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The prevalence of cardiovascular risk factors among insulin dependent type 2 patients in governmental PHC clinics-Bethlehem

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Thesis Approval

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Dedication

To the spirit of my father and all diabetic patients, I dedicate this research.

Declaration

I certify that this thesis submitted for the degree of master is the result of my own research , except where otherwise acknowledged , and that this thesis –or any of the same material –has not been submitted for a higher degree to any other university or institution .

Signed :

Ghada Mahmoud Ibrahim Sha'fout

Date :22/4/2018

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Sincere thanks and gratitude to God for all his blessings.

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Last by not least, I am grateful for the cooperation of the diabetic patients and their willingness to participate in the study.

Abstract

Background

Diabetes Mellitus (DM)incidence is growing rapidly globally and represents major challenges to public health, economy and social developments.DM is considered as one of the most important risk factors of cardiovascular disease (CVD).Moreover it is associated with the presence of other risk factors of CVD including obesity ,dyslipidemia and hypertension which increase the risk of having CVD and causing premature death and disability among diabetic patients .

The aim of the study:

To determine the prevalence of cardiovascular risk factors, including hypertension,
obesity, physical inactivity, dyslipidemia and smoking among patients with Type 2 DM at the diabetic clinics in the Bethlehem Health Directorate .

Method:

This is across sectional study through stratified random sample that was carried out in 5 diabetic clinics of Ministry of Health (MoH). The total number of participants was233in the period between June to November 2016 .

Results:

Results showed that 100 of 233 participants were having CVD which represented 43% of our sample ,the rest were not having CVD but having high prevalence rate of risk factors of CVD.

Prevalence rate of risk factors of CVD among 133 patients :

There were a statistical significant difference in both total cholesterol and obesity within the gender (p=.0001) in which females had a higher prevalence

than males by 80.2% and 83% respectively. Furthermore, results showed that approximately more than one-fifth of participants were overweight by 23.3% .

Physical inactivity was the highest prevalence among other risk factors by 86.5% and sedentary lifestyle mean was 12.1±3.3 hours with statistical significant difference with age (P=0.001), gender (p=.022)and duration of diabetes (p=.005) .

Hypertension was observed in 66.2% of participants with no statistical difference and smoking was the lowest prevalence rate by 6.8% for current smokers .

Also results showed that age was significantly associated with the risk of coronary heart disease CHD (p=.0001), while, age and duration of diabetes were statistically associated with stroke p=.0001 and p=.001 respectively .

With lipid analysis , results showed that total cholesterol was statically associated with gender (p=.004) and the same for triglycerides (P=.002).

Conclusion:

The number of diabetics is increasing every year in Palestine, with many factors pushing for this increase, such as changing the lifestyle and urbanization as well as obesity. Screening and early detection for diabetes are necessary to reduce the incidence of diabetes and reduce cardiovascular morbidity and mortality. Moreover , monitoring and controlling risk factors of CVD by providing effective treatment could decrease or delay the onset of CVD .

معدل انتشار بعض عوامل الخطورة لأمراض القلبوالأوعية الدموية بين مرضى السكري النوع الثاني المعالجين بالأنسولين والأنسولين والأقراص (compound) في مديرية صحة بيت لحم .

إعداد : غادة محمود إبراهيم شعفوط

إشراف : د. أسمى إمام

الملخص :

يزداد معدل الإصابة بمرض السكري عالميا وهذا يشكل تحديات رئيسية للصحة العامة والتنمية الاقتصادية والاجتماعية . يعتبر مرض السكري واحدا من أهم عوامل الخطورة لأمراض القلب والأوعية الدموية علاوة على ذلك،فإنه يرتبط بوجود عوامل خطورة أخرى لأمراض القلب والأوعية الدموية بما في ذلك السمنة وفرط دهون الدم وارتفاع ضغط الدم والتي تزيد من خطر الإصابة بأمراض القلب والأوعية الدموية وتتسبب في الوفاة المبكرة والإعاقة بين مرضى السكري.

هدف الدراسة :

تحديد مدى انتشار عوامل الخطورة المسببة لأمراض القلب والأوعية الدموية ،بما في ذلك ارتفاع ضغط الدم
السمنة ،قلة أو انعدام النشاط البدني ،فرط دهون الدم والتدخين بين المرضى الذين يعانون مرض السكري النوع الثاني في عيادات السكري في مديرية صحة بيت لحم.

المنهجية :

هذه دراسة مقطعية مستعرضة من خلال عينة عشوائية طبقية أجريت في 5 عيادات لمرضى السكري في وزارة الصحة. كان العدد الإجمالي للمشاركين 233 في الفترة من يونيو إلى نوفمبر 2016.

النتائج :

أظهرت النتائج أن 100 من 233 مشاركاً أصيبوا بأمراض القلب والأوعية الدموية والتي مثلت 43٪ من العينة،أما الباقون فلم يكونوا مصابين بأمراض القلب والأوعية الدموية ولكن كان لديهم معدل انتشار عالي لعوامل الخطورة لأمراض القلب والأوعية الدموية .

معدل انتشار عوامل الخطورة لأمراض القلب والأوعية الدموية بين 133 مريض:

,وقد اضهرت النتائج دلالة إحصائية في كل من الكولسترول والسمنة (p = .0001) مع الجندر حيث أظهرت الإناث معدل أعلى من الذكور بنسبة 80.2٪ و 83٪ على التوالي .وأظهرت نتائج أخرى أن حوالي أكثر من خمس المشاركين يعانون من زيادة في الوزن 23.3% .

كان انعدام النشاط البدني أعلى معدل انتشار بين عوامل الخطورة الأخرى بنسبة 86.5 ٪ وكان متوسط الخمول البدني 12.1 ± 3.3 ساعة مع وجود دلالة إحصائية مع العمر (P = 0.001) ، الجندر (P = .022) ومدة مرض السكري (p = .005)

لوحظ ارتفاع ضغط الدم في 66.2 ٪ بين المشاركين بنسبة 66.2% مع عدم وجود دلالات إحصائية وكان التدخين أقل معدل انتشار بنسبة 6.8 ٪ بين المدخنين الحاليين.

كما اظهر الدراسة وجود دلالة إحصائية بين العمر وخطر الإصابة بمرض القلب التاجي (p=.0001)

بينما السكتة الدماغية كانت لها دلالة إحصائية مع العمر ومدة الإصابة بالسكري(p=.0001) و (p=.001) على التوالي .

مع تحليل الدهون،أظهرت النتائج وجود دلالة إحصائية للكولسترول مع الجندر (P = 004) ونفس الشيء بالنسبة للدهون الثلاثية (P = .002) حيث أظهرت الإناث معدلات أعلى للذكور.

الخلاصة :

يتزايد عدد مرض السكري سنويا في فلسطين، مع وجود العديد من العوامل التي تدفع إلى هذه الزيادة ،مثل تغيير نمط الحياة والتحضر بالإضافة إلى السمنة. إن التحري والاكتشاف المبكر لمرض السكري ضروري للتقليل على حالات الإصابة الجديدة بمرض السكري والتقليل من معدلات الإصابة بالمرض والوفيات بأمراض القلب والأوعية الدموية . علاوة على ذلك مراقبة وضبط عوامل الخطورة الأخرى لأمراض القلب والأوعية الدموية من خلال توفير العلاج الفعال من شانها أن تقلل أو تؤخر ظهور أمراض القلب والأوعية الدموية.

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DM	Diabetes Mellitus

CVD	Cardiovascular Disease
HbA1c	Glycated Hemoglobin
MoH	Ministry of Health
TC	Total Cholesterol
TG	Triglycerides
CHD	Coronary Heart Disease
LDL	Low Density lipoprotein
HDL	High Density lipoprotein
NCDs	Non Communicable Disease
CD	Chronic Diseases
WHO	World Health Organization
CDC	Centers for Disease Control and Prevention
USA	United States of America
LMICs	Low and Middle Income Countries
GDP	Gross Domestic Product
PCBS	Central Bureau of Statistics
MI	Myocardial Infarction
HA	Heart attack
CHF	Congestive Heart Failure
PAD	Peripheral Artery Disease
HTN	Hypertension
AHA	American Heart Association
BMI	Body Mass Index
RBC	Red Blood Cells
UNRWA	United Nation Relief and Work Agency
NGOs	Non-Governmental Organizations
PEN	Package of Essential Non-communicable
WC	Waist Circumference
WHR	Waist-to-Hip Ratio
CRI	Chronic Renal Insufficiency
UAE	United Arab Emirates

DL	Dyslipidemia
NCEP-ATP-III	The National Cholesterol Education Program Adult Treatment Panel III
PA	Physical Activity
RT	Resistance Training
SBP	Systolic Blood Pressure
DBP	Diastolic Blood Pressure
QoL	Quality of Live
SB	Sedentary Behaviors
CA	Cancer
HR	Hazard Rate
ADA	American diabetes Association
ELISA	Enzyme Immunoassay
HP1c	High-Performance Liquid Chromatography
BP	Blood Presser
SD	Standard Deviations
P	Probability
UKPDS	United kingdom Prospective Diabetes Study
IPAQ	International Physical Activity Questionnaire
Met	Metabolic Equivalents
PHIC	Palestinian Health Information Center
IDF	International Diabetes Federation
RF	Risk Factor
IR	Insulin Resistance
OECD	Organization for Economic Cooperation and Development

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Chapter One

Introduction

1.1 **Background**

Non communicable disease (NCDs) or chronic diseases (CD) are the leading cause for death worldwide according to the World Health Organization (WHO).Globally, two thirds of deaths were caused by NCD in 2010 where cardiovascular disease (ischemic heart and stroke) was the major killer among other NCDs such as cancer and diabetes (WHO,2010).As a point of fact, and according to the findings of the WHO in 2010,low and middle income countries have about 80% of NCDs deaths. This may be an indicator for the increased morbidity, disability and mortality rates among people in these countries, which ultimately requires from their governments to adopt long-term strategic policies to curb the increase in these diseases and risk factors that cause them.

There are four behavioral risk factors that contribute to NCD. Those factors , tobacco use, physical inactivity, unhealthy diet and alcohol consumption (WHO, 2010). These risk factors can be reduced or controlled by preventative measures and changes in life style. Other minor risk factors which cannot be reduced or modified and can cause NCDs include age, gender, family history and race.

Burden of NCDs

According to the WHO's global status report on non-communicable diseases,56 million people died in 2014, 38 million (68%) of whom died due to NCDs (cardiovascular disease, cancers, diabetes and chronic respiratory disease)and 16 million (40%) of all NCD deaths were under the age of 70 years old. About 28 million of cases represent three quarters of all NCD deaths,

and 82 % of premature deaths occur in low- and middle-income countries.(WHO, 2014).

More than 80% of cardiovascular diseases and diabetes deaths , in addition, to 90% of deaths from chronic obstructive pulmonary diseases occurred in low and middle income countries(WHO, 2010).

Burden of NCDs in Palestine

According to the WHO , 74.9% of all deaths in the West Bank are due to NCDs which CVD represented the highest percentage by 44.2% followed by cancer 18.3%and diabetes mellitus 1.2% .(WHO,2015).

Ministry of Health (MoH)detected the major causes of death in Palestine in 2016 that CVD still the major cause of deaths with 30.6%, cancer was the second leading cause with 14% ,Cerebrovascular diseases were the third leading cause of death with 12.8% , diabetes and its complications are parallel with prenatal period that came in the forth rank by 8% followed by Respiratory diseases as six cause of death with 6.3% .(MoH , 2016)

According to the study done by Badran and Laher (2011), Arabic-speaking countries are experiencing an increase in chronic diseases with variations between them related to the different income rates and life style.

Burden of NCDs on Economy:

Chronic diseases such as cardiovascular diseases, diabetes and cancers are exhausting the budgets and resources of health systems in both developed and developing countries.

In the same context, the world is experiencing fundamental changes in lifestyle with a clear decline in middle-class layer in the society , which is increasing the class inequality among people leaving poverty and further risk factors for diseases .

This will increase the risk of having one or more of NCDs that could have a negative impact on the economic, political and social contexts for communities

According to the American Diabetes Association(ADA)(2013),the total direct and indirect cost of DM was $245 billion in United States of America (USA)in 2012.

The Robert Wood Johnson Foundation (2006) reports that 84% of all health care spending in USA in 2006 was for people who have one or more chronic disease .Also in USA, in 2010 the total cost of heart disease and stroke were $ 315.4 billion (American Heart Association(AHA), 2014).

In European countries, the health care expenditure was € 110 billion (10%) of the total annual cost of EU economy. For example, diabetes disease type 2 affected 10% of the adults populations in Europe and cost €166 billion annually which represents more than 10% of the European health budget (International Diabetes Federation(IDF),2006).

Cumulative economic losses to low and middle income countries (LMICs) from the four diseases are estimated to surpass US$ 7 trillion over the period 2011-2025 (an average of nearly US$ 500 billion per year).On a per-person basis, the annual losses amount to an average of US $25 in low-income countries, US$ 50 in lower middle-income countries and US$ 139 in upper middle-income countries (WHO, 2013, p5.).

According to the Palestinian Central Bureau of Statistics the health expenditure is about 11% from the Gross Domestic Product (GDP) in 2014with a slight difference compared to the year 2013 which was 10.9% (PCBS,2014).

Total expenditure on the health sector in 2015 was US $1.321,3 million compared with US $1.243.2 million in 2014 and the total expenditure per capita on health was US $ 282.2$ in 2015 compared to US $ 271.2 in 2014. (PCBS,2015) .

In 2012, 82 percent of all public expenditures on health in Palestinian Authority were allocated to curative care, while only 14 percent went towards preventative care and public health services; 66 percent of curative care expenditures were for inpatient care and 34 percent for outpatient care (World Bank, 2016,P.37).

1.2 Diabetes Mellitus:

The global burden of diabetes mellitus (DM) is rising dramatically and constitutes a major public health challenge for developed and developing countries. The International Diabetes Federation (2010) reports that there are 422 million (8.5%) people who have diabetes worldwide. More than 80% of people with diabetes live in low and middle income countries. Of whom, socially and economically disadvantaged people bear the greatest burden of disease and the most affected financially(International Diabetes Federation, 2013).Diabetes is rising globally and it is expected to reach 471 million affected individual in 2035 increasing the rate by55%. In 2013 diabetes killed 5.1 million people and the world health expenditure was 548 billion dollars (11%) of the total spent worldwide in that year(International Diabetes Federation, 2013).

Burden of diabetes in Palestine

Diabetes mellitus in Palestine is rising dramatically as the rest of the world .The prevalence of this disease was 11.5% in 2000 and increased to 14.5% in 2010 with forecasts to reach 20.8% in 2020 and 23.4% in 2030 .(Abu-Rmeileh et al ,2013**)**

1.2.1 Diabetes definition :

Diabetes Mellitus (DM) is a general term for heterogeneous disturbances in metabolism characterized by hyperglycemia(Kerner & Brückel, 2014).

There are three types of diabetes: type 1, type 2 and gestational diabetes .

- **Type 1 diabetes:**

Also called insulin-dependent and it is considered as an autoimmune disease affecting pancreatic B cells which lead to absolute insulin deficiency(Kerner & Brückel, 2014).

- **Type 2 diabetes:**

It is the most common form of diabetes known as insulin resistance whereby the pancreas~~es~~ cannot produce enough insulin or the body cannot use insulin well enough and this condition is called non-insulin dependent (Kerner & Brückel, 2014).

- **Gestational diabetes:**

This condition appears during pregnancy and can lead to serious health problems for mother and her infant by increase their risk to develop type 2 diabetes in their future(Kerner & Brückel, 2014).

All these types can cause damage for body organs such as the kidneys, eyes, feet, bones and heart which lead to early death (WHO, 2016).

1.2.2 Prevalence of diabetes:

The prevalence of diabetes is different from region to another . According to Chan *et al.* (2014), the Western Pacific region forms the highest prevalence of diabetes by 138 million and the Africa region is the smallest by 19.8 million .In the Middle East and North Africa, the number reached 34.6 million in 2013.Those regions are different in their expenditure and management for diabetes, which affects the health status of patients and the ability of health systems to develop the necessary policies for disease prevention.

Diabetes forms one of the major chronic diseases in the Arab countries and the gulf countries have the highest prevalence. As a point of fact, Saudi Arabia, Qatar, and Kuwait have the highest prevalence by 24%,23% and 23% respectively (International Diabetes Federation,2013).

1.2.3 Diabetes complications and cardiovascular disease:

Some people who've had type *2 diabetes* for a long time may not show any symptoms despite elevated blood sugars. They consequently expose their bodies for damage as a result of hyperglycemia and are at high risk to develop complications (International Diabetes Federation,2013).

Diabetes Mellitus can have an impact on a wide verity parts of the body including the eyes, kidneys, nerves, feet and heart. People with diabetes have high rates of obesity, dyslipidemia, high blood pressure and physical inactivity which are considered as risk factors for cardiovascular disease (CVD) and other health problems (WHO,2013).

With that being said, and as per the global status report of the WHO in 2013, diabetes mellitus is considered one of the major causes for cardiovascular diseases including ischemic heart disease , cerebrovascular disease (stroke) , peripheral vascular disease, congestive heart failure and myocardial infarction (MI)that lead to early death among people with diabetes. CVD is considered the main killer disease among diabetic patients as approximately 65%-80% of people with diabetes die from CVD in developing countries (WHO, 2013).

Although our study deals with risk factors for CVD , we have not neglected the effect of HbA1c of increased risk of CVD .

Patients with diabetes should have to keep HbA1c around 7% in blood to maintain their health and eliminate complications which increase the risk for CVD . HbA1c reflects the average blood glucose level over 12-14 weeks of red blood cells (RBC) lifespan .

WHO approved guidelines to diagnose Type 2 DM is represented by using glycated hemoglobin test (HbA1c) . That HbA1c can indicate whether an individual is normal , pre-diabetic or diabetic according to the following parameters:

Below 6% is considered normal , 6% to 6.4% pre-diabetes and 6.5% or more is diabetes.

It is considered as an indicator to glucose control and gives a good estimate about the prognosis of the disease and is therefore adopted as screening test diabetes (Global Diabetes Community,2009).

The American Diabetes Association (2009) recommend keepingHbA1c< 7% to have controlled glucose and eliminate the diabetes complications in the future (Monnier& Colette, 2009).

1.3Cardiovascular disease (CVD):

Non-communicable diseases (NCDs) are considered the leading cause of death globally. Approximately 56 million people died in 2015,39.5million (70%) of whom were due to NCDs, mainly CVD, cancer ,diabetes and chronic lung disease as reported by the WHO, 2016).

Approximately , 30 million deaths (70%) of NCDs occurred in low and middle income countries and most of these deaths occurring before the age of 70.CVD were the first cause of death by 17.7 million (45%), cancers were the second cause by 8.8 million (8.8%) and other types of NCDs deaths had a share of 22% (WHO, 2017).

Patients with diabetes type 2 are at high risk of developing one or more CVD in the future including stroke, coronary heart disease , congestive heart failure and many others.

The incidence of CVD among patients with diabetes type 2 is increasing for many reasons .Those include advancing age which represents as a risk factor for CVD and insulin treatment and improved medical care that prolongs their lives and delays or prevents complications of diabetes(WHO, 2017).

1.3.1Types of cardiovascular disease (CVD):

Cardiovascular diseases (CVDs) are a group of disorders of the heart and blood vessels and they include. CVD that accompany diabetes include heart attack (myocardial infarction MI), stroke, peripheral artery disease, congestive heart failure and angina (International Diabetes Federation,2010).

- **Stroke**

A stroke is similar to a heart attack but it occurs in the brain depriving it from oxygen and nutrients (Mayo Clinic, 2017).

- **Atherosclerosis**

Is a condition that develops when plaque builds up in the walls of arteries preventing blood flow to the heart which leads to a heart attack or stroke (American Heart Association, 2017).

- **Heart attack (HA):**

Is a condition that occurs when blood supply to the heart muscle is stopped or severely reduced, which causes death or damage to part of the heart muscle.

- **Congestive heart failure (CHF) :**

Also called heart failure, defined as the inability of the heart to provide efficient blood flow to other organs and this disease is caused by many conditions such as heart attack, failure of the ventricles and hypertension (Medicine Net, Inc. 2017).

- **Peripheral artery disease (PAD) :**

A reduction of blood supply in the body extremities particularly occurs in the legs as a result of the accumulation of fatty deposits in the arteries of the leg (Mayo Clinic, 2017).

1.3.2Cardiovascular Risk Factors:

There is no doubt that preventative measures to reduce and control risk factors (RFs) for CVD could lower mortality and disability rates among people with diabetes

Addressing Behavioral risk factors such as smoking , unhealthy diet , physical inactivity ,obesity and harmful use of alcohol by a adopt long term strategies aims to delay or eliminate CVD .One of these strategies is Best buys or cost effectiveness which can adopted and implemented even in low resource setting .WHO determined two approaches of intervention : population -wide and individual intervention .population –wide strategies including high taxes on tobacco industry and foods that are rich in sugars ,fats and salt .Adopt comprehensive policies to curb smoking by prohibition of smoking in public areas and enforcing laws that criminalize the sale of tobacco to children and adolescents .Moreover enabling people to exercise by providing places to walk and practice and provide healthy meals for students in schools .

At the individual level it is important to assess the risk factors of CVD such as dyslipidemia and hypertension , in addition to the presence of diseases including DM and provide an effective treatment with aspirin ,beta-blockers and statins. (WHO, 2017) .

