أو مقدم الرعاية) في قراءة المواد الاستشفائية؟					
2.كم مرّة واجهت صعوبة في معرفة معلومات حول حالتك الصحية بسبب الصعوبة في فهم المعلومات المكتوبة؟					
3.إلى أي مدى تكون واثقًا من نفسك حين تملأ استمارات بمفردك؟					

اختبار الثقافة حول مرض السكري

في ما يلي 20 عبارة متعلقة بمرض السكّري، بعضها صحيح والبعض الآخر خاطئ. نرجو قراءة كل عبارة ومن ثم تحديد ما إذا كانت برأيك صحيحة أم خاطئة من خلال وضع دائرة حول **صح** أو **خطأ**. أما إذا كنت لا تعرف الإجابة نرجو وضع دائرة حول **لا أعرف**.

1. حمية السكّري مفيدة لمعظم الناس	صح / خطأ / لا أعرف
2. مخزون السكر (HbA1c) هو اختبار يقيس معدل مستوى الغلوكوز في الدم في الأسبوع الفائت	صح / خطأ / لا أعرف
3. 1 كيلو من الدجاج يحتوي على نشويات (كربوهيدرات) أكثر من 1كيلو من البطاطا	صح / خطأ / لا أعرف
4. يحتوي عصير البرتقال على الدسم أكثر مما يحتوي الحليب قليل الدسم	صح / خطأ / لا أعرف
5. فحص البول وفحص الدم مناسبان لقياس مستوى السكر (الغلوكوز) في الدم	صح / خطأ / لا أعرف
6. عصير الفاكهة غير المحلّى يرفع نسبة الغلوكوز في الدم	صح / خطأ / لا أعرف
7. يمكن استخدام علبة من المشروبات الغازية الدايت لمعالجة انخفاض مستوى الغلوكوز في الدم	صح / خطأ / لا أعرف
8. يساعد استخدام زيت الزيتون في الطبخ على تخفيض نسبة الكولسترول في الدم	صح / خطأ / لا أعرف
9. التمارين الرياضية المنتظمة تساعد على تخفيض ضغط الدم المرتفع	صح / خطأ / لا أعرف

1.بالنسبة إلى شخص سليم، التمارين الرياضية ليس لها أي أثر على مستوى السكر في الدم	صح / خطأ / لا أعرف
11. من الممكن أن تسبب الإصابة بمرض ارتفاعًا في مستوى السكر في الدم	صح / خطأ / لا أعرف
12. انتعال حذاء أكبر من مقاس رجلك يساعد على الوقاية من تقرّح القدم	صح / خطأ / لا أعرف
13. تناول الأطعمة قليلة الدسم تخفض خطر الإصابة بمرض القلب	صح / خطأ / لا أعرف
14. قد يكون التخدّر والتنميل من عوارض مرض الأعصاب	صح / خطأ / لا أعرف
15. المشاكل الرئوية غالبًا ما تكون مرتبطة بمرض السكري	صح / خطأ / لا أعرف
16. حين تكون مريضًا بالإنفلونزا عليك أن تخضع لفحص الغلوكوز أكثر من مرّة	صح / خطأ / لا أعرف

إنتقل إلى السؤال رقم 19 إذا كنت لا تأخذ الأنسولين

17. قد يكون ارتفاع نسبة السكر (الغلوكوز) في الدم ناجمًا عن أخذ كمية كبيرة من الأنسولين	صح / خطأ / لا أعرف
18. إذا أخذت جرعة الأنسولين الصباحية وألغيت وجبة الفطور ينخفض مستوى السكر (الغلوكوز) في الدم	صح / خطأ / لا أعرف
19. زيارة الطبيب بشكل منتظم تساعد على كشف أولى إشارات مضاعفات مرض السكري	صح / خطأ / لا أعرف

20. يساعد التزامك بمواعيد طبيب السكري على منع حصول مضاعفات لمرض السكري	صح / خطأ / لا أعرف

شكرًا لتعاونك!

Date: **number:**

Measurements

BP:

Weight:

Height:

BMI:

Waist circumference:

Blood tests: HbA1C