In this study, the focus will be on modified cardiovascular risk factors that are associated with diabetes: hypertension, obesity , dyslipidemia, smoking and physical inactivity**.**

- **Hypertension :**

Hypertension (HTN) or high blood pressure, sometimes called arterial hypertension, is a chronic medical condition in which the force of the blood pushing against the artery walls can cause health problems on the long run (Mayo Foundation for Medical Education and Research,2017).

Blood pressure is summarized by two measurements, systolic and diastolic, which depend on whether the heart muscle is contracting (systole) or relaxed between beats (diastole). This equals the maximum and minimum pressure, respectively (American Heart Association,2016).

The American Heart Association(AHA) categorized blood pressure into five categories as shown below (2008):

Blood pressure category	Systolic(mmHg)	Diastolic(mmHg)
Normal	< 120	< 80
Pre-hypertension	120 -139	80 - 89
High blood pressure (stage 1)	140 – 159	90 - 99
High blood pressure (stage 2)	≥ 160	≥ 100
Hypertensive crisis (need emergency care) .	≥ 180	≥ 110

- **Over weight and Obesity :**

  WHO (2013) defines obesity and overweight as abnormal or excessive fat accumulation that may cause health problems, and are measured by the body mass index (BMI). The body mass index (BMI) is a simple index of weight-for-height that is commonly used to classify overweight

and obesity in adults. It is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m^2).

Normal weight is defined as a BMI 18 to 24.9 kg/m^2, overweight 25 to 29.9 kg/m^2 and obesity as BMI >= 30 kg/m^2(Pischon*et al.* 2008).

- **Dyslipidemia :**

A disorder of lipoprotein metabolism, including lipoprotein overproduction or deficiency. Dyslipidemia may be manifested by elevation of the total cholesterol the "bad" low-density lipoprotein (LDL) cholesterol and the triglyceride concentrations, and a decrease in the "good" high-density lipoprotein (HDL) cholesterol concentration in the blood. (Medical Dictionaries,2014).

- **Smoking:**

Smoking is the inhalation of the smoke of burning tobacco encased in cigarettes, pipes, and cigars(Medical Dictionaries , 2014).

- **Physical Inactivity :**

The WHO defines physical activity as "any bodily movement produced by skeletal muscles that requires energy expenditure – including activities undertaken while working, playing, carrying out household chores, travelling, and engaging in recreational pursuits"(WHO, 2017).

- **Sedentary Lifestyle :**

It is defined as "The a type of lifestyle where an individual does not receive regular amount of physical activity " (WHO, April 2002) .

1.4 Health status in Palestine:

Palestinians are clearly living in difficult and unstable economic conditions that are indirectly reflected on their life style and health status. Approximately 25.8% of Palestinians live in poverty (17.8% in the West Bank and 38.8% in the Gaza Strip) and living on a monthly income of $637(Palestinian Central Bureau of Statistics,2014).

Also Israeli occupation is one of the main factors that threaten the lives of Palestinians not because it causes death , injury and disability , but also because the occupation promotes discrimination and segregation and marginalization, which reduces the chances of the Palestinians to live in dignity and accessibility to public services, including health services (The Lancet, 2009).

In addition to the internal Palestinian division between Fatah and Hamas, which created two governments one in West Bank and the other in the Gaza Strip, where this division strengthened fragmentation in the Palestinian situation, including of course the health system (Ashoor,2010).

According to the Palestinian Central Bureau of Statistics "The contribution of the household sector to total expenditure was 40.9% in 2010 and 43.1% in 2011, while Contributions by the governmental sector (through the Ministries of Finance and Health) were 35.3% in 2011. These numbers indicate the burden of health expenditure on the Palestinians' life and threatens their right and ability to access proper health care when needed .

Another challenge is the fragmented and weak healthcare system and its inability to meet the growing needs and demands that contribute to increasing the burden of NCDs and risk factors.

1.5 Health Care System:

The health system is the combined entity of all resources, actors and institutions related to the financing, regulation and provision of all activities

whose primary intent is to improve or maintain health .The health system is made up of fragmented services that are supplied across different providers including Ministry of Health (MoH), United Nation Relief and Work Agency (UNRWA), Non-Governmental Organizations (NGOs)and for profit private sector.

The Ministry of Health is the largest provider of services, but some of these services may be not adequate for needs of the people, especially in tertiary. Therefore, the MoH refers patients to different destinations (Jordan , Israel , Egypt and local health NGOs).

In this context, the Ministry of Health has made a great and significant effort to reduce the cost of purchasing the service in general from abroad and from Israel in particular, by reorganizing all procedures and policies, establishing protocols and concluding agreements with the Israeli side, training health personnel and providing services through enabling hospitals with equipment, physicians with a rare specialty and building specialized hospitals .

The cost of referrals services to Israeli hospitals declined by 32% in the second half of 2015, less than the same period in 2014. This decline continued in 2016 with 27% less than the same period in 2015 (Bitar, 2016).

On the same hand, the Ministry of Health is seeking to adopt and develop health policies aimed to reducing or minimizing the burden of chronic diseases through early detection of injury, and monitoring of the risk factors that lead to injury by CD.

One of these polices is implemented in their primary health care is known as Package of Essential Non-communicable (PEN) Disease intervention for primary health care (Pin Approach) in Low-Resource Settings.

Palestine was chosen by the WHO to implement this trial concerned with the major NCDs such as heart disease and stroke, cancers, diabetes and chronic respiratory disease that are leading to death worldwide .Through this

prevention policy, the WHO seeks to strengthen equity and efficiency of health systems in low and middle income countries (WHO, 2010).

1.6 Problem statement:

The incidence of diabetes mellitus (DM) is rising among Palestinians which indicates an increased burden of this disease and additional numbers of individuals affected by it and its related complications in the near future .In Gaza strip, the incidence rate for diabetes were 178.3 per 100,000 in 2016 and in West Bank the incidence rate for men was 174.6 per 100,000 and 211.5 per 100,000 in women .(MOH, 2017)

Furthermore, a reasonably large number of diabetic patients may have one or more risk factors for CVD and others are diagnosed previously by CVD as a result of diabetes complications (National Diabetes Education Program, 2007).

Efforts towards reducing or preventing injury by CVD among diabetic patients do not seem to be effective and the policies carried out by the Palestinian Ministry of Health (MoH) and other health organizations need to be assessed.

According to the WHO, 17.7 million of people were died from CVD which represented 31% of all total deaths .Coronary heart disease (CHD) has been issued with 7.4 million of deaths while the number of deaths from stroke was 6.7 million Low –and middle income countries have the largest share of NCDs deaths with 82% and 37% of these deaths caused by CVD in 2015. (WHO , 2017)

As a result of CVD and are hence causing more challenges for the health system in terms of social and economic burdens.

1.7 Study justification:

The burden of CVD is high and expensive and DM is considered an independent risk factor for CVD thereby requiring actual intervention by health care system and the community.

CVD is the first cause of death among Palestinians by 30.6%% and diabetes is the fourth reason for death by 8% as a result of its complications which could be CVD or other diseases**(**Ministry of Health , 2016**)**.

Therefore, early detection of risk factors for CVD and controlling blood glucose levels among diabetic patients could improve their health and avoid early onset of CVD and other health problems.

Health is a right for all. Diabetic patients need not only to receive treatment but also to be more aware and responsible about their disease. Until recently, there are still patients who deny or are careless about their disease. This attitude unfortunately accelerates early risk factors for CVD.

Therefore, early detection and prevention of risk factors for CVD among diabetic patients has to be a fundamental priority for the Palestinian Ministry of Health.

1.8 Aim of the study:

This study aims to determine the prevalence of modifiable cardiovascular risk factors including hypertension, obesity, physical inactivity and, smoking, among patients with Type 2 DM at diabetic clinics in the Bethlehem health directorate.

1.9 Objectives

To assess the prevalence rate of risk factors of CVD among insulin dependent patients type 2 patients and to examine the relationship between these risk factors and the risk of having CVD**.**

1.10 Limitations of the study:

1- Despite the fact that the waist circumference parameter is essential, it will not be considered because it was not applied in all clinics.

2- There was an unreal increase in the records numbers of diabetic patients in the central diabetic clinic in the Directorate due to the lack of updating these records for a long time which we had to renewal the records with the help of the nurse.

3- Documentation in Patients' records were particularly not complete regarding the progression of disease, change of treatment or the addition of other treatments and the onset of disease . Physician Only reported any complications or changes as notes in the form of drug prescription despite the existence of the form. This issue will indirectly affect the follow-up of patients and the monitoring the progression of DM.

Chapter Two

Literature Review

Introduction

This chapter presents information about modified CVD risk factors among diabetic patients and the previous studies which is related to including local , regional and international studies .Moreover, information about uncontrolled HbA1cand its association with CVD are presented.

2.1 Risk Factors related to the risk of CVD among diabetic patients

International Studies

2.1.1 Hypertension :

Hypertension (HTN) or high blood pressure, sometimes called arterial hypertension, is a chronic medical condition defined as force of the blood against artery walls. Blood pressure is summarized by two measurements, systolic and diastolic , which depend on whether the heart muscle is contracting (systole) or relaxed between beats (diastole). This equals the maximum and minimum pressure, respectively. Blood pressure is measured in millimeters of mercury (mm Hg) (Mayo Foundation for Medical Education and Research, 2017, P.1) .

Most people who have hypertension have no symptoms which is the reason for it being called silent killer. The Centers for Disease Control and Prevention (2017) state that late diagnosis of high blood pressure increases the risk of stroke , heart attack, congestive heart failure and other diseases. The regular measurement for blood pressure can achieve early detection and delay or prevent other complications in the future.

There are many factors that, combined together, cause hypertension and develop complications as social detriments (urbanization , globalization, aging, income, education level and housing). These factors can be accompanied by some behavioral risk factors such as physical inactivity, unhealthy diet, smoking, stress and harm use of alcohol.

Globally more than 1 in 5 adults have hypertension .It is responsible for half of all deaths from stroke and heart disease (HD). Also complications of raised blood pressure caused 9.4 million deaths worldwide every year. The highest prevalence of hypertension was in African region at 30% and the lowest rate was in America at 18% in 2014 (WHO, 2015).

In Palestine , few studies have been conducted to determine the prevalence rate of HBP , one of these studies was carried out in West Bank in 2011.
The study targeted 2077 of adults older than 25 years in six governmental primary health care clinics in Hebron , Ramalla and Nablus .women represented 58% of the total participation .Results showed high prevalence rate among Palestinians by 28% (Lancet ,2013) .

Many studies were carried out about hypertension among patients with type 2 DM .Three cross-sectional studies were conducted in Nigeria, Jordan and Morocco in 2004, 2006 and 2006 respectively.

These studies aimed to detect the prevalence of HTN among patients with type 2 diabetes and to detect risk factors, level of awareness and control of HTN among Type 2 DM. Their findings showed a high prevalence of HTN by 58.9% in Nigeria, 72.4% in Jordan and 70.4% in Morocco .All three studies showed a significant statistical difference between males and females, where in Jordan, the rate was 70.9% for men and 73.9% for women. Morocco scored the same rate for both men and women (31%). Whereas in Nigeria, men had the highest

rate by 50.8% compared to women by 49.2% . (Unadike*et al.* 2004, Mubarak *et al.* 2006, Berraho*et al.* 2006).

A famous Framingham Study done by Delany (2009) which has been carried out for44 years concluded that there was a relationship between the BMI which included overweight and obesity and high blood pressure .The author concluded that overweight and obesity accounted by 26 % of cases of hypertension in men and 28% in women and cases of CHD by 23% for men and 15% for women .

2.1.2 Overweight and Obesity:

Overweight and Obesity have represented a real challenge for public health both clinically and economically worldwide (Lavie*et al.*, 2009). Globally, overweight and obesity are increasing dramatically and the obesity increased more than double since 1980 (WHO,2015).The prevalence of overweight individuals was 39% (1.9 billion adults) and 13% (600 million) were obese in 2014.

The burden of obesity is large and complicated and may be causing significant health problems including CVD, diabetes, bone disease, hypertension, dyslipidemia and other problems (Lavie*et al.*, 2009).That is in addition to the social problems from which obese individuals suffer .Some of these problems exemplify as shame from others, stress and may be treated with bias. Therefore, WHO considered obesity as an epidemic disease and has committed many programs aimed to prevent and manage the consequences of obesity .

These alarming figures and others represent a real danger and a threat to communities as they are increasing health problems which in turn mean more expenditures, mortality, morbidity and disability. Accordingly, it is necessary to have a national program which aims to bring a change in life style and prevention against obesity

Clinically, obesity is playing a significant role in developing insulin resistance and glucose intolerance and these metabolic factors considered as major cause of onset of diabetes type 2 and CVD (American Heart Association, 2004).Also it has adverse effects on the structure and function of the cardiovascular system leading the onset of other health problems and serious heart diseases such as heart failure (HF) and coronary heart disease (Arthame*t al.*, 2009).

Measuring of Weight:

There are many indices that are used to detect obesity and abnormal adiposity such as the BMI, body fatness, waist circumference (WC), waist-to-hip ratio (WHR) and weight-to-height ratio (Litwin, 2008).

Many studies were conducted about obesity and its association with DM and CVD .

A cohort study entitled "Body Mass Index and Heart Failure Among Patients with Type 2 Diabetes" was conducted by Louisiana State University Hospital with the aim to examine the association between BMI and the risk of incident HF among patients with type 2 diabetes. A total of 31155 patients with type 2 diabetes were included in the study (36.8% men and 63.1% women) aged between30-94 years with a mean follow–up of 7.8 years. Their findings showed a positive association between BMI and the incident of HF among participants. 5834 of patients(18.7%) developed HF among men and women (40.8%, 59.2%) respectively .There was also a significant increased risk of HF among men with a BMI $\geq$30 kg/m^2 and among women with a BMI $\geq$30 and 18.5 to 22.9 kg/m^2, compared with those with a BMI of 25 to 29.9 kg/m^2(Weiqin*et al.*, 2010).

Another cohort study in the Swedish National Diabetes Register investigated the associations of BMI, overweight (BMI 25–29.9 kg/m^2) and obesity (BMI $\geq$ 30 kg/m^2) with cardiovascular disease in type 2 diabetes. The total number of participants was 13,080 with an age category of 30-74 years with no previous CHD or stroke. Patients were followed for a mean of 5.6 years until

2003. The authors concluded that there is a statistical significant relationship between the incidence of overweight and obesity and the incidence of cardiovascular disease.

The results showed that increasing of 5 units in BMI at baseline will give a relative risks of stroke (11%), CHD (15%), cardiovascular disease (13%) and a total mortality rate of 27% (Eeg-Olofsson*et al.*, 2013).

A descriptive study took place in the United Kingdom in 2006 whose objective was to determine the prevalence of overweight and obesity among diabetic patients (Type 1, Type 2). The authors studied the effect of overweight and obesity on other CVD risk factors including uncontrolled glucose, lipid profile and blood pressure .The study shows information on 3637 patients (916 type 1 and 2721type 2) who attended secondary diabetic care clinics. The findings showed a high prevalence of overweight by 86% and obesityby52% among patients with type 2 diabetes compared to patients with type 1diabetesby 55.3% were overweight and 16.6% were obese. Also, patients with type 2 diabetes had hyper pressure, higher level of HbA1c and worse lipids when compared to other groups(Daousi*et al.*, 2006).

2.1.3 Dyslipidemia:

Dyslipidemia is classified into two categories: Primary refers to genetic disorders or defects that affect the metabolism of lipoprotein directly, and secondary as a result of other diseases that affect the metabolism of lipoprotein indirectly such as DM, autoimmune diseases, hypothyroidism, sepsis ,liver disease and chronic renal insufficiency (CRI).(Elsevier,2010) .

According to the Centers for Disease Control and Prevention, 31million adults in the United States have total cholesterol levels that exceed 240 mg/dL. The risk for CVD injury among people with high total cholesterol has twice compared to people with total cholesterol less than 200 mg/dL. Also ,73.3 million adults (31.7) have elevation level of low density lipoprotein (LDL)or

what is known as bad cholesterol and about 48% of adults with high LDL cholesterol are treated with lipid lowering therapy (Mozaffarian *et al.*, 2014).

Dyslipidemia considered as one of the major risk factor for CVD among T2DM. With diabetic patients type 2 this condition occurs as a result of insulin resistance or deficiency which affects key enzymes and pathways in lipid metabolism(Taskinen, 2002).

Mathew *et al.* (2009) investigated the records of 294 patients with type- 2 DM who attended two hospitals (private & governmental) in Northern Emirates, the age group of40-59 years (49%). Only 32% had controlled glucose levels. 8.6% of the study subjects did not have HTN or Dyslipidemia (DL) and the majority (88%) had HTN and 69.6% had Dyslipidemia and 66.1 % had both.

The authors concluded that there was a significant association between age and DL, and nationality and DL, but not with HTN. These findings showed a high percentage of three conditions (DL, HTN and uncontrolled glucose) emphasizes the importance of working to control and eliminate these conditions in order to delay or prevent the risk of CVD (Mathew *et al.*, 2009).

Yet another cross sectional study carried out in India among 50 newly diagnosed type 2 diabetic patients between the period of March 2013 and October 2014with the aim to detect the prevalence and pattern of dyslipidemia in type 2 diabetes mellitus patients attending the Rural Health and Training Centre of medical college in Bhopal,

Madhya Pradesh. The results indicated a high prevalence of dyslipidemia in 43(86%) participants. High total cholesterol with increased LDL, cholesterol and triglycerides was detected in 18 (36%), 33 (66%) and 32 (64%) of participants, respectively. The results also showed decreased HDL cholesterol in 26 (52%) study subjects. Furthermore, the study observed that the most common pattern of dyslipidemia was mixed (more than two parameters of

dyslipidemia) and this might lead to developing one or more cardiovascular or cerebrovascular diseases (Amod*et al.* 2014).

On the same note, a cross sectional study was conducted among 295 diabetic patients in Hawassa University Referral Hospital, Ethiopia. According to the National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP-III) model guideline,34.9% of all diabetic patients had high LDL, high TC 34.6%, high TG 29.8% and low HDL 12.2%.Also, the mean serum level of TC and LDL were higher in type 2 DM than in type 1DM. Females reported highly percentage of TC and LDL serum levels in comparison to males whereas males had lower HDL serum levels than females (48.04 ± 9.13 versus 51.93 ± 11.49 mg/dl) (Ambachew*et al.,* 2014).

The study of Jayarama*et al.* (2012) was carried out in Kolar India among 820 T2DM patients between March 2010 and April 2012.In this study, the authors reported a high prevalence of dyslipidemia among diabetic men and women by 95.4% and 86.75%, respectively .The pattern of this disorder among diabetic men was combined dyslipidemia with high triglycerides (TG) and low high density lipoprotein (HDL).Conversely, diabetic women had combined dyslipidemia with high low density lipoprotein (LDL) and low (HDL) (Jayarama*et al.* 2012).

One clinical study by Al-Adsani*et al.* (2002) was done in Kuwait about the pattern and determents of dyslipidemia among 206 patients with T2DM.Their results showed high percentages of obesity by 57% and overweight 32% in addition to high TC by 67% , LDL 86% and TG by 25% and lowering HDL among males compared to females by 63% and 71%, respectively. 41% of dyslipidemia represented by an increase of LDL and a decrease of HDL levels and isolated increase of LDL was represented in 21% of study subjects(Al-Adsani*et al.,* 2002).

2.1.4 Physical Inactivity:

WHO defines physical activity (PA) as "any bodily movement produced by skeletal muscles that require energy expenditure – including activities undertaken while working, playing, carrying out household chores, travelling, and engaging in recreational pursuits" . Insufficient physical activity is one of the leading risk factors for CVD, diabetes, cancers (WHO, 2017).

In the same context physical inactivity has negative effects on mental health, obesity and injuries . Globally, physical inactivity is considered the 4th leading risk for mortality worldwide contributing to3.2 million deaths worldwide (WHO, 2017).

In Europe , annually,1 million deaths and 8.3 million disability-adjusted life years lost are attributable to physical inactivity .According to the WHO, one third of adults and 2 thirds of adolescents are insufficiently active . Physical inactivity, overweight and obesity and an unhealthy diet all are considered risk factors for diabetes .These account for 80% of the increase prevalence of DM .The presence of these risk factors along with diabetes will increase the risk of heart diseases which require more effort to achieve the global recommendation of activity (WHO, 2015).

A study by Chudyk *et al.* (2009) was conducted to investigate the impact of the mode of exercise on cardiovascular (CV) risk factors in type 2 diabetes. A meta-analysis of 34 articles with systematic review of their literature between 1970 and October 2009 in representative databases for the effect of aerobic or resistance exercise training on clinical markers of CV risk .The study showed a positive correlation between aerobic training alone or combined with resistance training (RT) significantly improved HbA1c −0.6 and −0.67%, respectively and in general improved systolic blood pressure (SBP), triglycerides, and waist circumference(Chudyk *et al.*, 2009).

A total of six cross sectional studies were conducted in Finland from 1972 to 1977 and from 1982 to 1997 in order to assess the relation between physical

activity and CVD risk factors and mortality among diabetic patients type 2.The findings showed that people who are highly active have lower risk factors of CVD and mortality, while others who had low activity levels or who were inactive have higher risk and mortality (Gang *et al.* 2005).

A cohort study was done in USA on 2803 male participants with T2DM aged from 30 years and older to study physical activity and its association with reduced RFs of CVD and mortality . During 14 years of fellow up the incidence of CVD was 266 and 355 of participants died , furthermore , results showed that walking was associated with reduced risk of total mortality , Brisk walking was inversely associated with CVD, fatal CVD and total mortality (Tanasescu *et al.*, 2003).Another randomized control study in USA aimed to assess whether exercise improves quality of living (QoL) in adults with T2DM whereby the sample group of participants was subjected to aerobic and resistance training for a period of 9 months and compared with the non-exercise control group on hemoglobin A1C (HbA1c). The findings showed that general health was improved by aerobic and resistance training or a combination of both compared with the control group. Resistance training had modifying bodily pain whereas aerobic and combined condition groups improved the physical function of the body (Myers *et al.*, 2013).

In the Arab countries, there have been many barriers for people being physically inactive . A literature review of 15 studies was conducted in the Gulf countries which aimed to assess the barriers and /or facilitators to PA. Findings show that lack of time and presence of diseases were the main barriers in addition to other reasons including lack of interest and information about the benefits of PA on health ,lack of motivation, stress and spend long hours on the internet and computers (Benjamin *et al.* 2013).

Physical inactivity has led to the increase of sedentary time behaviors among diabetic patients which, in turn, increases the risk of CVD. Having a sedentary lifestyle is considered one of ten leading causes of morbidity and mortality (WHO,2002).

As a point of fact, there is research- based evidence linking it to many health risks including an increased risk of diabetes, cancers in particularly breast and colon cancer, metabolic syndrome, obesity and CVD .Sedentary lifestyle behaviors (SB) among diabetic patients along with physical inactivity increase the risk of CHD and stroke(Hicks , 2017) .

Many studies linked between sedentary lifestyle and other risk factors including obesity, uncontrolled HbA1c, ageing and dyslipidemia. A cross sectional study from Chile in 2010 aimed to estimate the impact of smoking , sedentary life style ,obesity and alcohol consumption on the prevalence of type 2 DM showed that a sedentary life style and obesity were significantly associated with an increased risk of type 2 DM .The latter can be avoided in 52.4% of participants provided they were not obese .Additionally,64% of type 2 DM were described as sedentariness and this percentage could be avoided by62.2% if participants become active . (Bertoglia *et al.*, 2010) .

Maastricht study investigated the association of total amount and patterns of SB with type 2 DM and metabolic syndrome .Results showed that increasing hours of sedentary time was associated with increased risk to type 2 diabetes by 22% and with an increased 39% risk of metabolic syndrome by 39% (Van der Berg *et al.*, 2016)

Another study was carried out in 15 members of the European union investigated the association between leisure-time, sedentary and non-sedentary activities with BMI and with the prevalence of obesity. Results showed the presence of a strong association between sedentary lifestyle and physical inactivity within obese and higher BMI individuals (Martínez-González *et al.* 1999).

2.1.5 Smoking :

Smoking is considered a major risk factor for many of chronic diseases such as CVD, chronic obstructive lung disease , asthma, cancers (CA) and other diseases (Chang *et al.*, 2012).Approximately 7 million people die from tobacco

per year . More than 6 million of whom died as a result of direct smoking and the rest as a result of being passive smokers .More than 1 billion smokers (80%) live in low and middle –income- countries (WHO,2017).

Several cohort studies have found a positive relationship between smoking and diabetes in Korea .One of these studies was done in 2009 and included 4,041 men representing ex- and current smokers and never-smokers as the control group .The study examined the relationship between smoking and its effect on insulin resistance and beta-cell function on the incidence of type 2 diabetes. The results showed a higher incidence of T2DM among ex – and current smokers in comparison to never smokers by 12.5%, 11.1% and 7.9% respectively (Chan *et al.*, 2009).

A prospective cohort study was conducted among men and women who were followed for 14 years on the association between the number of cigarettes smoked and the incidence of T2DM . Results showed that smoking was a statically associated with increased the risk of diabetes and mortality , participants who smoked ≥20 cigarettes /day had increased risk for incidence diabetes .(Jee *et al.*, 2010).

Another Japanese study explored the impact of cigarette smoking on the incidence of Type 2 diabetes mellitus (DM) in middle-aged (35-60 years old) men .The study concluded that the relative risk of Type 2 DM among current smokers who smoked ≥ 25 cigarette /day compared with non-smokers was 1.47 (95% confidence interval (CI) 1.14-1.92) and who smoked >30 cigarette /day had relative risk of 1.73 (95% CI 1.20-2.48) compared with non-smokers (Uchimoto *et al.*, 1999).

A prospective cohort study by Barengo *et al.* (2017)in Finland aimed to examine the risk of CHD incidence and mortality among people with and without T2DM according to their smoking status. Type 2 smoker male and female patients had higher all-cause mortality than type 2 non-smoker patients . Also, male type 2 smoker patients had higher risk for CHD mortality than their

peers non-smoker (HR 6.15; 95% CI 4.22-8.96) and (HR 2.62; 95% CI 1.60-4.29) respectively. The same was for women by 6.92 (95% CI 2.79-17.19)and (4.06 (95% CI 2.83-5.82) respectively.

On the other hand, non-smoker, non-diabetic patients showed a low risk for CHD incidence (HR in men 3.00; HR in women 2.80) than smoker and diabetic patients (Barengo *et al.*,2017)

National Studies :

In general, there are lack of studies about the DM and other CDs, but some studies conducted in Gaza and West Bank searched of diabetes and its related to CVD .

One of these studies conducted in West Bank aimed to assess the prevalence of microvascular and macrovascular complications of type 2 among Palestinians .The study results showed high prevalence rates of obesity by 74% , HbA1c concentration level was >9% among half of participants ,dyslipidemia was 37.3%and hypertension was 23% .(Abu Halaweh et al, 2017) .

Screening for diabetes and hypertension were done by UNRWA and targeting 7762 refugee in Palestine , Jordan , Lebanon and Syrian Arab Republic in 2007 .findings showed 18.7% had HTN and 9.1% had DM with higher rates of obesity in Jordan and Palestine by 32.7% in males and 53.7% in females and 34.1% in males and 52.6 % in females respectively .Lebanon has the highest prevalence rate in smoking by 59.5% in males and 39.9% in females . (Mousa etal.2010).

Another study used mathematical Markov model conducted in Palestine aimed to estimate diabetic prevalence in the future and compare five future policy scenarios of diabetes prevention in presence of obesity and smoking as risk factors . prevalence . Results concluded that 22.1% of Palestinians males were obese and 37.2% among females and smoking prevalence was 53.7% among males and 5.2% among females For DM prevention estimation in the future,

WHO , global and regional targets (EMRO) and two additional targets ,one feasible and one ideal were used the study showed that diabetic prevention could be achieved if obesity trend start to decline ,5% reduction of obesity trends within 5 years will lead to 2.8% decreasing of diabetic prevalence and 20% reduction if obesity trends decline to 35% within 10 years . (Abu-Rmeileh etal ,2013) .

Cross sectional study have been conducted to determine the prevalence rate of HBP , in West Bank in 2011.
The study targeted 2077 of adults older than 25 years in six governmental primary health care clinics in Hebron , Ramalla and Nablus .women represented 58% of the total participation .Results showed high prevalence rate among Palestinians by 28% (Lancet ,2013)

In our study, we can't overlook the importance of HbA1c and its effect on the risk factors of CVD .WHO and ADA recommended HbA1c as a means to diagnostics DM with a cut point of 6.5% and less than 6.5%. For diabetic patients, HbA1c must be less than 7% (WHO, 2011).

HbA1c and CVD :

HbA1c reflects average plasma glucose over the previous 120 day of RBC life span. HbA1c is used in screening tests for individuals with a high risk of DM, and for diagnosis of diabetes, and it is used as marker test in monitoring and controlling DM.

Many studies were conducted on HbA1c and its association with CVD. One of these studies was conducted in China , and it aimed to examine the relationship between HbA1c and the complexity coronary artery lesions among the older patients with DM (World Health Organization, 2011).(PLOS , 2014) .Results showed that HbA1c is significantly associated with complex coronary artery lesions, and concluded that higher HbA1c levels among older diabetic patients are considered as independent risk factorof coronary artery lesions (Ma J *et al*, 2014).

Another study was carried out in Saudi Arabia in 2006. It aimed at examining the impact of glycaemic control on the lipid profile of diabetic patients. The finding of this study showed a significant association between highHbA1c and TC, TG and low HDL-C, while LDL-C remained unaffected (Khan *et al*., 2007)

A study was conducted in India, which aimed to examine the current HbA1c status, diabetes and the prevalence of Complications among Type 2 Diabetes Patients .The results showed that the mean of HbA1c was 9.2% and poor controlling for patients within long duration of diabetes (9.9±5.5 years) .Microvascular and microvascular were detect with a high prevalence rate due to poor glycemic control , the prevalence of cardiovascular complication (23.6%), renal (21.1%), eye (16.6%) and neuropathy (24.6%) complications (Mohan, Shahand, 2013).

A cohort study was carried out in Sweden in 2012 and aimed to examine the relationship between glycemic control HbA1c and hospitalization for heart failure (HF). The findings showed that the risk of HF hospitalization increased with the high level of HbA1c as the hazard ratio (HR) was 1.2 % increment in concentration of HbA1c.Furthermore, there was a significant association between the incidence of (HF) and males, the long duration of diabetes and old age by a p value of (<.001 , <.001 and <.001) respectively (Marcus*et al*, 2012).

A cross sectional study was done in Gaza aimed to to assess the level of good glycemic control, to determine association between adherence to anti diabetic medications and glycosylated hemoglobin (HbA1c) and to examine factors influencing good glycemic control.

Results showed only one fifth of participants had good glycemic control ≤7% and the

mean of of HbA1c was 8.97% .Oder age , medication adherence and good health literacy were associated with good glycemic control while duration of diabetes >7 years was negatively associated . (Radwan etal,2017)

Chapter Three

Conceptual Framework

3- Introduction:

This chapter presents the modifiable risk factors and metabolic disorders (dyslipidemia , hypertension ,obesity ,smoking and physical inactivity) for CVD among insulin dependent type 2 patients. Patients with type 2 diabetic mellitus have a two-three-fold increased risk of heart attacks and stroke (Sarwar et al ,2010). Many diabetic patients exhibit a cluster of metabolic disorders including obesity hypertension and dyslipidemia which are linked with a number of modifiable life style risk factors .

Dyslipidemia :

It is a manifested condition refers to an increase in one or more of plasma lipids concentrations , usually cholesterol and triglycerides. Cholesterol, Triglycerides and lipoproteins are normal physiological components in the body. Plasma lipids represented a fundamental source to energy for metabolism and cell membrane homeostasis (Mahmood etal,2014) .

Total Cholesterol is divided into three major components , high density lipoproteins (HDL-C) , very low density lipoproteins (VLDL-C) , low density lipoproteins (LDL-C) that represent 60-70% of the total cholesterol and considered atherogenic lipoprotein (NCEP,2002) .

In diabetic patients with Hyperglycemia ,excessive glucose linked to plasma proteins that producing insoluble complex components lead to changes of endothelial cells. on the same hand , glycation of lipoproteins LDL-C can prolong it's life span that increase their risk to accumulate in the vascular walls where it is more susceptible to oxidation leading to atherosclerosis (Haffner , 1998) .

Also patients with type 2 exhibit high triglyceride concentration with low HDL-C level in blood , elevation of triglycerides are activating some of coagulant factors including ,factor v11,factor X and plasminogen Activator Inhibitor-1 (PAI-1) which increase the platelets aggregation which may accelerate atherogenesis .(Basa & Garber,2001) .

Many studies have concluded that elevated HDL-C level can decrease risk of CHD , but some studies have gone further in focusing on the importance HDL-C functions in cardiovascular protection , one of these studies was carried out in 2014 and concluded that HDL-C can play as inhibiter for inflammations and thrombin. Apolipoprotein, apoA-1is one of the major components of HDL-C represented as anti-atherogenic (Rye, Ong ,2014).

Obesity :

Overweight and obesity defined as abnormal fat that accumulated and may cause health problems and are measured by the body mass index (BMI). A person with a BMI equal to or more than 25 is considered overweight and >= 30 kg/m^2 is considered obese (WHO, 2011). Obesity is one of the major challenges faced the world , increasing rates of obesity may increase the risk of DM , CVD and other chronic conditions which reduce life expectancy for individuals .(Olshansky etal, 2005).

Globally, 39% of adults aged ≥18 years were overweight with BMI ≥ 25 and more than half billion adults were obese in 2014 with 6.3% of children under 5 years old in 2013.(WHO.2014). In Palestine obesity affects 26.8% of people (23.3% males ,30.8% females) (WHO,2015) .

In Sweden study, it was concluded that obese type 2 patients have high prevalence rates of risk factors which increase the risk of CVD (Ridderstråle etal,2006). Also several studies showed that the association between obesity and the risk of developing insulin resistance (IR) and type 2 DM (Kahn etal;2006 & Al-Goblan etal;2014)

Obese patients with type 2 tend to develop insulin resistance (IR) , that adipose tissues release more of fatty acids, hormones, glycerol and cytokines ,all of these secretions increase of developing IR (Kahn etal;2006). Furthermore obesity is considered as an independent and a major risk factor for CVD, and the risk of CVD is increased for patients with type 2 DM. Moreover, people who are overweight with central deposition of adipose tissues showed high prevalence CVD mortality and morbidity (Van etal;2006) .

It is important here to mention that obesity may be associated with dyslipidemia , HBP , DM and IR ,it is associated with incremental level of fibrinogen and C-reactive protein which increase the risk of CVD (Ritchie & Connell; 2007).

Hypertension:

It is one of the most important risk factor for premature CVD including stroke, coronary heart disease, heart failure, atrial fibrillation and peripheral vascular disease (Angeli et al.2014). Globally , 13.5% of premature CVD deaths were attributed to hypertension and 54% of stroke and 47% of ischemic heart disease events were accounted by hypertension (Lawes et al . 2008).

Hypertensive patients with DM having highly risk for death and disability (Campbell et al ,2011). In Canada, the mortality rate for people who are diagnosed with hypertension and diabetes is 2.5 time higher than who were not diagnosed (Public Health Agency of Canada,2011) .

According to the Word Health Federation, hypertension is responsible for 50% of ischemic stroke and increase the risk of hemorrhagic stroke by damaging for blood vessels and increase plaque (Word Health Federation,2017) .

Physical Inactivity:

According to WHO physical inactivity is the fourth leading risk factor for mortality and increases the risk of DM , CHD, stroke and cancer by 20-30% and shortness lifespan 3-5 years (WHO,2018). Globally, 23%of adults and 81 % of adolescents are not active enough and females tend to be more less inactive than males (WHO,2017).

A meta analysis review of 21 prospective cohort studies aimed to examine the association between physical activity and the risk of CVD with population size 650000 who were free of CVD showed that 20000 incidence cases of CVD were reported. Furthermore, findings indicated reduction of CVD risk factors by 20-30% with individuals who do vigorous level of activity and 10-20% who do moderate level of activity compared to others who do low level of leisure time (Li & Siegrist ,2012).

Moreover, aging , overweight and obesity and sex are associated inversely with physical activity level and may increase risk of CVD (DiPietro, 1995; Blair & Brodney,1999 & Singh etal,2016) .

Smoking

Smoking is considered one of the most risk factor of CVD and the second leading cause for CVD death after HBP (Wong, 2014). In 2000, more than 1.5 million died from CVD, and more that 10% of those deaths caused by smoking (Ezzati et al. 2005) .

Smoking is associated with other risk factors such as dyslipidemia and HBP , Smokers having high blood concentration of Cholesterol, Triglycerides ,LDL-C and low HDL-C concentration (Keto etal, 2016).

Smoking cessation can reduced mortality rates of Ischemic Heart Disease and cerebrovascular diseases (Organization for Economic Cooperation and Development, 2013).

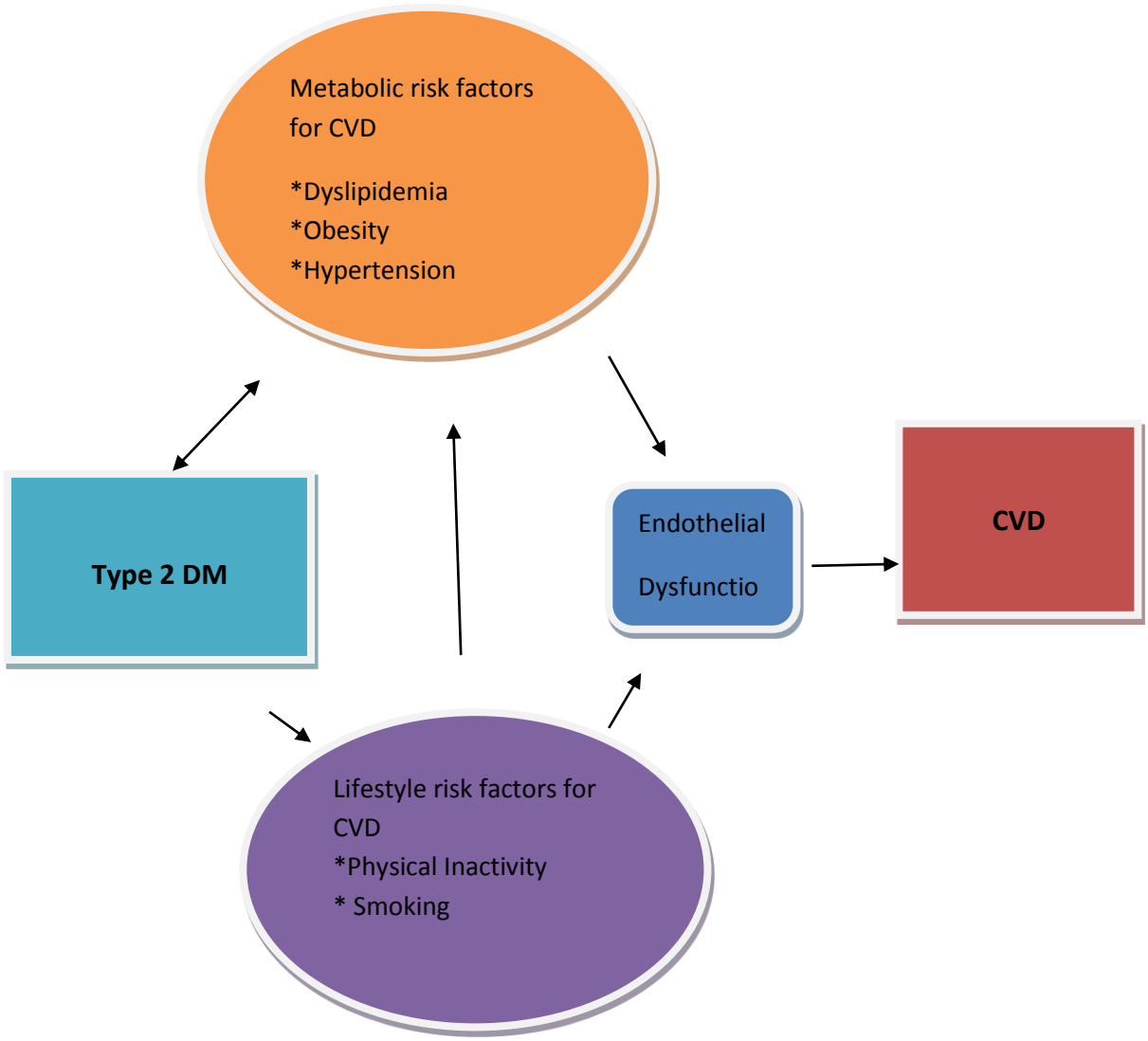

Figure (2): Risk factors for CVD among insulin dependent type 2 patients

Chapter Four

Methodology

Introduction

This chapter outlines the elements of research process which were utilized in the research study . It describes the study design , data collection procedures ,sample size and data analysis as well as the ethical consideration **.**

4.1 Study design

A cross sectional descriptive study was used to assess the prevalence rate of risk factors of CVD among diabetic patients type 2 and to examine the relationship between these risk factors and the risk of having CVD . Type 2 diabetic patients attending governmental diabetic clinics in the Bethlehem Health Directorate have been targeted between July and October of 2016.

A cross sectional design is suitable for studying the prevalence of health disorders related diseases and is considered as important in public health for estimating the burden of disease (Hennekens & Buring, 1987). This study design is also easy, quick and rather cheap (Setia, 2016).

4.2 Target Population

Approximately 757 diabetic patients were distributed over nine MoH diabetic clinics in the urban and rural areas of Bethlehem district providing medical care for patients with type 2diabetes with 348 of them treated with insulin and 409 treated with compound (insulin+ tablets) .

Table 1: Summary about diabetic patients who receive care at the diabetic clinics in the Bethlehem Health Directorate

Name of clinics	No of patients Type 2	Patients number type 2 (insulin)	Patients number type 2 (compound)
Alúbeidiya	68	25	43
Bet Jala	60	19	41
Bet Sahoor	45	20	25
Bet Fajjar	83	42	41
Taqoo'a	46	40	6
Za'atara	40	33	7
Central clinic	379	158	221
Harmala	15	5	10
Nahaleen	21	6	15
Total	757	348	409

4.3 Target Sample Size

Five clinics were selected as mentioned in 3.4 p 40 representing 591 patients; one of these clinics was in Bethlehem city and the others were located in the nearby villages: Alúbeidiya, Bet Fajjar, Za'atara and Nahaleen as shown in table 2below.

The sample size was calculated using Tomas Thompson equation:

$$n = \frac{N \times p(1-p)}{\left[\left[N-1 \times \left(d^2 \div z^2\right)\right] + p(1-p)\right]}$$

N = population size ,

Z = Z-Score corresponding to the level of significance equal to 0.95and 1.96

D = The error rate is equal to 0.05

P = The proportion of the property offers and neutral=0.50 .

Approximately 233 patients were selected from the total number of 591 patients who visited diabetes clinics in the period between July and December 2016 by using the stratified sampling technique.

After that, the weight percentage of each clinic in relation to the total five selected clinics was assessed by dividing the total number of patients in each clinic on the total of all patients in the five clinics for example central clinic percentage = 379/591=.64 % and so on for other clinics . Doing that reflects the real weight of the central clinic in the population of study.

In order to know the sample size for each clinic, percentage weight of each clinic was multiplied by the total sample size (233); for example sample size of the Central clinic = .64 *233 = 149 participants .

The last process was computing the percentage weight for patients with insulin and compound which was done by dividing the total number of patients treated with insulin on the total number of patients at the same clinic, for example the central clinic insulin percentage=158/379= .42 % and so on for other clinics and this isapplied in patients treated with compound.

Finally, the number of participants of each clinic was computed by multiplying the percentage weight of patients with insulin or compound by the total sample

size of each clinic for example sample size of the Central clinic = 149*.42=62 participants .and so on for each clinics to get in the last 233 of participants.

Table 2: Sample size per clinic and treatment methods

Total	Percentage (%)	Compound Sample	Percentage	Insulin Sample	Sample size	percentage	Total	Type 2 (compound)	Type 2 (insulin)	Clinic Name
	0.58	87	0.42	62	149	0.64	379	221	158	Central
	0.18	3	0.83	13	16	0.07	40	7	33	Za3tara
	0.63	17	0.37	10	27	0.11	68	43	25	Alúbeidiya
	0.49	16	0.51	17	33	0.14	83	41	42	Bet Fajjar
	0.71	6	0.29	2	8	0.04	21	15	6	Nehalen
233		129		104	233	1.00	591	327	264	Total

4.4 Criteria of Selection:

The five clinics were selected based on the ability to access the sample , and the location of the villages. The clinics were chosen representing the south , east and west of the city to be representative sample . Moreover , the fact that the clinics have the same devices in measuring weight, height and blood pressure was taken into consideration.

4.5 Exclusion Criteria

1-Patients who are treated with tablets only.

2-Some clinics were excluded from the study including Bet Sahoor and Taqoo'a because some nurses were not cooperative in the sorting patient's records to facilitate access to the sample required .

3-Devices were not standardized in all clinics which required to excluded some clinics including Bet Sahoor , Bet Jala and Taqoo'a .

4.6 **Research Instrument**

3.6.1 Tool 1: Study questionnaire. This questionnaire was filled by all study population. It consists of four sections (See Annex for the English and Arabic versions), as follows:

Section 1: includes demographic data including age, gender, education, address and income.

Section 2: includes information about diabetes including, duration of disease, family history and the type of treatment provided.

Section 3: addresses CVD and family history of CVD.

Section 4: This section was only filled by the non-CVD participants. It includes smoking history ,blood pressure and lipids the last section of the survey addresses physical activity intensity : light, moderate (which require 150 min every week) and the vigorous types of physical activity (which need 75 min every week)(WHO, 2017). in addition to sedentary lifestyle .

Tool 2: Objective assessment for patients without CVD

1- **Anthropometry measurements**

   The weight parameter was measured by using weigh Beam Eye – Level detecto scale and height was measured by using Wall Mount Highest scale

Body Mass Index (BMI) was calculated from the weight in kilograms divided by the square of the height in meters.

In this research study, the BMI was used as an index for body weight . Some selected diabetic clinics like Beit Fajjar and the Central Clinic in Bethlehem used the waist circumference (WC) as an indicator for obesity and the rest of the diabetes clinics did not supported this standard which is the reason for adopting BMI only in this study.

2- **Blood pressure**

It was measured through the auscultatory method or the manual method and it was measured for 3 times (10 min between each read and read) then the mean value was taken.

3- **Blood sample for:**

- Fasting blood sugar was measured for Glycated hemoglobin (HbA1c), lipid profile (Cholesterol, HDL, LDL and triglycerides).Those blood tests were analyzed by Enzyme Immunoassay which is known as ELISA or EIA for lipid profile tests. Reagents from Bio System company were used and performed through automated analyzer named Chemwell (GlobalChemwell Manufacture /China).
- HbA1c test: It was measured by using high-performance liquid chromatography [HP1c]method using the automated analyzer from Trinity Biotech manufactures.

Pilot Study:

A pilot was conducted to detect any problems or ambiguous issues that might occur. It was launched in March 2016.The researcher filled a total of 20 questionnaires of diabetic patients at the Central Diabetic Clinic in Bethlehem City with measurement of highest , weight and blood presser for each participants and had a blood sample for each one of them . Note that there were no problems or obstacles to remember during the pilot

4.7 Data Collection procedures

The data collection started after reviewing patients' medical files in order to identify the patients with insulin and compound medication then we detect the percentage weight for patients with insulin an compound for each clinic in order to find the number of participants in our study.

We used simple random sample from computer program by using random numbers .

After receiving the approval letter for conducting the study, the questionnaires were filled out for each participant by the researcher herself . The researcher asked for their consent and agreement to participate before filling out the questionnaire. Through filling the questionnaire, the researcher measured blood presser (BP) three times , height and body weight without shoes.

After filling out the questionnaire , the researcher sent the participants to the lab to draw a blood sample if he/she were fasting for at least 12-14 hours. If he/she were not fasting, they were asked to return to withdraw a blood sample when they were fasting within one week from the date of filling out the questionnaire.

Fasting blood sugar was measured for glycated hemoglobin (HbA1c), lipid profile (Cholesterol, HDL-C, LDL-C and Triglycerides).

4.8 Study operational definitions

1- **Cardiovascular risk assessment for 10 years:** It is defined according to the United kingdom Prospective Diabetes Study risk engine (UKPDS). It is considered as. It is considered a specific risk engine for individuals with type 2 DM who are undiagnosed by heart diseases previously. UKPDS risk engine calculates automatically some of the risk factors of CVD including: duration of diabetes , gender, current age, ethnicity, smoking status, systolic blood pressure and concentration of HbA1c and HDL/TC ratio .UKPDS risk engine calculates the patient's risk factors as risk score then groups them as >10 % low risk , 10% - 19% moderate risk and ≥20% high risk for CHD and stroke. It estimates the risk of onset of non-fatal and fatal coronary heart disease and non-fatal and fatal stroke (The Oxford Center for Diabetes, Endocrinology and Metabolism, 2016).

2- **Lipids**: According to the United State National Cholesterol Education Program Adult Treatment Panel(NCEP-ATP) III guideline (2002) was followed . According to this guideline , the desirable cholesterol level is<200mg/dl , and the normal triglyceride level is <150mg/dl , the optimal level of LDL was defined as LDL ≥ 100 mg/dl and low level of HDL was defined as HDL < 40 mg/dl**.**

3- Physical activity and leisure time: It is the exact tool used by the WHO for physical activity assessment. The International Physical Activity Questionnaire (IPAQ) which classifies PA according to the type, intensity, duration and frequency was used .IPAQ is one health indicator for diseases. Individuals with a highly active life meet the recommendations of WHO and are considered healthy . Others who are categorized as being moderately active have an increased risk of non-communicable diseases including DM, obesity and hypertension. Individuals with low physical activity or who are inactive have a considerably very high risk for premature death from CVD.

There are many types of PA including (Aerobic Activity , Muscle-strengthening , bone-strengthening and Stretching activates) and intensity classified to light , moderate and vigorous intensity (NIH, 2016) .

As for the level of intensity, it is measured by Met (Metabolic Equivalents).WHO defined Met as "the ratio of a person's working metabolic rate relative to the resting metabolic rate. One MET is defined as the energy cost of sitting quietly, and is equivalent to a caloric consumption of 1 kcal/kg/hour".

WHO adopted guidelines to estimate the energy cost and person caloric consumption by assigning 4 METS to time spent in moderate activities and 8 MITS to the time spent in vigorous activities (WHO, 2006).The same concept of the intensity of activity and MITS is followed in this study.

4.9 Data Analysis:

Data was entered and analyzed by the using of SPSS version 17 by the researcher herself in a collaboration with statistician .

3.9.1 Descriptive analysis for all study participants

Patient's characteristics were presented by descriptive analysis as means and standard deviations (SD) for continuous data and as frequencies for categorical data using person Chi Square at p value less than 0.05.An independent t-test was used to show the gender differences in mean values of variables.

3.9.2 Analysis for non-CVD participants data: A test of significance was pearson chi-square was performed for the comparison of distributions of risk factors in male and female and according to 10 years risk level for developing CVD. Two tailed probability (P) value less than 0.05 was significant.

Physical activity analysis was done according to the WHO Global Physical Activity Questionnaire (GPAQ) Analysis Guide .(WHO, 2006).

3.9.3 Multivariate analysis was done for patients without CVD ,.binary logistic regression was used to identify predictors.

4.10 Permissions and Ethical Considerations:

Public Health School at Al-Quds University reviewed the study proposal and approved it. A permission letter was sent to MoH by the Public Health Faculty of Al-Quds University (Annexes 3&4) .

Patients' consents was taken by informed consent verbally, after full explanation of the study and its objectives and their right to refuse. Patients were assured of the anonymity of participation and confidentiality of the data collected.

Chapter Five

Results

Introduction

This chapter presents the results of the study. This chapter comprises of two sections; first section contains the socio-demographic characteristics of the sample (233) and initial information about the duration of diabetes , family history , type of treatment and whether having or not having CVD .Second section presents results of participants who were not diagnosed of CVD (133).Means and percentages of risk factors and other associations were calculated and presented.

5.1 Section One

5.1.1 Frequencies of the socio-demographic characteristics of the study population:

The study population consisted of 233 participants out of which 100 (43%) were previously diagnosed with CVD; 52% were males and 48% were females as shown in Figure 4.1 below. The remaining portion (133) of the sample were not having CVD comprising 31.6% males and 68.4% females.

There was a significant statistical difference with the gender parameter (p=0.002) whereby women were less having CVD compared to men as shown in table 3. Also there was a significant statistical difference in regard to working in paid job the job parameter (p=0.029). Working status for diabetic patients who did not have CVD were lower than diabetic patients with CVD as shown in table 4.3.

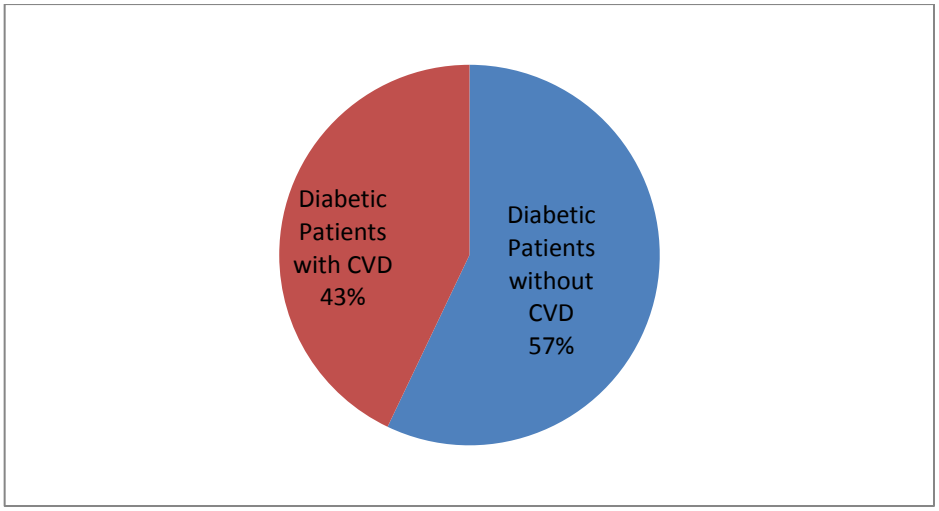

Figure 1: Percentages of diabetic patients with and without CVD.

Table 3: Socio-demographic characteristics of the study population

Variable	Diabetic Patients without CVD (133)	Diabetic Patients with CVD (100)	P-value
Gender			
Male	42 (31.6%)	52 (52%)	0.002
Female	91 (68.4%)	48 (48%)	
Age group			
35-44	3(2.3%)	4(4%)	.126
45-54	17(12.8%)	5(5%)	
55-64	56(42.1%)	38(38%)	
≥65	57(42.9%)	53(53%)	
Residency			
City	47 (35.3%)	30 (30%)	0.458
Village	85 (63.9%)	70 (70%)	
Camp	1 (.8%)	0(0%)	
Education			
Level Low	63(47.7%)	42(42%)	0.359

Illiterate +Literate			
Moderate Level (Elementary+ Preparatory+ Secondary)	50(37.9%)	47(47%)	
High Level Tawjeh and above	19(14.4%)	11(11%)	
Profession			
Work (Employee Private interest Volunteer Laborer)	42(34.1%)	45(48.9%)	0.029
Not work Unemployed - but able to work+ Unemployed - Unable to work+ Retired+ Housewife	81(65.9%)	47(51.1%)	
Monthly Income			
<1000 NIS	37(29%)	27(28%)	0.514
1001-2500 NIS	53(41%)	47(48%)	
2501-4000 NIS	27(21%)	20(20%)	
>4000 NIS	11(9%)	4(4%)	

5.1.2 Duration of diabetes ,family history and treatment among male and female participants:

There were no statistical significant differences between diabetic patients with heart disease and those not having it in regard to duration of DM, type of treatment and history of family as shown in table 4 .

Table 4:Distribution of duration of diabetes , family history and type of treatment among male and female participants .

Variable	Diabetic Patients without CVD N= 133		Diabetic Patients with CVD N=100		P –value
	male	female	male	female	
Duration of Diabetes 1-9 y	13(31%)	23(25.3%)	10(19.2%)	12(25%)	0.753
10-19 y	25(59.5%)	47(51.6%	27(51.9%)	22(45%)	
≥20 y	4(9.5%)	21(23.1%)	15(28.8%)	14(29%	
Family History First –Degree Relative	13(33%)	28(35%)	18(43%)	21(50%)	0.176
	5(13%)	7(9%)	(7%)	5(12%)	
Second Degree Relative	22(55%)	46(57%)	21(50%)	16(38%)	
Mix	24(57%)	64(70%)	20(38%)	21(44%)	

5.1.3 Diabetic patients with CVD

As we mentioned above 43% of diabetic patients were having CVD including Atherosclerosis , Heart Attack , Stroke and Myocardial Infarction .

Atherosclerosis was the highest prevalent disease among other CVD with 73%, heart attack followed by 32%,then stroke by 29% while myocardial infarction had the lowest prevalence by 14%.as shown in table 4 .

5.2Section Two :

Diabetic patients without CVD

4.2.1 Risk factors for CVD

Five risk factors for CVD among diabetic patients type 2 were studied. Those include: smoking, hypertension, dyslipidemia, obesity and physical inactivity.

In general, all risk factors among diabetic patients were high except smoking , the majority of participants were non-smokers (93.2%) as shown in table 4.4

Findings showed a statistical significant difference in T-Cholesterol and Obesity (p=0.0001) in which females had a higher prevalence of T-Cholesterol and obesity than males by 80.2% and 83.5% respectively. Moreover, results showed that 23.3% of participants were overweight.

Hypertension was observed in 88 (66.2%)participants, however there is no significant differences according to gender.

The physical inactivity risk factor was the highest in terms of prevalence among other risk factors by 86.5%. Data showed that the number of participants with moderate physical activity was12 (9%) while only 6 (14.3%)of participants exercised vigorously as shown in table 4.4.

It is important to note that P-value for physical inactivity and smoking were not computed because of the low rate prevalence .

Table 5: Distribution of CVD risk factors among insulin dependent type2 according to gender:

Risk Factors	Male = 42 (31.6%)		Female = 91 (68.4%)		Total =133 (100%)		P-value
	yes	No	yes	no	yes	No	
Hypertension	25(59.5%)	17(40.5%)	63(69.2%)	28(30.8%)	88(66.2%)	45 (33.8)	.271
T-Cholesterol	20(47.6%)	22(52.4%)	73(80.2%)	18(19.8%)	93(70%)	40 (30%)	.0001
Overweight	19(45.2%)	23(54.8%)	12(13.2%)	79(86.8%)	31(23.3%)	102 (76.7%)	0.124
Obesity (3 stages)	21(50%)	21(50%)	76(83.5%)	16(17.6%)	97(73%)	36(27 %)	.0001
Physical Activity							
moderate	7(16.6%)	35(83.3%	5(5.5%)	86(94%)	12(9%)	121 (91%)	
vigorous	6(14.3%)	36(85.7%)	0(0%)	91(100%)	6(14.3%)	127 (95.5%)	
Smoking							
Current	9(21.4**%)**	33(78.6%)	0(0%**)**	91(100%)	9(6.8%)	124 (93.2%)	
Ex-Smoker	13(31**%)**	29(69%)	0(0%)	91(100%)	13(9.8%)	120 (90.2%)	

5.2.2. Distribution of patients characteristics and CVD risk factors according to gender

The overall mean(±sd) for age of diabetic patients (133) was 60 ± 9years as shown in table 4.5 .TC , TG and LDL-Cholesterol results showed a significant difference in females within (p=.004 , (p=.002) and (p= .015) respectively. Means of TC ,TG and LDL-Cholesterol in females were higher than men by 193±45 ,195±24 and 113±40 respectively .Moreover , BMI was higher in females than males with a significant difference in (p=.006) .The mean systolic blood pressure was 134±19 and the mean diastolic blood pressure was 78± 9 as shown in table 4.5 .

Table 6:Distribuation of means for participants' characteristics and CVD risk factors by gender:

Characteristics	Male Mean ± std N= 42	Female Mean ± std N=91	Total Mean ± std N=133	p-value
Age (years)	59 ±10	60 ±9	60±9	.520
BMI (KG/M²)	30.0±4	35.2 ±6	33.6±6	.006
Systolic BP (mmHg)	135±21	134±19	134±19	.631
Diastolic BP (mmHg)	79±9	78±9	78.2±9	.127
T Cholesterol (mg/dl)	178±40	193±45	189±44	.004
LDL – C (mg/dl)	94±37	113±40	107±40	.015
HDL – C (mg/dl)	47±13	51±15	50±14	.159
Triglyceride (mg/dl)	178±25	195±24	184±17	.002
Smoking(current and ex-smoker)	20±13.2	0	20±13.2	

5.2 .3 Cardiovascular risk assessment:

The UKPDS risk engine was used to predict the risk of having non-fetal CHD, fetal CHD, non-fetal stroke and fetal stroke after 10 years .The UKPDS risk engine reflects the effect of the combined risk factors present in the patient, so, patients with higher number of risk factors are expected to predict higher risk for CHD and stroke, although this may not happen in reality.(Ahn*et al.*, 2011).

The Pearson Chi square test was done and the results showed that age is significantly associated with the risk of CHD (P=0.0001).The predicted 10-year CHD risk increased gradually as the age of participants increased. This was evident in all age groups except the age group between 35-44 years as shown in table 4.7.

On the same hand HbA1c associated significantly with the risk of Non fetal CHD with (p value (0.042) and fetal CHD with (p value (0.0001). More than half of participants 78(58.6%) had their HbA1c more than 7% which predicted high risk to CHD.

There were no association between gender, duration of diabetes blood pressure and T Cholesterol and the risk of CHD as shown in table 4.5. Current or ex-smokers predicted low to moderate risk of CHD.

Table 7:Cardiovascular risk assessment for diabetic patients

	Non-Fatal CHD				Fatal CHD			
variable	Low risk <10	Moderate 10-19.99	High ≥20	p-value	Low risk <10	Moderate 10-19.99	High ≥20	p-value
Age								
35-44	7(15.9%)	2(3.9%)	0(0%)	.0001	1(1.5%)	2(5.4%)	0(0%)	.463
45-54	21(47.7%)	12(23.5%)	1(2.6%)		7(10.8%)	7(18.9%)	3(9.7%)	
55-64	16(36.4%)	33(64.7%)	12(31.6%)		31(47.7%)	12(32.4%)	13(41.9%)	
≥65	0(0%)	4(7.8%)	25(65.8%)		26(40.0%)	16(43.2%)	15(48.4%)	
Duration of Diabetes								
1-10	20(45.5%)	21(41.2%)	15(39.5%)	.012	20(30.8%)	8(21.6%)	8(25.8%)	.582
11-20	24(54.5%)	21(41.2%)	13(34.2%)		31(47.7%)	24(64.9%)	17(54.8%)	
≥20	0(0%)	9(17.6%)	10(26.3%)		14(21.5%)	5(13.5%)	6(19.4%)	
Sex								
Male	9(18.2%)	16(31.4%)	17(44.7%)	.034	15(23.1%)	15(40.5%)	12(38.7%)	.118
Female	35(81.8%)	35(68.6%)	21(55.3%)		50(76.9%)	22(59.5%)	19(61.3%)	
SBP								
Normal	7(15.9%)	13(22.5%)	14(36.8%)	.113	13(20.0%)	9(24.3%)	12(38.7%)	.301
Prehypertension	23(52.3%)	20(39.2%)	12(51.6%)		33(50.8%)	12(32.4%)	10(32.3%)	
High (stage 1)	12(27.3%)	11(21.6%)	7(18.4%)		14(21.5%)	11(29.7%)	5(16.1%)	
HBP(stage 2)	2(4.5%)	6(11.8%)	2(5.3%)		4(6.2%)	4(10.8%)	2(6.5%)	
Hypertensive crisis	0(0%)	1(2%)	3(7.9%)		1(1.5%)	1(2.7%)	2(6.5%)	
HbA1c								
<7%	13(29.5%)	10(19.6%)	3(7.6%)	.042	23(35%)	1(3%)	0(0%)	.0001
7-8%	23(52.3%)	31(60.8%)	20(52.6%)		22(34%)	7(19%)	2(6%)	
>8%	8(18.2%)	10(19.6%)	15(39.5%)		20(31%)	29(78%)	29(94%)	
T C								
Desirable	29(65.9%)	36(70.6%)	20(52.6%)	.219	44(67.7%)	25(67.6%)	16(51.6%)	.464
Borderline high	8(18.2%)	12(23.5%)	10(26.3%)		14(21.5%)	8(21.6%)	8(25.8%)	

High	7(15.9%)	3(5.9%)	8(21.1%)		7(10.8%)	4(10.8%)	7(22.6%)	
HDL-C								
low	5(11.4%)	13(25.5%)	11(28.9%)	0.120	11(16.9%)	7(18.9%)	11(35.5%)	.134
Borderline high	24(54.5%)	26(51%)	22)57.9%)		35(53.8%)	20(54.1%)	17(54.8%)	
High	15(34.1%)	12(23.5%)	5(13.2%)		19(29.2%)	10(27%)	3(9.7%)	
Smoking	2(4.5%)	10(19.6%)	1(2.6%)	.010	9(13.8%)	1(2.7%)	3(10.0%)	.134

Non-fetal stroke risk assessment:

Age was significantly associated with the risk of non fetal stroke (P=0.0001) as per the predicted 10-year. For age group 55-64 the risk was moderate however, it was moderate-high for ≥ 65 years old as shown in table 4.8 .

Duration of diabetes and HbA1c were significantly correlated with low risk of non-fetal stroke by (p-value 0.001 and 0.0001) respectively.

Table 8:Comparison of significant RFs in diabetic patients according to stroke risk group .

	Non-Fetal stroke			
variable	Low risk <10	Moderate 10-19.99	High ≥20	p-value
Age				
35-44	9(100%)	0(0%)	0(0%)	**.0001**
45-54	33(97.1%)	1(2.9%)	0(0%)	
55-64	46(75.4%)	14(23%)	1(1.6%)	
≥65	1(3.4%)	9(31%)	19(65.5 %)	
Duration of Diabetes				
1-10 y	41(73.2%)	8(14.3%)	7(12.5%)	**.001**
11-20 y	43(74.1%)	10(17.2%)	5(8.6%)	
>20	5(26.3%)	6(31.6%)	8(42.2%)	
Sex				
Male	22(24.7%)	11(45.8%)	9(45.9)	**.053**
Female	67(75.3%)	13(54.2%)	11(55%)	
SBP				
Normal	23(25.8%)	5(20.8%)	6(30%)	**.501**
Prehypertenstion	40(44.9%)	8(33.3%)	7(35%)	
High (stage 1)	18(20.2%)	8(33.3%)	4(20%)	
HBP(stage 2)	7(7.9%)	2(8.3%)	1(5%)	
Hypertensive crisis	1(1.1%)	1(4.2%)	2(10%)	
HbA1c				

<7%	24(27%)	0(0%)	0(0%)	**1**
7-8%	30(33.7%)	1(4.2%)	0(0%)	
>8%	35(39.3%)	23(95.8%)	20(100%)	
T C				
Desirable	44(66.7%)	9(56.3%)	7(63.6%)	**.870**
Borderline high	13(19.7%)	5(31.3%)	2(18.2%)	
High	9(13.6%)	2(12.5%)	2(18.2%)	
HDL-C				
low	18(20.2%)	6(25%)	5(26%)	**.075**
Borderline high	43(48.3%)	15(62.5%)	14(70%)	
High	28(31.5%)	3(12.5%)	1(5%)	
Smoking	9(10.1	2(8.3%)	2(10.5%)	**.961**

5.2.4 : Distribution of lipid profile levels in diabetic patients according to the ATP-111classification among male and female participants:

Of the total 133 subjects, 30% had dyslipidemia (CI 95%, p =0.0001) in47.6% of males and 80.2% of females as shown in table 4.5 above.

Findings showed more than third of patients had high Triglyceride concentration in blood with a statistical significance difference (p=.012) in which males had higher prevalence than women by 38.1%

According to the NCEP ATP 111 classification border line high thresholds for TC, TG and LDL-C were ≥240,≥200 and ≥160 mg /dl respectively. Based on this categorization 13.5% had TC ≥ 240 mg/dl, 37.6% had TG ≥ 200 mg/dl and

11.3% had LDL-C ≥ 160 mg/dl. and 21.8% of participants had HDL-C <40 mg/dl.

Table 9: Distribution of the lipid profile parameters according to NCEP ATP III classification among males and females :

Variable	Males	Females	Total	p-value
	N 42 (31.6%)	N 91 (68.4%)	N 133 (100%)	
Total Cholesterol (mg/dl)				
Desirable (< 200)	27(64.3 %)	58(63.7%)	85(64%)	.921
Borderline high (200-239)	10(23.8 %)	20(22%)	30(30%)	
High (≥ 240)	5(11.9%)	13(14.3%)	18(13.5%)	
HDL-C (mg/dl)				
Low(< 40 **)**	9(21.4%)	20(22%)	29(21.8%)	.868
Borderline high (40-59)	24(57.1 %)	48(52.7%)	72(54.1%)	
High (≥ 60	9(21.4%)	23(25.3%)	32(24%)	
LDL-C (mg/dl)				
Optimal (<100)	20(48.8 %)	41(47.1%)	61(45.9%)	.874
Near optimal (100 -129)	11(26.8 %)	24(27.6%)	35(26.3%)	
Borderline high	6(14.6%	11(12.6%)	17(12.8%)	

(130 -159)	)			
High (160 - 189)	1(2.4%)	6(6.9%)	7(5.3%)	
Very high (≥ 190 **)**	3(7.3%)	5(5.7%)	8(6%)	
Triglyceride (mg/dl)				
Normal (<150 **)**	12(28.8 %)	45(49.5%)	57(42.9%)	.012
Borderline high (150 -199)	14(33.3 %)	12(13.2%)	26(19.5%)	
High (≥200)	16(38.1 %)	34(37.4%)	50(37.6%)	

5.2.5: Distribution and frequencies of physical activity intensity levels among males and females

According to the American Heart Association on physical activity to achieve overall health, one needs at least 30 minutes of moderate –intensity exercise at least 5 days /week for150 minutes. Or one needs to have 25 minutes of vigorous exercise for at least 3days for75 minutes or a combination of moderate and vigorous intensity activity.

In this study, results showed a low percentage of participants in both the moderate and vigorous physical activity groups (6.8%only) .Despite the low participation rate in physical activity in general, males had a higher participation rate than females as shown in table 4.8.Also results showed a decrease in the intensity level of physical activity, which did not reach the required level among participants such that 6.8% of participants did not exceed 600 met as shown in table 4.8.

Table 10: Distribution and frequencies of physical activity intensity levels among males and females participants .

PA intensity level	Male =42 (31.6%)	Female =91 (68.4%)	Total =133 (100%)
Inactive	29(69%)	86(94.5%)	115(86.5%)
Active			
Low Active <600 MET	5(12%)	4(4.4%)	9(6.8%)
Moderate Active >600>3000 Met	7(16.6%)	1(1.1%)	8(6%)
High Active ≥3000 Met	1(2.3%)	0(0%)	1(0.8%)

5.2.6 Sedentary lifestyle

Only 125 of 133 participants reported the number of hours they spent lying down and the rest did not. The mean was 12.1±3.3 with a range minimum of 3 hours to a maximum of 19 hours per day was consumed.

Age was significantly associated with SB (P=0.001), older age was reflected on the life style of participants with more wasted hours /day lying down .Furthermore sex and duration of diabetes were significantly associated with SB (p=.022) and p=.005 respectively

Table 11: Characteristics of study population and risk factors with compared of mean of hours of sedentary behaviors.

CHARASTARISTICS	Mean ±SD	p-value
Age		
35-44	10.67±4.62	.001
45-54	9.66±2.75	
55-64	11.71±3.38	
≥65	13.37±2.92	
Sex		
Male	10.76±3.7	.022
Female	12.72±2.99	
Duration of Diabetes		
1-9 y	12.16±3.14	.005
10-19y	11.46±3.74	
≥20 y	13.79±1.38	
BP (mmHg)		
Normal	11.74±3.88	.838
Prehypertenstion	11.77±2.2	

	3	
HBP (stage 1)	12.38±3.13	
HBP (stage 2)	14±3.08	
Hypertensive Crises	12±75	
T Cholesterol (mg/dl)		
Desirable	11.93±3.36	.334
Borderline	12.73±73	
High	11±3.17	
Triglyceride (mg/dl)		
Normal	11.99±3.49	.513
Borderline	12.28±2.39	
High	12.2±3.68	
HbA1c (%)		
<7	12.18±3.06	.548
7-8	11.46±3.61	
>8	12.31±3.34	
BMI		
Normal	12.50±3.7	.444
Overweight	11.74±3.69	
Obesity	12.19±3,25	

5.3 : Comparison of cardiovascular risk factors among diabetic patients without CVD residing in cities and villages

Our study population consisted of 133 participants of whom47 (35.3%) residing in the city, and 85 (63.9%) residing in villages and only 1(.8%) participant lived in a refugee camp. The result showed that there were no associations between risk factors for CVD and the location of residency.

Table 12**:**Means for risk factors according to residency

Risk Factor	City	Village	P-Value
SBP	135±18	133±20	.559
DBP	77±8	79±9	.271
TC	186±44	191±44	.589
HDL-C	49±13	51±15	.477
LDL-C	103±40	110±42	.365
TG	179±90	197±153	.477
BMI			
Overweight	10(21.7%)	20(23.5%)	.801
Obesity	34(73.9%)	63(74.1%)	
HbA1c			
<7%	11(23.4%)	13(15.3%)	.389
7-8%	12(25.5%)	19(22.4%)	
>8	24(51.1%)	53(62.4%)	
Physical Activity	9(19.1%)	11(13%)	
Smoking			
Current Smoker	3(6.4%)	6(7%)	
Ex- Smoker	4(10.3%)	9(11.3%)	

-HbA1c and cardiovascular risk factors predictors :

HbA1c was divided into two levels <8 and ≥8% and conducted logistic regression for risk factors including ,age, sex, duration of diabetes , family history , treatment smoking, blood pressure, total cholesterol , physical activity and sedentary behavior .the results in table 12 below showed that all risk factors for CVD were not statistically significant predictor of HbA1cin the logistic regression analysis.

All the p-values are between 0.209-0.985 which is not significant at the level of 0.05 and the odds ratio between 0.434-1.452 .

Table 13: Logistic regression analysis of cardiovascular risk factors, adjusted OR and CI 95%.

Risk Factor	P-value	OR	CI 95%
Age	.985	1.001	.881-1.137
Sex	.592	1.297	.501-3.357
Duration of Diabetes	.944	.995	.877-1.130
Family History	.589	1.452	.375-5.632
Treatment	.472	1.358	.589-3.131
Smoking	.209	.434	.118-1.595
Blood Presser	.264	.593	.237-1.484
Total Cholesterol	.960	1.024	.401-2.615
Physical Inactivity (vigorous)	.892	.873	.124-6.128
Physical Inactivity (Moderate)	.449	.580	.142-2.373
BMI	.918	.956	.410-2.231

Chapter Six

DISCUSSION AND RECOMMENDATIONDS

Introduction

This chapter is divided into two sections. Section one discussed the demographic characteristics, the duration of diabetes, family history and the type of treatment for all participants. Section two discussed the prevalence of CVD risk factors among the participants who is not suffering from CVD.

Section One

A sample of 233 diabetic patients with type 2 diabetes was studied and a total of 100 participants (43%) were diagnosed with CV diseases , the remaining portion of the sample was not having CVD comprising 31.6% of males and 68.4% of females.

The prevalence of CVD was 43% among diabetic patients, this is a high and alarming rate, indicating the importance of developing preventive, diagnostic and therapeutic interventions for managing diabetes and CV risk factors . One of the major goals in treatment of diabetic patients is to reduce CVD burden in order to improve their quality of life, and to decrease disability and premature death (Cecilia *et al.* 2016).

This result is congruent with a study done by (Wong *et al.* 2014) in inconsistent with a study by Jurado*etal* (2009)but still in agreement with this study that male participants showed a higher rate (52%) than females (48%).

The high prevalence of CVD among participants was 43% and this may be due to the fact that diabetes is an independent risk factor for heart disease. According to (Sowers *et al*. (2001)diabetes is a silent disease that may cause

heart problems before even being diagnosed. Moreover, this may refer to the ineffective treatment provided to the participants (Gædeet *al*. 2003).

61.1 Description of diabetic patients Characteristics

The mean age of participants was 60±9 (males:59±10 and females: 60 ±9).Most participants in this study were 55 years and above whereby 91% out of 100 patients have CVD. The association between age and risk of DM and CVD is still not understood and this may due to the genetic difference between elderly people , lack of understanding of the biology of aging and lack of studies about the effect treatment for elderly people(Halter et al., 2014).

The majority of participants were above the age of 55of whom a small minority (1.5%) had a university level education. This might affect their compliance with treatment and their exposure to CVD risks. Bryant et al., (2004) concluded that patients with diabetes and low literacy have poor knowledge of their disease and may have difficulties learning the advanced self-care skills needed to improve their status .

Approximately 30% of participants had a monthly income that exceeds 2500 NIS and the rest of them ranged between less than 1,000 NIS to 2,500NIS. According to the PCBS, the poverty line for a family consisting of five persons is 2,293 NIS and the extreme poverty line is 1,832NIS (PCBS, 2011).

According to Brown,(2009) The economic burden facing patients adversely affect their diseases management and contribute to exposure to CVD risks . Moreover, the bad economic conditions seem to be a strong barrier to the implementation of health policies which aim to improve the outcomes of non-communicable diseases (Weaver*et al.* 2014).On the other hand the bad economic conditions seem to be a strong barrier to the implementation of health policies which aim to improve the outcomes of non-communicable diseases (Houle, *et al.* 2016).

6.1.2 Duration of diabetes

In patients without CVD, there was no statistical significant association between the duration of diabetes and the presence of risk factors. However, results showed that participants with a duration longer than 9 years have high percentages of risk factors which may increase the risk of having CHD, stroke and other cardiovascular diseases. Wannamethee and colleagues (2011) found statistical significant association between duration of diabetes (≥8 years) and CHD risk factors.

This calls for dealing with diabetic cases with great effectiveness, screening and early detection for any early complications related to the heart or other organs. In addition ,to increasing the awareness of patients about the seriousness of diabetes early after diagnosis .

6.1.3 Family History of Diabetes

A total of 93% of participants(87.2% of male and 88.2% of females) regardless of with or without CVD reported a family history of diabetes .FH is considered as independent risk factor for type 2 diabetes (Meigs etal.2000 & Harrson . 2003).

There is no evidence of the association between genetic factors in people with history of diabetes and incidence of diabetes, however, persons with bi parental FH were at high risk of type 2 diabetes (Scott etal .,2013).

6.1.4 Prevalence of cardiovascular disease among diabetic Patients by gender

Atherosclerosis was the highest prevalent disease (73%) among other CV diseases and this may be due to insulin resistance among patients and its correlation with other metabolic syndrome including dyslipidemia and hypertension in addition to obesity (Kashyap , Defronzo.,2007&DeFronzo,Ferrannini.,1991).Heart attack prevalence was 32%,then stroke 29% while myocardial infarction had the lowest prevalence

14%.The prevalence of stroke and heart attack was higher in females than males. These findings are consistent with the Giorda study in which the incidence rate for stroke in females was 6.3per 1000 person compared to 5.5 per 1000 person . Giorda *et al.*(2007).

Section Two

6.2.1 Prevalence of Risk Factors among Diabetic patients without CVD .

Overall, the results showed a high prevalence of risk factors for CVD among type 2 diabetes patients .A high percentage of participants (86.5%) were under the lack of physical activity. Shazwani and his colleagues (2010) contributed the lack of physical activities among type 2 diabetes patients to lack of time and motivation, however, Benjamin (2015) concluded that environmental barriers such as lack of exercise facilities influenced patients participation in physical activities.

Age and sex of diabetes were statistical significant with SB. These results were congruent with Bruguara and his colleagues study in 2016where prevalence of sedentariness was higher in females than males at early and older age .(Bruguara et, al .,2016). This might be explained by the fact that 42.9% of participants elderly and in general the majority of the participants were physically inactive. Furthermore, 80% of them is out of the work force due to disease, unemployment, in addition, to the fact that55.6% of females were housewives.

Moreover, SB was statistical significant with duration of diabetes, this might be explained by the lack of motivation and persistence to introduce lifestyle changes among participants. These higher rates of physical inactivity and SB correspond with higher level of HbA1c . HbA1c is an important indicator to predict the risk of heart disease mortality and morbidity and control other risk factors. It is worthy to mention that the medical team has the responsibility to raise awareness for the patient on how to control his/her blood sugar and provide appropriate intervention in addition to treatment and to make greater

efforts to adjust the behavioral risk factors and work aggressively with diabetes incidence cases(Sotero, *et al.* 2013).

Our study showed high HbA1c levels among patients with a mean value of 8.7% (Male participants: 64.5% and female participants: 56%) and these findings are compatible with neighboring countries such as Jordan(Khattab, *et al.* 2010)and Lebanon (Noureddine *et al.* 2014) while in Canada, the situation seems to be better than in the Arab countries (Leiter, *et al.* 2013) in which 50% of participants was HbA1c level≤ 7% .

In this study, approximately84.9% of the participants were aged 55 years or older and it is found in Yang *et al.* study (1997) that aging affect HbA1c.

Duration of diabetes have impact on HbA1c level.72.9% of 133 participants had diabetes for more than 10 years and the duration of diabetes influences HbA1clevels(Verma, *et al.* 2006, Khattab, *et al.* 2010, Noureddine, *et al.* 2014).

Furthermore , high prevalence rates of obesity, physical inactivity and dyslipidemia among patients could contribute to poor HbA1c control and increase risk of CVD especially heart failure(HF) (Badran& Laher, 2012& Power & Thomas, 2011).

Obesity prevalence was high (73%) regardless of the sex while 23.3% of participants were overweight which was higher than Tanzania study (Damian *et al.* 2017) . There was statistical significant between obesity and gender; the average body weight for female participants was within moderate obesity class2, while, males were classified under obesity class 1 .This was inconsistent with the findings of two international studies from Romania and China (Adriana, 2013; Wang *et al.*, 2013).

The association between BMI and other metabolic diseases such as hypertension and dyslipidemia among diabetics was investigated by other researchers. Studies showed that a high BMI is positively associated with increased prevalence of hypertension and dyslipidemia (Bays *et al.* 2017 and Mogre, *et al.* 2014). Physical inactivity, Urbanization, unhealthy diet and

insulin resistance all these factors associated with obesity which increase risk of CVD .(Ershow,2009 & Kasuga, 2006). According to WHO, obesity, hypertension and diabetes together were responsible for 24% of the global risk of CV morbidity and mortality (WHO,2010).

Approximately , 66.2% of patients have hypertension and receive antihypertensive medication and this is higher than Mussa and his colleges study (2016) and Nouh, *et al.*(2017).There was no variation between means of systolic blood pressure (SBP) and diastolic blood pressure (DBP) between males and females. The mean value of SBP was 135 mmHg for males compared to 134mmHg for females and DBP mean values were 79mmHg and 78 mmHg for males and females, respectively. These means indicate the achievement of the desired goal of controlling systolic and diastolic blood pressure as 140mmHg/90mmHg.On the other hand, there is a high prevalence of heart diseases in our study population which requires aggressive and effective intervention to control other risk factors (Lahham, 2009; Mengesha, 2007).

Although patients with hypertension were under control by medication ,poor management of lipids was observed. Approximately 93(70%)of participants were suffering from dyslipidemia although they receive Cholesterol-Lowering drugs and these findings are higher than the findings of a study done by Zhao *et al.* (2014)

Findings showed high mean value of TC, TG and LDL-C by (189±44, 184±17 and 107±40)respectively. TC and TG showed a significant statistical association in males and females by 189±44, 184±17respectively(p= 0.004,p= 0.002) .This condition does not meet the criteria adopted by the American Diabetes Association (ADA) for treatment.

One of the approaches for treatment is statins therapy which is initiated in order to control lipids among patients in order to decrease their risk of CHD and other heart events. The ADA has adopted Standards of Medical Care in Diabetes to achieve this goal by detecting the possible target of T Cholesterol (TC)which should be <135 mg/dl, Triglycerides <150 mg/dl, LDL –Cholesterol <70 mg/dl where above of these limits should be treated and HDL-Cholesterol >50 mg/dl (Meyers *et al.* 2006).

Our results showed that two-thirds of patients 93 (70%)suffer from hypercholesterolemia(p= 0.0001)even though they were treated with cholesterol –lowering drugs. The results were consistent with earlier studies on diabetes patients in Tehran (Ghoddusi*et al.* 2008) and in Tunis (Khiari*et al.* 2006).

Means of TC, TG and LDL-C were high in our study (189±44),(184±17) and (107±40) respectively while HDL-C was within the target value (50±14).This could due to the lack of physical activity , high rate of obesity and insulin resistance(Blaton, *et al.* 2008).In addition, various medications should be used to lower T Cholesterol levels in the blood. Statins are recommended for patients with diabetes for their effective role in reducing the risk of a heart attack and stroke (American Heart Association, 2017).

The Palestinian Ministry of Health (MoH) provide only one item of Statins based on the Palestinian Essential Drugs List and this item is not available on a continuous basis. Therefore, the management of dyslipidemia currently is inefficient and needs more efforts from the MoH and medical community .

Treatment of dyslipidemia should be parallel with the control of other risk factors in the body such as smoking, obesity, physical inactivity, high blood pressure, high levels of HbA1c and modifying the drugs policy in treatment management of dyslipidemia in diabetic patients.

Smoking had the lowest rate amongst other risk factors (6.8% among males and zero percent among females).Smoking cigarettes did not have a considerable load according to the results of this study as up to 85% had never smoked. These results were consistent with the findings of studies conducted in Nablus and Tanzania studies by Lahham (2009) and Thunberg (2015).

More than two thirds (68.4%) of the sample in this study were females and 63.9% of whom lived in rural areas which are usually conservative with regards to smoking (York *et al.* 2010). so ,80% of participants were out of workforce which may refer to refrain from smoking for economic reasons .

6.2.2 Cardiovascular Risk Assessment:

As was previously mentioned the UKPDS risk assessment was used to predict the level of risk for both CHD and stroke. This tool uses modified and non-modified risk factors for each individual and computes the risk related to risk factors together **.**

Type 2 diabetic patients have two to fourfold increased risk of incidence CHD and ischemic stroke and have an increased risk of mortality by 1.5 to 3.6-fold (Sarwar, *et al.* 2010).

CHD Risk Assessment:

Age and HbA1c levels were positively correlated with an increased risk of both CHD and stroke, however, duration of diabetes correlated with stroke. Participants in this study showed a high prevalence of CVD risk factors with poor management including HbA1c, lipids and obesity.

The study found that participants aged 44 years and younger were a low risk group for the risk of CHD (fetal and non-fetal) and those who were aged > 44 years of age were at moderate to high risk. These findings were consistent with a study by Camethon, *et al.* (2010) .

Female participants had a higher risk rate (61.3%) for fetal and non-fetal CHD in comparison to55.3% in males. This, however, does not mean that the situation for male participants is satisfactory; their data showed that 44.7% had a high risk of non-fetal CHD and more than a third were at high risk to fetal CHD and this is in agreement with Zaho *et al.* (2017) and Barzi& Woodward (2006) who reported that menopausal condition and other risk factors including obesity increase the risk of CHD among females.

In this study, age is significantly associated with the risk of non-fetal CHD (P=0.0001).It can be concluded that aging with presence of other risk factors play a major risk of CHD.(Dhingra,2012). This leads to the need for early detection of diabetes and the adoption of appropriate treatment options to avoid complications of other metabolic diseases associated with diabetes (Jousilahti, *et al.* 1999).

There were no significant difference between the number of years of having diabetes and the risk of CHD. Participants with different durations of diabetes showed high rates in all categories low, moderate and high risk. This is indicative of the fact that diabetes itself, along with other factors such as age and sex, play a major role in increasing the risk of heart disease (National Heart Lung and Blood Institute (NIH), 2016).BP, TC and HDL-C contribute to increasing the risk of CHD despite of the fact that these risk factors might be under control or not.

There were no significant difference between level of TC and the risk of CHD. However, TC results showed that participants with normal or borderline concentration levels (on medication) were at high risk to non-fetal CHD (79%) and risk of fetal CHD(77.4%).This could be referred to the insulin resistance effect of each risk factor on other factors and the relation between them in addition to diabetes.

HbA1c was strongly associated with the risk of fatal CHD(P=0.0001). This means that uncontrolled HbA1c>7% had a positive influence on increasing the

risk of CHD which is consistent with the study conducted by Zhao *et al.* (2014). Therefore, it is important to maintain HbA1c levels <7% which keeps patients away from the risk of CHD.

Non-Fetal Stroke Risk Assessment

Results showed significant statistical differences between age and non fetal stroke (p=0.0001),It can be due to the fact that age acts as an independent risk factor for CVD.

Moreover, significant statistical differences was found between duration of diabetes and non fetal stroke (p=0.001).It appears that the duration of diabetes is significantly associated with the risk of ischemic stroke which is congruent to the findings of Banerjee *et al.* (2012). In addition significant statistical differences were found between HbA1c blood levels and non fetal stroke (P=0.0001).More than half of the participants had HbA1c level above 8% and this is consistent with the Chinese study's findings by Chen *et al.*(2016).

Our results showed high rates of obesity, dyslipidemia, and hypertension which work inversely with the management of diabetes and increasing the risk of stroke and other CVD. Moreover, metabolic syndrome risk factors including hypertension, dyslipidemia and obesity in addition to hyperglycemia played a serious role whether separately or together in increasing the risk of stroke (Tuttolomondo*et al.* 2015).

6.3 Locationof residency

In this study, the association between diabetic patients (without CVD) lifestyle and the presence of risk factors was investigated.47(35.3%) of diabetic patients were living in the city and 85(63.9%) in rural areas. Results showed that there was no significant statistical correlation between risk factors among diabetics according to their location of residency. However, diabetic patients living in villages showed high mean of TC,TG,LDL-C , and HDL-C which was

consistent with a study in Cameroon by Lissock, *et al.* (2011).Also results showed high mean of obesity, poor control of HbA1c blood levels and physical inactivity. These findings may refer to the need of more diabetic management awareness campaigns and outreach programs devoted to rural areas. Although diabetic patients might be encouraged by healthcare providers to perform physical exercises, long-term compliance is a major problem with physical activity programs. Many patients fail to maintain self-motivation. Moreover, Personal and environmental barriers are associated with failure to stay active (Thomas, et.al, 2004).

Conclusion :

Effective diabetic care requires first of all to identify patients at high risk of CV complications then targeting common modifiable risk factors that are associated with each other and increase the risk of CVD . Life style behaviors is one of the major obstacles in improving health status for patients with type 2.

UKPDS is considered as a specific risk engine in identify patients with type 2 at high risk of CVD ,but it is not enough that we need for essential evaluation for all applied policies in DM through offered specific intervention to primary health care such as weight reduction , maintaining HbA1c level around 8% and controlling blood pressure .

educational intervention is necessary to improve compliance of treatment , communications with medical team and improve diabetic outcomes .

Recommendations

Based on the results of this study the following recommendations were concluded:

The high prevalence of risk factors among diabetic patients shed light on the importance of having proper prevention, treatment and intervention approaches to control those risk factors.

It is of extreme important to modify the lifestyle of diabetic patients which could be achieved through continuous counseling provided by the medical team in the clinics and exchanging experiences between patients and sharing success stories in disease control and prevention in support groups.

The Ministry of Health along with other sectors has a serious role in decreasing individuals' relying on fast food by legislating laws that fight unhealthy food served in restaurants as per international health standards which decreases obesity and overweight in addition to lipids among children, teenagers and adults.

Frequent awareness campaigns about diabetes etiology, control, treatment, prevention of complications ought to be done through the use of media, schools, universities and others.

Ministry of Health should expand its surveillance and early disease detection especially in the scattered villages for better control of T2DM.

Decision-makers should take effective measures and policies for prevention monitoring and control of DM prognosis and diagnosis.

More care should be given to early detection of the CVD risk factors among diabetic patients .

Finally, there is a need for conducting similar studies to assess the prevalence rates for risk factors of CVD among diabetic patients in several areas in Palestine.

References

Abdullah S Al-Goblan, Mohammed A Al-Alfi, Muhammad Z Khan . (2014). Mechanism linking diabetes mellitus and obesity. Volume 2014:7 Pages 587—591 Dove Medical Press (Dovepress). Accessed at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4259868/pdf/dmso-7-587.pdf>

Abu Al-Halaweh A, Davidovitch N, Almdal TP, Cowan A, Khatib S, Nasser-Eddin L, Baradia Z. (2017). Prevalence of type 2 diabetes mellitus complications among Palestinians with type 2DM.Diabetes MetabSyndr.11 Suppl 2:S783-S787.

Abu-Rmeileh, *et al*. (2013). Health in the Occupaied Palestinian Territory. Volume 380, pages S3-S44. Retrieved from https://www.sciencedirect.com/journal/the-lancet/vol/380/suppl/S1

Al-Kaabi J, Al-Maskari F, Saadi H, Afandi B, Parkar H, Nagelkerke N. (2009). Physical activity and reported barriers to activity among type 2 diabetic patients in the United Arab Emirates. Rev Diabet Stud. 6(4):271–278. Retrieved from http://www.qscience.com/doi/pdf/10.5339/avi.2013.8

Al Mahmood, AK. et al. (2014). Dyslipidemia in Insulin Resistance: Cause or Effect.
Bangladesh J Med Biochem. Accessed at <https://www.banglajol.info/index.php/BJMB/article/download/18576/13011>

Amelita L.P Basa, Alan J. Garber. (2001). Cardiovascular disease and diabetes: modifying risk factors other than glucose control. The Ochsner Journal 2001; 3:132-137. Volume 3, Number 3. Accessed at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3385778/pdf/i1524-5012-3-3-132.pdf>

Angeli F, Reboldi G, Verdecchia P. (2014). Hypertension, inflammation and atrial fibrillation. J Hypertens. 2014 Mar;32(3):480-3. Accessed at <https://www.ncbi.nlm.nih.gov/pubmed/24477094>

Artham, S. M., Lavie, C. J., Milani, R. V., & Ventura, H. O. (2009).Obesity and Hypertension, Heart Failure, and Coronary Heart Disease-Risk Factor, Paradox, and Recommendations for Weight Loss.*TheOchsner Journal*, *9*(3), 124–132.

Ahn H. R., Shin M. H., Yun W. J., Kim H. Y., Lee Y. H., Kweon S. S., Rhee J. A., Choi J. S., Choi S.W. (2011). Comparison of the Framingham Risk Score, UKPDS Risk Engine, and SCORE for Predicting Carotid Atherosclerosis and Peripheral Arterial Disease in Korean Type 2 Diabetic Patients**.** *Korean J Fam Med*;32: 189-196.

Air E. L. and Kissela B. M.(2007).Diabetes, the Metabolic Syndrome, and Ischemic Stroke: Epidemiology and possible mechanisms. *Diabetes Care30*(12): 3131-3140.DOI: 10.2337/dc06-1537

Al-AdsaniA., Memon A. & Suresh A. (2002). Pattern and determinants of dyslipidemia in type 2 diabetes mellitus patients in Kuwait. *Pub Med 41*(3): 129-135.

AlmgrenT, Persson B., Wilhelmsen L., Rosengren A., Andersson O. K.(2005). Stroke and coronary heart disease in treated hypertension - a prospective cohort study over three decades.*J Intern Med. 257*(6):496-502.DOI: 10.1111/j.1365-2796.2005.01497.x

Ambachew, H., Shimelis, T., & Lemma, K. (2015). Dyslipidemia among diabetic patients in Southern Ethiopia: Cross-sectional study. *Journal of Diabetes and Endocrinology, 6*(4), 19-24.

American Heart Association (AHA). (May 2017). What is Cardiovascular Disease? Retrieved from http://www.heart.org/HEARTORG/Support/What-is-Cardiovascular-Disease_UCM_301852_Article.jsp#.Wgd4k9KWbIU

American Heart Association. (Dec 2013). Heart Disease and Stroke Statistics—2014 Update. AHA Statistical Update Website.https://doi.org/10.1161/01.cir.0000441139.02102.80

American Heart Association. (Mar2013).Statistics About Diabetes Overall Numbers, Diabetes and Prediabetes 2017 Update. Retrieved from http://www.diabetes.org/diabetes-basics/statistics/

Anokute, C. (1992). Suspected synergism between consanguinity and familial aggregation in type 2 diabetes mellitus in Saudi Arabia. Journal of the Royal Society of Health. 112(4): 167–169.

American Heart Association. (Oct 2016). What is Hypertension .Retrieved from http://www.heart.org/HEARTORG/Conditions/HighBloodPressure/GettheFactsAboutHighBloodPressure/What-is-High-Blood-Pressure_UCM_301759_Article.jsp#.Whjyg9KWbIU

Borle, A., Chhari, N., Gupta, G., &Bathma, V. (2017).Study of prevalence and pattern of dyslipidemia in type 2 diabetes mellitus patients attending rural health training center of medical college in Bhopal, Madhya Pradesh, India.*International Journal Of Community Medicine And Public Health, 3*(1), 140-144. doi:http://dx.doi.org/10.18203/2394-6040.ijcmph20151549.

BadranM. &Laher I. (2011). Obesity in Arabic-Speaking Countries, *Journal of Obesity* vol. 2011, Article ID 686430, 9 pages, 2011. doi:10.1155/2011/686430

Banerjee C, Moon Y. P., Paik M. C., Rundek T., Mora-McLaughlin C., Vieira J. R., Sacco R. L., Elkind M. S. (2012). Duration of diabetes and risk of ischemic stroke: the Northern Manhattan Study.*Stroke43*(5):1212-7.doi: 10.1161/STROKEAHA.111.641381.

Barengo, N. C., Teuschl, Y., Moltchanov, V., Laatikainen, T., Jousilahti, P., &Tuomilehto, J. (2017).Coronary heart disease incidence and mortality, and all-cause mortality among diabetic and non-diabetic people according to their smoking behavior in Finland.*Tobacco Induced Diseases*, *15*, 12. http://doi.org/10.1186/s12971-017-0113-3

Bengtsson.(2015). Self-management in hypertension care.University of Gothenberg.University of Gothenburg, Sweden. Retrieved from https://gupea.ub.gu.se/bitstream/2077/39563/1/gupea_2077_39563_1.pdf

Benjamin K. & Donnelly T. T. (2013). Barriers and facilitators influencing the physical activity of Arabic adults: A literature review. *Avicenna*. http://dx.doi.org/10.5339/avi.2013.8

Berraho, M., El Achhab, Y., Benslimane, A., EL Rhazi, K., Chikri, M., &Nejjari, C. (2012). Hypertension and type 2 diabetes: a cross-sectional study in Morocco (EPIDIAM Study). *The Pan African Medical Journal*, *11*, 52.

Bertoglia MP, Gormaz JG, Libuy M, Sanhueza D, Gajardo A, Srur A, et al. (2017). The population impact of obesity, sedentary lifestyle, and tobacco and alcohol consumption on the prevalence of type 2 diabetes: Analysis of a health population survey in Chile, 2010. PLoS ONE 12(5): e0178092. https://doi.org/10.1371/journal.pone.0178092.

Bitar, S. (2016).Improvements to the Palestinian Medical Referral System Significantly Reduce costs.Retrieved from https://www.intrahealth.org/sites/ihweb/files/attachment-files/phcpsuccessstoryaugust2016-final.pdf

Blair SN, Brodney S. (1999). Effects of physical inactivity and obesity on morbidity and mortality: Current evidence and research issues. Med Sci Sports Exerc. 1999;31(11 Suppl):S646–62.

Blaton V., Korita I., Bulo A. (2008). How is metabolic syndrome related to dyslipidemia? *BiochemiaMedica; 18*(2):14-24. http://dx.doi.org/10.11613/BM.2008.003

Brugnara L, Murillo S, Novials A, Rojo-Martínez G, Soriguer F, Goday A, et al. (2016) LowPhysical Activity and Its Association with Diabetesand Other Cardiovascular Risk Factors: A
Nationwide, Population-Based Study. PLoS ONE 11 (8): e0160959. doi:10.1371/journal.pone.0160959

Cade, W. T. (2008). Diabetes-Related Microvascular and Macrovascular Diseases in the Physical Therapy Setting. Physical Therapy, 88(11), 1322–1335. http://doi.org/10.2522/ptj.20080008

Campbell NR, Gilbert RE, Leiter LA, Larochelle P, Tobe S, Chockalingam A, Ward R, Morris D, Tsuyuki RT, Harris SB. (2011). Hypertension in people with type 2 diabetes: Update on pharmacologic management. Can Fam Physician. 2011 Sep;57(9):997-1002, e347-53. Review. Accessed at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3173417/>

Carnethon, M. R., Biggs, M. L., Barzilay, J., Kuller, L. H., Mozaffarian, D., Mukamal, K., …Siscovick, D. (2010). Diabetes and Coronary Heart Disease as Risk Factors for Mortality in Older Adults.*The American Journal of Medicine*, *123*(6), 556.e1–556.e9.http://doi.org/10.1016/j.amjmed.2009.11.023

Cecilia C. Low Wang, MD; Connie N. Hess, MD, MHS; William R. Hiatt, MD;
Allison B. Goldfine, MD.(2016). Cardiovascular Disease in Diabetes Mellitus Atherosclerotic Cardiovascular Disease and Heart Failure in Type 2 Diabetes Mellitus – Mechanisms, Management, and Clinical Considerations. Circulation 133:2459–2502.DOI: 10.1161/CIRCULATIONAHA.116.022194

Centers for Disease Control and Prevention. (Oct 2017). High Cholesterol Facts. Retrieved fromhttps://www.cdc.gov/cholesterol/facts.htm

Centers for Disease Controls and Prevention. (Nov 2017). High Blood Pressure. Retrieved from https://www.cdc.gov/bloodpressure/

Chan JC, Cho NH, Jang HC, Lim S, Kim HL, Choi SH. (2009). Cigarette smoking is an independent risk factor for type 2 diabetes: a four-year community-based prospective study. *ClinEndocrinol (Oxf).;71*(5):679-85.doi: 10.1111/j.1365-2265.2009.03586.x.

Chan JC, Cho NH, Tajima N, Shaw J.(2013). Diabetes in the Western Pacific Region-past, present and future. *Diabetes Res ClinPract.103*(2): 244-55.doi: 10.1016/j.diabres.2013.11.012

Chen R. OvbiageleB., and Feng W.(2016).Diabetes and Stroke: Epidemiology, Pathophysiology, Pharmaceuticals and Outcomes. Am J Med Sci. 351(4): 380–386 .doi: 10.1016/j.amjms.2016.01.011

Chudyk, A. and Petrella RJ.(2009). Effects of Exercise on Cardiovascular Risk Factors in Type 2 Diabetes.American Diabetes Association.*Diabetes Care*2011 May; 34(5): 1228-1237. https://doi.org/10.2337/dc10-1881

Daousi C, Casson IF, Gill GV, MacFarlane IA, Wilding JP, Pinkney JH. (2006). Prevalence of obesity in type 2 diabetes in secondary care: association with cardiovascular risk factors. *Postgrad Med J.82*(966): 280–284.

DeFronzo RA, Ferrannini E. (1991). Insulin resistance. A multifaceted syndrome responsible for NIDDM, obesity, hypertension, dyslipidemia, and atherosclerotic cardiovascular disease. Diabetes Care 14: 173-194.

Delaney J.(2009). Hypertension and Obesity: How Weight-loss affects Hypertension. Retrieved from http://www.obesityaction.org/wp-content/uploads/Hypertension.pdf

Dhingra, R. (2012). Age as a Cardiovascular Risk Factor.Med Clin North Am. 96(1): 87–91. doi:10.1016/j.mcna.2011.11.003.

DiPietro L. (1995). Physical activity, body weight, and adiposity: An epidemiologic perspective. Exerc Sport Sci Rev. 1995;23:275–303.

Eeg-Olofsson K, Cederholm J, Nilsson PM, Zethelius B, Nunez L, Gudbjörnsdóttir S, Eliasson B. (2013). Risk of cardiovascular disease and mortality in overweight and obese patients with type 2 diabetes: an observational study in 13,087 patients. *Diabetologia*. 2009 Jan;52(1):65-73. doi: 10.1007/s00125-008-1190-x

Ershow AG. Environmental influences on development of type 2 diabetes and obesity: challenges in personalizing prevention and management. J Diabetes Sci Technol. 2009;3(4):727–734.

Ewenighi, O. , Dimkpa, U. , Adejumo, B. , Onyeanusi, J. , Nnatuanya, I. , Simon, U. , Onoh, L. and Ezeugwu, U. (2012) The effect of age, gender, level of adiposity and diabetes duration on glycated hemoglobin reduction after anti-diabetic therapy in type-2 diabetic patients. *Journal of Diabetes Mellitus*, **2**, 245-250. doi: 10.4236/jdm.2012.22039.

Ezzati M, Henley SJ, Thun MJ, *et al.* (2005). Role of smoking in global and regional cardiovascular mortality. *Circulation*2005;**112***:*489–97.

Funnell, M., Tammy L. Brown, Belinda P. Childs, Linda B. Haas, Gwen M. Hosey, Brian Jensen, Melinda Maryniuk, Mark Peyrot, John D. Piette, Diane Reader, Linda M. Siminerio, Katie Weinger, Michael A. Weiss. Diabetes Care Jan 2009, 32 (Supplement 1) S87-S94; DOI: 10.2337/dc09-S087.

Gæde, P., Vedel, P., Larsen, N., Jensen G., Parving, HH., and Pedersen O. Multifactorial Intervention and Cardiovascular Disease in Patients with Type 2 Diabetes. *N Engl J Med* 2003; 348:383-393 January 30, 2003DOI: 10.1056/NEJMoa021778

Gunasekaran, U. and Gannon, M. (2011). Type 2 diabetes and the aging pancreatic B cell. AGING, 3(6): 565-575. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3164365/pdf/aging-03-565.pdf

GherbonA.(2013). Prevalence of obesity in adult patients with diabetes mellitus type 2 and autoimmune chronic thyroiditis. European Scientific Journal. 9(36): 1857 – 7881. Retrieved from http://eujournal.org/index.php/esj/article/viewFile/2213/2097

Gang H. , Jousilahti P, Barengo NC, Qiao Q, Lakka TA, Tuomilehto J. (2005). Physical Activity, Cardiovascular Risk Factors, and Mortality among Finnish Adults with Diabetes.*Diabetes Care.* 2005 Apr;28(4):799-805.

Gherbon. (2013). Prevalence of obesity in adult patients with diabetes mellitus type 2 and autoimmune chronic thyroiditis. *European Scientific Journal9*(36): ISSN: 1857–7881.

Giorda C., Avogaro A., Maggini M., Lombardo F, Mannucci E., Velussi M, Ferrannini E. (2007).Incidence and Risk Factors for Stroke in Type 2 Diabetic Patients. Stroke American Heart Association.DOI: 10.1161/01.STR.0000260100.71665.2f

Global Diabetes Community.(2009). Diabetes .Retrieved from http://www.diabetes.co.uk/what-is-hba1c.html

Halton Health Indicator Report. International Physical Activity Questionnaire. (Aug 2015) retrieved from www.halton.ca/common/pages/UserFile.aspx?fileId=137108

Hennekens CH &Buring JE.(1987). Epidemiology in Medicine. Lippincott Williams &Wilkins.Retrieved from https://www.healthknowledge.org.uk/public-health-textbook/research-methods/1a-epidemiology/cs-as-is/cross-sectional-studies

Halter JB, Musi N, McFarland Horne F, Crandall JP, Goldberg A, Harkless L, Hazzard WR, Huang ES, Kirkman MS, Plutzky J, Schmader KE, Zieman S, High KP. 2014. Diabetes and Cardiovascular Disease in Older Adults: Current Status and Future. Diabetes. 63(8):2578-89. doi: 10.2337/db14-0020.

Houle, J., François Lauzier-Jobin, Marie-Dominique Beaulieu, Sophie Meunier, Simon Coulombe, José Côté, François Lespérance, Jean-Louis Chiasson, Louis Bherer, Jean Lambert. (2016). Socioeconomic status and glycemic control in adult patients with type 2 diabetes: a mediation analysis. BMJ Open Diabetes Research and Care4:e000184. doi:10.1136/bmjdrc-2015-000184. Retrieved from http://drc.bmj.com/content/bmjdrc/4/1/e000184.full.pdf

Haffner S. M. Management of dyslipidemia in adults with diabetes. Diabetes Care. 1998;21:160–178.

Harrison TA, Hindorff LA, Kim H, et al. (2003). Family history of diabetes as a potential public health tool. Am.J.Prev.Med. 24:152–159.

Hicks. (2017). A Sedentary Lifestyle and Diabetes: Get Moving to Prevent Diabetes, Obesity and Complications. Retrieved from https://www.verywell.com/a-sedentary-lifestyle-and-diabetes-1086997

Huxley R, Barzi F, Woodward M.(2006). Excess risk of fatal coronary heart disease associated with diabetes in men and women: meta-analysis of 37 prospective cohort studies. BMJ 2006 Jan 14; 332(7533):73-8.

International Diabetes Federation.(2017). Retrieved from https://www.idf.org/sites/default/files/Chronic-disease-alliance-Final.pdf

InternationalPhysicalActivity Questionnaire (IPAQ).(2013). Retrieved from file:///C:/Users/user/Downloads/2013_IPAQ_Indicator Report.pdf

Int J Environ Res Public Health. 2012 Feb;9(2):391-407.

IPAQ-Indicator.201374.Retrieved from file:///C:/Users/user/Downloads/2013_IPAQ_IndicatorReport.pdf

Jayarama*et al.* (2012). Prevalence and pattern of dyslipidemia in Type 2 diabetes mellitus patients in a rural tertiary care center, southern India. Global Journal of Medicine & Public Health.

Jee SH, Foong AW, Hur NW, Samet JM. (2010). Smoking and risk for diabetes incidence and mortality in Korean men and women. *Diabetes Care* 2010 Dec;33(12):2567-72. doi: 10.2337/dc10-0261.

Jørgensen H, Nakayama H, Raaschou HO, Olsen TS. (1994). Stroke in patients with diabetes: the Copenhagen Stroke Study. *Stroke* 25:1977–1984 .

Jurado J, Ybarra J, Solanas P, Caula J, Gich I, Pou JM, Romeo JH. (2009). Prevalence of cardiovascular disease and risk factors in a type 2 diabetic population of the North Catalonia diabetes study.*J Am Acad Nurse Pract*. 2009 Mar; 21(3):140-8. doi: 10.1111/j.1745-7599.2008.00377.x.

Kashyap SR, Defronzo RA(2007) The insulin resistant syndrome physiological consideration.DiabVasc Dis Res 4:13-19 .

Khattaba, M., Yousef S. Khaderb, Abdelkarim Al-Khawaldehd , KamelAjlouni. (2010). Factors associated with poor glycemic control among patients with Type 2 diabetes. Journal of Diabetes and Its Complications 24: 84–89. Retrieved from https://pdfs.semanticscholar.org/ee2a/8453dc149cc45562f2bc2737df477d36a365.pdf

Kasuga M. (2006). Insulin resistance and pancreatic β cell failure. J Clin Invest. 116(7):1756–1760.

Kerner W, Brückel J.(2014). Definition, classification and diagnosis of diabetes mellitus.*ExpClinEndocrinol Diabetes.* 2014 Jul; 122(7):384-6. doi: 10.1055/s-0034-1366278

Kerry-Anne Rye, Kwok Leung Ong. (2014). HDL function as a predictor of coronary heart disease events: time to re-assess the HDL hypothesis? The Lancet Diabetes & Endocrinology, Vol. 3, No. 7, p488–489. Accessed at <https://www.thelancet.com/journals/landia/article/PIIS2213-8587(15)00205-3/fulltext>

Keto J, Ventola H, Jokelainen J, Linden K, Keinänen-Kiukaanniemi S, Timonen M, Ylisaukko-Oja T, Auvinen J. (2016). Cardiovascular disease risk factors in relation to smoking behaviour and history: a population-based cohort study. Open Heart. 2016 Jul 12;3(2):e000358.

Khdour MR, Hallak HO, Shaeen M, Jarab AS, Al-Shahed QN. (2013). Prevalence, Awareness, Treatment and Control of Hypertension in the Palestinian Population.J Hum Hypertens. 2013 Oct; 27(10):623-8. doi: 10.1038/jhh.2013.26.

Kissela BM, Khoury J, Kleindorfer D, Woo D, Schneider A, Alwell K, Miller R, Ewing I, Moomaw CJ, Szaflarski JP, Gebel J, Shukla R, Broderick JP. (2005). Epidemiology of ischemic stroke in patients with diabetes: the Greater Cincinnati/Northern Kentucky Stroke Study. *Diabetes Care* 2005 Feb; 28(2):355-9.

Klein S., Burke L., and Bray G. (2004). Clinical implications of obesity with specific focus on cardiovascular disease.Circulation 110:2952– 67.

LavieCJ.,Milani RV., Ventura, HO. (2009). Obesity and Cardiovascular Disease.Journal of the American College of Cardiology May 2009, 53 (21) 1925-1932; DOI:10.1016/j.jacc.2008.12.068

Lawes CM, Vander Hoorn S, Rodgers A. (2008). International Society of Hypertension. Lancet. 2008 May 3;371(9623):1513-8.

Lawreuce A. Leiter, Lori Berard , Keith Bowering, Allice Y Cheng. (2013). Type 2 Diabetes Mellitus Management in Canada: Is It Improving?Canadian Journal of Diabetes, 37(4): 277. Retrieved fromhttps://www.sciencedirect.com/science/article/pii/S1499267113001329

Li J, Siegrist J., (2012).Physical activity and risk of cardiovascular disease--a meta-analysis of prospective cohort studies.

Lind M, Olsson M, Rosengren A, Svensson AM, Bounias I, Gudbjörnsdottir S. (2012). The relationship between glycaemic control and heart failure in 83,021 patients with type 2 diabetes. Diabetologia. 2012 Nov; 55(11):2946-53. doi: 10.1007/s00125-012-2681-3.

Lissock, C., Sobngwi, E., Ngassam, E., &NgoaEtoundi, L. S. (2011).Rural and urban differences in metabolic profiles in a Cameroonian population.*The Pan African Medical Journal*, *10*, 1.

Litwin SE.(2008). Which measures of obesity best predict cardiovascular risk? *J Am CollCardiol52*:616–9.

Lawrence A. Leiter, Lori Berard, C. Keith Bowering, Alice Y. Cheng, Keith G. Dawson, Jean-Marie Ekoé, Carl Fournier, Lianne Goldin, Stewart B. Harris, et al. (2013). Type 2 Diabetes Mellitus Management in Canada: Is It Improving? Canadian Journal of Diabetes. 37(2): 82-89. ISSN 1499-2671. Retrieved from https://doi.org/10.1016/j.jcjd.2013.02.055.

Ma J, Wang X, Wang Y, Zhao Y, Gao M. (2014). The Relationship between Glycated Hemoglobin and Complexity of Coronary Artery Lesions among Older Patients with Diabetes Mellitus.PLoS ONE 9(3): e91972. doi:10.1371/journal.pone.0091972.

MansoubiM., Clemes S., Pearson N., Yates T. (2015). Energy expenditure during common sitting and standing tasks: Examining the 1.5 MET definition of sedentary behavior. DOI: 10.1186/s12889-015-1851-x

Mansour, A. A. (2012). Prevalence and Control of Hypertension in Iraqi Diabetic Patients: A Prospective Cohort Study. *The Open Cardiovascular Medicine Journal*, *6*, 68–71. http://doi.org/10.2174/1874192401206010068

Martínez-González MA, Martínez JA, Hu FB, Gibney MJ, Kearney J.. (1999). Physical inactivity, sedentary lifestyle and obesity in the European Union.Int J ObesRelatMetabDisord. 1999 Nov;23(11):1192-201.

69)Martín-Timón I, Sevillano-Collantes C, Segura-Galindo A, Del Cañizo-Gómez FJ. (2014). Type 2 diabetes and cardiovascular disease: Have all risk factors the same strength?World J Diabetes. 2014 Aug 15;5(4):444-70. doi: 10.4239/wjd.v5.i4.444.

Mathew*et al*. (2009). Hypertension and Dyslipidemia in Type 2 Diabetes Mellitus in United Arab Emirates. *Australian Med Jour10*(10).

Mayo clinics. (Nov 2017). Stroke.Retrieved from http://www.mayoclinic.org/diseases-conditions/stroke/home/ovc-20117264

Mayo clinics.(Aug 2017).Peripheral Artery Disease.Retrieved from http://www.mayoclinic.org/diseases-conditions/peripheral-artery-disease/basics/definition/CON-20028731

73)Mayo Foundation for Medical Education and Research. (Sept 2016). Hypertension.Retrieved fromhttps://www.mayoclinic.org/diseases-conditions/high-blood-pressure/basics/definition/con-20019580

MedicineNet, Inc. (2017). Retrieved from http://www.medterms.com/script/main/art.asp?articlekey=697

Meigs JB, Cupples LA, Wilson PW. Parental transmission of type 2 diabetes: the Framingham Offspring Study. Diabetes. 2000; 49:2201–2207. [PubMed: 11118026].

Ministry of Health.(2017). Annual Health Report.Retrieved from info.wafa.ps/atemplate.aspx?id=5119

Monnier,L. and Colette, C. (2009). Target for Glycemic Control: Concentrating on glucose.Diabetes Care 2009 Nov; 32(suppl 2): S199-S204. https://doi.org/10.2337/dc09-S310

Mubarak FM, Froelicher ES, Jaddou HY, Ajlouni KM.(2006). Hypertension among 1000 patients with type 2 diabetes attending a national diabetes center in Jordan.Ann Saudi Med. 2008 Sep-Oct; 28(5):346-51.

Mussa BM, Abduallah Y, Abusnana S (2016) Prevalence of Hypertension and Obesity among Emirati Patients with Type 2 Diabetes. J Diabetes Metab 7:638. doi: 10.4172/2155-6156.1000638.

Mousa, H.S.A., Yousef, S., Riccardo, F., Zeidan, W. & Sabatinelli,G. (2010). Hyperglycaemia, hypertension and their risk factors among Palestine refugees served by UNRWA. Retrieved from http://www.who.int/iris/handle/10665/117926

Myers VH, McVay MA, Brashear MM, Johannsen NM, Swift DL, Kramer K, Harris MN, Johnson WD, Earnest CP, Church TS.. (2013). Exercise Training and Quality of Life in Individuals with Type 2 Diabetes.Diabetes Care 2013 Jul; 36(7):1884-90. doi: 10.2337/dc12-1153.

Nathan DM, Turgeon H, Regan S. (2007) Relationship between glycated hemoglobin levels and mean glucose levels over time. Diabetologia. 2007 Nov; 50(11):2239-44.

National Cholesterol Education Program (NCEP)(Adult Treatment Panel III). Retrieved from http://circ.ahajournals.org/content/106/25/3143

National Diabetes Education Program. (2007). Retrieved fromhttps://www.niddk.nih.gov/health-information/health...programs/ndep/.../index.aspx

National Diabetes Register. Steering Committee of the Swedish National Diabetes Register (NDR).J Intern Med. 2006 Mar;259(3):314-22.

National Health, Lung, and Blood Institute (NIH). (June 2016). Retrieved from https://www.nhlbi.nih.gov/health/health-topics/topics/phys/types

National Health Report: Leading Causes of Morbidity and Mortality and Associated Behavioral Risk and Protective Factors—United States, 2005–2013. MMWR. 2014;63(04);3–27.

Niveen M E Abu-Rmeileh, Abdullatif Husseini, Simon Capewell, Martin O'Flaherty. (2013). Preventing type 2 diabetes among Palestinians: comparing five future policy scenarios. Retrieved from file:///C:/Users/user/Documents/%D8%AF%D8%B1%D8%A7%D8%B3%D8%A7%D8%AA%20%D8%A7%D9%84%D9%85%D9%86%D8%A7%D9%82%D8%B4%D8%A9/abu%20Rmeileh%20N%20preventing%20type%202%20diabetes%202013.pdf

Nouh, F., Mariam Omar and Manal Younis. (2017). Prevalence of Hypertension among Diabetic Patients in Benghazi: A Study of Associated Factors . Asian Journal of Medicine and Health 6(4): 1-11, 2017; Article no.AJMAH.35830 ISSN: 2456-8414.

Noureddine, H., Nancy Nakhoul, Amal Galal, Lama Soubra and Mounzer Saleh. (2014). Level of A1C control and its predictors among Lebanese type 2 diabetic patients. 5(3) 43–52 DOI: 10.1177/ 2042018814544890. Retreived from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4132378/pdf/10.1177_2042018814544890.pdf

OECD. (2013). Health at a Glance: OECD Indicators. *OECD publishing*. Accessed at <https://doi.org/10.1787/health_glance-2013-en2>

Palestinian Central Bureau of Statistics.(2009). Palestine in Figures, Palestine. Retrieved from www.pcbs.gov.ps/Downloads/book1661.pdf

Palestinian Central Bureau of Statistics.(2013). Health Annual Report. Palestine. Retrieved from http://www.moh.ps

Palestinian Central Bureau of Statistics.(2013). Palestinian Children –Issues and Statistics Annual Report, 2013.Retrieved from www.pcbs.gov.ps/Downloads/book1971.pdf

Palestinian Central Bureau of Statistics.(2017). Palestine.Retrieved from http://www.pcbs.gov.ps/postar.aspx?lang=ar&ItemID=1702

Palestinian Central Bureau of Statistics.(2017). Palestine.Retrieved from http://www.pcbs.gov.ps/site/512/default.aspx?tabID=512&lang=en&ItemID=703&mid=3171&wversion=Staging

Palestinian Central Bureau of Statistics.(2017). Palestine.Retrieved from www.pcbs.gov.ps

Palestinian Health Information Center (2016).General Directorate of Health Policies &Planning.Health Annual Report. Retrieved from: http://www.site.moh.ps/Content/Books/ZxRcynmiUofNqt66u4CrHRgmJR6Uv7z77srjjIEAho6xnz5V3rgLTu_RhO7xf2j2VusNiIvWkjwp84yXHLdGleB97gKrHHI5iZ9oPJ25owGEN.pdf

Palestinian Ministry of Health.(2016). Annual Report. Retrieved from http://www.moh.gov.ps/portal/wp-content/uploads/Annual-Report-2016.pdf

Pischon T, Boeing H, Hoffmann K, Bergmann M, Schulze MB, Overvad K, van der Schouw YT, Spencer E, Moons KG, Tjønneland A, Halkjaer J, Jensen MK, Stegger J, Clavel-Chapelon F. (2008). General and abdominal adiposity

and risk of death in Europe.NEngl J Med. 2008 Nov 13;359(20):2105-20. doi: 10.1056/NEJMoa0801891.

Power, C. and Thomas, C. (2011). Changes in BMI, Duration of Overweight and Obesity, and Glucose Metabolism: 45 Years of Follow-up of a Birth Cohort. *Diabetes Care* 2011 Sep; 34(9):1986-91. doi: 10.2337/dc10-1482.

Public Health Agency of Canada. Report from the Canadian Chronic Disease Surveillance System: hypertension in Canada, 2010. Ottawa, ON: Public Health Agency of Canada; 2010. Accessed at <www.phac-aspc.gc.ca/cd-mc/cvd-mcv/ccdss-snsmc-2010/index-eng.php>

Radwan M, Elsous A, Al-Sharif H, Abu Mustafa A. (2018). Glycemic control among primary care patients with type 2 diabetes mellitus in the Gaza Strip, Palestine. 9(1):3-14. doi: 10.1177/2042018817742070

Ridderstråle M, Gudbjörnsdottir S, Eliasson B, Nilsson PM, Cederholm J. (2006). Obesity and cardiovascular risk factors in type 2 diabetes: results from the Swedish

Ritchie SA, Connell JM. (2007). The link between abdominal obesity, metabolic syndrome and cardiovascular disease. Nutr Metab Cadiovasc Dis. 2007 May; 17(4):319–26. Accessed at <https://www.ncbi.nlm.nih.gov/pubmed/17110092>

Sarwar N, Gao P, Seshasai SR, Gobin R, Kaptoge S, Di Angelantonio E, Ingelsson E, Lawlor DA, Selvin E. (2010). Diabetes mellitus, fasting blood glucose concentration, and risk of vascular disease: a collaborative meta-analysis of 102 prospective studies. Lancet 2010 Jun 26;375(9733):2215-22. doi: 10.1016/S0140-6736(10)60484-9.

Setia, MS. (2016). Methodology Series Module 3: Cross-sectional Studies.Indian J Dermatol61(3): 261–264.

Shazwani, N. , Suzana S, HanisMastura , Lim CJ , Teh SC , MohdFauzee MZ , Lim HC , Dahlia S &Norliza M. (2010). Assessment of Physical Activity Level among Individuals with Type 2 Diabetes Mellitus at Cheras Health Clinic, Kuala Lumpur. Retrieved from http://nutriweb.org.my/publications/mjn0016/Shazwani(edSP)101-112.pdf

S. J. Olshansky, D. J. Passaro, R. C. Hershow et al. (2005). A potential decline in life expectancy in the United States in the 21st century. New England Journal of Medicine, vol. 352, no. 11, pp. 1138–1145, 2005.

Singh S, Issac R, Benjamin AI, Kaushal S. (2015). Prevalence and association of physical activity with obesity: an urban, community-based, cross-sectional study. Indian J Community Med. 2015 Apr-Jun;40(2):103-7.

Steven E. Kahn, Rebecca L. Hull & Kristina M. Utzschneider. (2006). Mechanisms linking obesity to insulin resistance and type 2 diabetes. Nature volume 444, pages840–846 (14 December 2006). Accessed at <https://www.nature.com/articles/nature05482>

Scott, RA, C Langenberg, SJ Sharp, PW Franks, O Rolandsson, D Drogan, et al. (2013). The link between Family History and risk of Type 2 Diabetes is Not Explained by Anthropometric, Lifestyle or Genetic Risk Factors: the EPIC-InterAct StudyDiabetologia. 56(1): 60–69. doi:10.1007/s00125-012-2715-x.

Inzucchi, S. E., Bergenstal, R. M., Buse, J. B., Diamant, M., Ferrannini, E., Nauck, M., … Matthews, D. R. (2012). Management of Hyperglycemia in Type 2 Diabetes: A Patient-Centered Approach: Position Statement of the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). *Diabetes Care*, *35*(6), 1364–1379. http://doi.org/10.2337/dc12-0413

Tailakh, A., Evangelista, L. S., Mentes, J. C., Pike, N. A., Phillips, L. R., &Morisky, D. E. (2014). Hypertension prevalence, awareness, and control in Arab countries: A systematic review. *Nursing & Health Sciences*, *16*(1), 126–130. http://doi.org/10.1111/nhs.12060

Tanasescu M, Leitzmann MF, Rimm EB, Hu FB. (2003). Physical Activity in Relation to Cardiovascular Disease and Total Mortality Among Men With Type 2 Diabetes. Circulation May 20;107(19):2435-9.

Taskinen MR. (2002). Diabetic dyslipidemia. AtherosclerSuppl 3(1):47–51.

The Free Dictionary. (Dec 2017). Retrieved from http://www.thefreedictionary.com

The Lancet, Vol. 373 March 2009.Retrieved from thelancet.com

The Oxford Center for Diabetes, Endocrinology and Metabolism. 2016. Retrieved from file:///C:/Users/user/Desktop/UKPDS%20Risk%20Engine%20_%20the%20best.html

The Oxford Center for Diabetes, Endocrinology and Metabolism.(2016).Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) Final Report. Retrieved from http://circ.ahajournals.org/content/106/25/3143

Thomas N, Alder E, Leese GP. Barriers to physical activity in patients with diabetes. Postgrad Med J. 2004;80(943):287–291.

Tuttolomondo A, Maida C, Maugeri R, Iacopino G, Pinto A. (2015). Relationship between Diabetes and Ischemic Stroke: Analysis of Diabetes-Related Risk Factors for Stroke and of Specific Patterns of Stroke Associated with Diabetes Mellitus. J Diabetes Metab 6:544. doi:10.4172/2155-6156.1000544

Uchimoto S, Tsumura K, Hayashi T, Suematsu C, Endo G, Fujii S, Okada K.. (1999). Impact of cigarette smoking on the incidence of Type 2 diabetes mellitus in middle-aged Japanese men: the Osaka Health Survey. Diabet Med. 1999 Nov; 16(11):951-5.

Unadike AC, *Eregie, A., Ohwovoriole, AE*. (2004). Prevalence of hypertension amongst persons with diabetes mellitus in Benin City, Nigeria.Nigerian Journal of Clinical Practice14(3).
http://dx.doi.org/10.4103/1119-3077.86772

Van der Berg JD, Stehouwer CD, Bosma H, van der Velde JH, Willems PJ, Savelberg HH, Schram MT, Sep SJ, van der Kallen CJ. (2016). Associations of total amount and patterns of sedentary behavior with type 2 diabetes and the metabolic syndrome: The Maastricht Study.Diabetologia 2016 Apr; 59(4):709-18. doi: 10.1007/s00125-015-3861-8.

Verma, M, Sangeeta Paneri, PreethaBadi& P.G. Raman.(2006). Effect of increasing duration of diabetes mellitus type 2 on glyated hemoglobin and insulin sensitivity. Indian Journal of Clinical Biochemistry, 21 (1) 142-146. Retreived from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3453763/pdf/12291_2008_Article_BF02913083.pdf

Van Gaal LF, Mertens IL, De Block CE. (2006). Mechanisms linking obesity with cardiovascular disease. Nature. 2006 Dec.444:875–80. Accessed at <https://www.ncbi.nlm.nih.gov/pubmed/17167476>

Weaver RR, Lemonde M, Payman N, et al. (2014). Health capabilities and diabetes self-management: the impact of economic, social and cultural resources. SocSci Med.102:58–68.

Wannamethee SG, Shaper AG, Whincup PH, Lennon L, Sattar N. (2011). Impact of diabetes on cardiovascular disease risk and all-cause mortality in older men: influence of age at onset, diabetes duration, and established and novel risk factors. Arch Intern Med. 2011 Mar 14; 171(5):404-10. doi: 10.1001/archinternmed.2011.2.

Li, W., Katzmarzyk, P. T., Horswell, R., Zhang, Y., Wang, Y., Johnson, J., & Hu, G. (2015). Body Mass Index and Heart Failure Among Patients with Type 2 Diabetes. *Circulation. Heart Failure*, *8*(3), 455–463. http://doi.org/10.1161/CIRCHEARTFAILURE.114.001837

World Health Organization (WHO).(2016). Global Report on Diabetes. Geneva, Switzerland. Retrieved from apps.who.int/iris/bitstream/10665/204871/1/9789241565257_eng.pdf

World Health Organization (WHO).Global Strategy on Diet, Physical Activity and Health Geneva, Switzerland. Retrieved from http://www.who.int/dietphysicalactivity/physical_activity_intensity/en/

Wong ND. (2014). Epidemiological studies of CHD and the evolution of preventive cardiology. *Nat Rev Cardiol* 2014;11:276–89.

World Health Organization. (2011). Health topics: obesity. Geneva, Switzerland. Accessed at <http://www.who.int/topics/obesity/en/>

World Health Organization. (2014). Fiscal Policies for Diet and Prevention of Noncommunicable Diseases. Geneva, Switzerland. Accessed at <http://apps.who.int/iris/bitstream/handle/10665/250131/9789241511247-eng.pdf;jsessionid=7E9F1BBD6B29CBC9B2CB0C83CDF412C5?sequence=1>

World Health Organization. (2015). Health profile 2015, Palestine. Geneva, Switzerland. Accessed at <http://applications.emro.who.int/dsaf/EMROPUB_2016_EN_18926.pdf?ua=1>

World Health Federation. (2017). Stroke and Hypertension. Accessed at <https://www.world-heart-federation.org/resources/stroke-and-hypertension/>

World Health Organization. (2017). 10 facts on physical Activity. Accessed at <http://www.who.int/features/factfiles/physical_activity/en/>

World Health Organization. (2018). Noncommunicable disease and their risk factors . Geneva Switzerland. Accessed at <http://www.who.int/ncds/prevention/physical-activity/introduction/en/>

World Health Organization (WHO).(2016). NCD mortality and morbidity.Geneva, Switzerland. Retrieved fromwww.who.int/gho/ncd/mortality_morbidity/en/

World Health Organization (WHO).(2006). Global Physical Activity Questionnaire (GPAQ) Analysis Guide.Retrieved from http://www.who.int/chp/steps/resources/GPAQ_Analysis_Guide.pdf

World Health Organization (WHO). (2010). Global health risks: mortality and burden of disease attributable to selected major risks. Retrieved from http://www.who.int/healthinfo/global_burden_disease/GlobalHealthRisks_report_full.pdf

World Health Organization (WHO).(2002). Physical inactivity a leading cause of disease and disability.Retrieved from http://www.who.int/mediacentre/news/releases/release23

World Health Organization (WHO).Global Physical Activity Questionnaire (GPAQ) Analysis Guide. (2006). Retrieved from http://www.who.int/chp/steps/resources/GPAQ_Analysis_Guide.pdf

World Health Organization (WHO).(2013). Global Status Report. Geneva, Switzerland. Retrieved from apps.who.int/iris/bitstream/10665/148114/1/9789241564854_eng.pdf

World Health Organization (WHO). (2004). Non-Communicable Diseases: chapter 1: burden, mortality, morbidity and risk factors. Retrieved from www.who.int/nmh/publications/ncd_report_chapter1.pdf

World Health Organization (WHO).(2011). Cardiovascular diseases (CVDs).Fact sheet N°317. Geneva, Switzerland. Retrieved from http://www.who.int/mediacentre/factsheets/fs317/en/index.html

World Health Organization (WHO). (2011). Use of GlycatedHaemoglobin (HbA1c) in the Diagnosis of Diabetes Mellitus: Abbreviated Report of a WHO Consultation. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK304271/

World Health Organization (WHO).(2011). Global status report on non-communicable diseases, 2010. Geneva, Switzerland. Retrieved from http://www.wpro.who.int/mediacentre/factsheets/fs20130311/en/

World Health Organization (WHO).(2015). Hypertension.Geneva Switzerland. Retrieved from http://www.who.int/features/qa/82/en</

World Health Organization (WHO).(2015). Physical Inactivity and diabetes.Retrieved from http://www.euro.who.int/en/health-topics/disease-prevention/nutrition/news/news/2015/11/physical-inactivity-and-diabetes

World Health Organization (WHO).(2017). Global Health Estimate NCD mortality and morbidity .Geneva Switzerland. Retrieved from http://www.who.int/healthinfo/global_burden_disease/estimates/en/index1.html

World Health Organization (WHO).(2017). Physical inactivity. Geneva Switzerland.Retrieved from http://www.who.int/mediacentre/factsheets/fs385/en/2017

World Health Organization (WHO).(2010). A comprehensive global monitoring framework including indicators and a set of voluntary global targets for the prevention and control of non-communicable diseases. Retrieved from www.who.int/nmh/events/2012/discussion_paper3.pdf

Viswanathan, M., Siddharth S., Saboo B. (2013). Current Glycemic Status and Diabetes Related Complications among Type 2 Diabetes Patients in India: Data from the A1 chive Study. SUPPLEMENT TO JAPI January 2013 VOL. 61.

Zhao W, Katzmarzyk PT, Horswell R, Wang Y, Johnson J, Hu G.. (2014). HbA1c and Coronary Heart Disease Risk Among Diabetic Patients.Diabetes Care 2014 Feb;37(2):428-35. doi: 10.2337/dc13-1525.

Zhao S., Wang Y., Mu Y., Yu B., Ye P., Yan X., Li Z., Wei Y., Ambegaonakr BM., Hu D. (2014). Prevalence of dyslipidemia in patients treated with lipid-lowering agents in China. Atherosclerosis 2014 Aug;235(2):463-9. doi: 10.1016/j.atherosclerosis.2014.05.916

Annex 1

Study questionnaire (English version)

جامعة القدس

Al-Quds University

School of Public Health

Master Degree in Health Policies and Management

Survey

Dear participants

The researcher Ghada Ibrahim Shafout is conducting a study to complete her master's program in health policies and management on the "prevalence of certain risk factors for heart disease among type 2 diabetics approved in their treatment of insulin alone, insulin and medication tablets in some diabetes clinics in Bethlehem Health Directorate". You were chosen at random among reviewers of some health centers. The participation in this research is voluntary

and the information you give is confidential and will be used only for research purposes and will not affect the service provided to you. We hope you will cooperate with us in filling out this survey.

Researcher: GhadaShafout Mobile: 0599313892

V1 No. of Questioner_____

Demographic Data

V3 Clinic: 1) Central Clinic 2)BeitFajjar 3) Za'tara

4) Alúbeidiya 5) Nahaleen

V4 Sex: 1)Male 2) Female

V5 Age in years: _____

V6 Marital Status: 1) Married 2)Single 3) Divorced 4) Widow

5) Separated

V7 Address: 1)City 2) Village / Town 3) Camp

V8 Educational Level

1) Illiterate 2) Literate 3)Elementary

2) 4) Preparatory 5) Secondary 6) Tawjehi

7)Diploma 8)Bachelor 9)H. Diploma

10) Master's and above

V19 Which of the following categories best describes your job over the past 12

Months ?

1) Government employee 2)Non-governmental employee

3) Private work or institution4) Volunteer work without pay

5)Housewife 6) Student

7) Retiree 8)Unemployed - but able to work

9) Unemployed - Unable to work10) Laborer88)Refused to answer

V10 Average monthly income / NIS:_____

S1 Part 1: History of Diabetes

S1_1 How long have you had diabetes?

The number in years:_____

99) Don't Know

S1_2 Do any of your family members have diabetes?

1) Yes 2) No (Skip to S2_4)

S1_3 If yes, please specify from: (Select all that applies)

1) Mother / Father 2) Brother / Sister 3) Son / daughter

4) uncle / aunt (father's side) 5) uncle / aunt (mother's side)

6) grandfather / grandmother

S1_4 What is the treatments prescribed by the doctor for the treatment of diabetes?

1) Only insulin 2)Insulin& medication tablet together (compound)

3) Medication tablets only

S2 Part II: Cardiology

Note: Complete the questions of this part in full and then if the respondent answered yes to any question,

S2_1 Do you have any form of cardiovascular disease?

1) Yes 2) No 3) Don't Know

If the respondent answered no or do not know go to the second part S3

If yes, complete the following questions S2_2

	Did you suffer from:	1) Yes	2) No
a	Arteriosclerosis		
b	Myocardial infarction		
c	Heart Attack		
d	a stroke		
e	Other(specify): _____		

S2_4 Do any of your family members suffer from heart disease for genetic reasons?

1) Yes 2) No **(**if not , please go to S3)

S1_5 If yes, please specify from: (Select all that apply)

1) Mother / Father 2) Brother / Sister 3) Son / daughter

4) uncle / aunt (father's side) 5) uncle / aunt (mother's side)

6) grandfather / grandmother

If yes to any of the questions of Part II thank the respondent and end thequestionnaire .

S3_1Part III: Smoking

S3_1 Do you currently smoke any of the following types of tobacco, such as cigarettes, cigars or pipes, hubbly bubbly or argeela?

1) yes 2) No 8) Refused to answer

<u>If the answer is no or no answer, go to previous smoking questions. If yes, complete the following questions</u>

S3_2 Do you smoke any of these types daily (more than one choice)

	Type of tobacco:	1) Yes	2) No
a	Cigarettes		
b	Hand-made cigarettes		
c	Bubbly/Argeela		
d	pipe		
e	cigar		

S3_3 How old were you when you started smoking:

Age (in years) ---------- 2) Don't Remember 88) Refused to answer

S3_4 On average, how many of the following tobacco products do you smoke every day in the last month?

Note: If the answer is that he does not smoke a particular type of the next we write the word (none) or zero writing and not numbers.

	Type of tobacco	The Answer

a	Cigarettes	
b	Hand-made cigarettes	
c	Bubbly/Argeela	
d	pipe	

Previous Smoking X: SMOKER

S3_5 In the past, did you smoke on a daily basis?

1) Yes 2) No 8) Refused to answer

If no or refuse to answer (go to Part 4 S4), if yes complete the following questions:

S3_6 How old were you when you stopped smoking?

Age (in years) ---------- 2) Don't Remember

How long has it been since you stopped smoking? (Only one answer) _____

S4 Part IV: Blood pressure

S4_1Have you ever been diagnosed with high blood pressure?

1)Yes 2) No 3) Don't know

If you do not or do not know (go to Part 5 of the S5), then complete the following

Questions

S4_2 How long have you been diagnosed with hypertension? (Period in years)----------

Note: if the period is less than one year please specify the number of months.

S4_3 Do you take prescription medication prescribed by your doctor?

1) Yes (go to Part V S5) 2) No 3) Do not know

S5 Part V: Lipids

S5_1 Have you ever been diagnosed with high cholesterol in your blood?

1) Yes 2) No 3) Do not know

If you do not or do not know (go to Part VI S6), if yes complete the following questions

S5_2 How long have you been diagnosed with high cholesterol (period in years)

Note: if the period is less than one year please specify the number of months

S5_3 Are you taking cholesterol-lowering drugs prescribed by your doctor ?

1) Yes (go to Part V S6) 2) No 3) Do not know

S6 Part VI: Physical activity during leisure time

First: vigorous physical activities

For the researcher: The following questions about the activities that you do during your leisure or recreation, such as sports, physical fitness, etc. (and now

I will ask you about the physical activities that you are doing during this time which lead to a significant increase in your In your heartbeat and breathing)

S6_1 Do you do any vigorousphysical activity as sports such as: running quickly or weight training, drilling, farm work or building workshop for at least 10 minutes continuously in your spare time?

1) Yes 2) No 3) Do not know 4) Refused the answer

(If the answer is no, or do not know or reject the answer, go to the question of moderate physical activity, if the answer is yes, complete)

S6_2 How many days per week do you exercise?

Please choose from 1 - 7 days of the week

Answer: _____ 77) Do not know 88) Refused to answer

S6_3 In an ordinary day, how much time (hours/ minutes) do you exercise?

Time: hour: _____ min: _____ 77 (do not know 88) refused to answer

Second: Moderate physical activity

It leads to a small increase in your heartbeat or breathing such as: walking fast, swimming, riding a bike or playing volleyball

S6_4 Do you do any physical activity of moderate intensity to maintain fitness for at least 10 minutes continuously in a day during your spare time?

1) Yes 2) No 3) Do not know 4) Refused the answer

If yes, complete, if no, do not know or reject answer, go to physical inactivity

S6_5 How many days a week do you do these moderate physical activities?

Please choose from 1 - 7 days of the week

Answer: _____ 77) Do not know 88) Refused to answer

S6_6 In a normal day: How much time (hours / minutes) do you exercise doing moderate physical activity?

Time: hour: _____ min: _____ 77) do not know 88) refused to answer

Behavioral physical inactivity:

The following question involves sitting or lying down at work or at home or going to and from different places, or with friends. This includes the loss of sitting, reading, watching television, using computers, doing handicrafts (drawing or embroidery), etc. Includes sleep times

***Calculates the total time spent sitting at work, reading, watching TV, computer, etc.)*S6_7**

S6_7 In an ordinary day how much time (hours / minutes) are you sitting or lying down (except for bedtime) ?

Time: hour: _____ min: _____ 77) do not know 88) refused to answer

---

Part 7: Laboratory Tests A1

A1 Questioner Number: _____ A2 Clinic Name: ----------

A3 Sample number in the study: _____

A4 Mobile number of the participant (if desired) ----------

Physical Measurements(S7)

Measuring blood pressure, height and weight

blood pressure

The first measurement of pressureS7_1

S7_1Systolic pressure | | | |

S7_2Diastolic pressure | | | |

The second measurement of pressure

S7_3Systolic pressure | | | |

S7_3Diastolic pressure | | | |

The third measurement of pressure

S7_5Systolic pressure | | | |

S7_6Diastolic presser | | | |

S7_8<u>Measurement of height and weight</u>

S7_8Measure length (for nearest cm) | |

S7_9 Weight measurement (for nearest kg | |

Body Mass Index (BMI)

S7_10 BMI 1) Normal weight 2) Overweight 3) Obesity

<u>Laboratory tests for HbA1C and lipid profile</u>

Note: The respondent should be fasting for 12-14 hours

S7_11 Date of withdrawal of blood sample / /

S7_12 <u>HbA1C %</u> | |

Lipid Profile

S7_14 Total cholesterol mg/dl

S7_15 HDL – Cholesterol mg/dl

S7_16 LDL – Cholesterol mg/dl

Status classification: filled by the researcher

S7_17Suffers from high cholesterol in the blood 1) Yes 2) No

S7_18Suffers from low HDL in the blood 1) Yes 2) No

S7_19Suffers from high LDL in the blood 1) Yes 2) No

S7_20Triglyceride level in Blood mg/dl

S7_21Suffers from high Triglyceride in the blood 1) Yes 2)

Annex 1

Study questionnaire (Arabicversion)

جامعة القدس

Al-Quds University

كلية الصحة العامة

ماجستير سياسات وإدارة صحية

معدل انتشار عوامل الخطورة لأمراض القلب بين مرضى السكري النوع الثاني المعالجين بالأنسولين والأنسولين والأقراص (compound) في مديرية صحة بيت لحم

الأعزاء المشاركين

تحية وبعد ،،

تقوم الباحثة **غادة إبراهيم شعفوط** بإجراء دراسة لاستكمال برنامج الماجستير تخصص سياسات وادارة صحية _ حول "معدل انتشار بعض عوامل الخطورة لأمراض القلب بين مرضى السكري النوع الثاني المعتمدين في علاجهم على الأنسولين لوحده والأنسولين والأقراص في بعض عيادات السكري قي مديرية صحة بيت لحم"، لقد وقع الاختيار عليكم ضمن عينة عشوائية من كافة المراجعين لبعض المراكز الصحية. إن المشاركة في هذا البحث طوعية والمعلومات التي تدلون بها تبقى سرية وستستخدم فقط لأغراض البحث ولن تؤثر على الخدمة المقدمة لكم ، آملين منكم التعاون معنا في تعبئة هذه الاستمارة.

الباحثة : غادة شعفوط جوال: 0599313892

V1الرقم المتسلسل للاستمارة: _____

البيانات التعريفية

V3العيادة : 1) المركزية 2) بيت فجار 3) زعترة

4) العبيدية 5) نحالين

V4 الجنس: 1) ذكر 2) أنثى

V5 العمر بالسنوات : _____

V6 الحالة الاجتماعية: 1) متزوج/ة 2) أعزب/عزباء 3) مطلق/ة 4) أرمل/ة

5) منفصل

V7 مكان السكن: 1) مدينة 2) قرية/بلدة 3) مخيم

V8 المستوى التعليمي :

1) أمي 2) ملم (يقرأ ويكتب 3) ابتدائي 4) إعدادي
5) ثانوي 6) انهى التوجيهي بنجاح 7) دبلوم متوسط 8) بكالوريوس 9) دبلوم عالي 10) ماجستير فأعلى

V9 أي من الفئات التالية يصف عملك الأساسي خلال الأنثى عشر شهرا الماضية ؟

1) موظف حكومي 2) موظف غير حكومي 3) صاحب مصلحة او مؤسسة خاصة 4) عمل تطوعي بدون اجر 5) ربة منزل
6) طالب
7) متقاعد 8) عاطل عن العمل - ولكنة قادر على العمل

9) عاطل عن العمل - غير قادر على العمل 10) عامل 88) رفض الإجابة

V10 متوسط دخل الأسرة الشهري \ بالشيكل : _____

S1 الجزء الاول: تاريخ السكري

S1_1 منذ متى وأنت مصاب بمرض السكري؟

عدد السنوات --------- 99) لا يعرف

S1_2 هل أي من أفراد عائلتك مصاب بالسكري ؟ 1) نعم 2) لا (انتقل إلى S2_4)

S1_3 إذا نعم، الرجاء التحديد من : (اختر كل ما ينطبق)

) الأم \ الأب 2) أخ \أخت 3) ابن \ ابنة

4) العم \العمة 5)الخال\الخالة 6) الجد\الجدة

S1_4 ما هي العلاجات الموصوفة من قبل الطبيب و التي تأخذها لعلاج مرض السكري

1) الأنسولين فقط 2) أقراص وأنسولين معا

S2الجزء االثاني :امراض القلب

(ملاحظة : اكمل اسئلة هذا الجزء كاملة ومن ثم اذا اجاب المبحوث بنعم على اي سؤال انهي الاستمارة)

S2_1 هل تعاني من أي مرض بالقلب ؟

1) نعم 2) لا 3) لا اعرف

(إذا أجاب المبحوث لا أو لا اعرف انتقل إلى الجزء الثاني S2)

S2_2 إذا أجاب نعم أكمل الأسئلة التالية :

	هل عانيت أو تعاني من	1) نعم	2) لا
a	تصلب أوانسداد في الشرايين		
b	هبوط في عضلة القلب		
c	أصبت بجلطة قلبية		
d	أصبت بجلطة دماغية (جلطة على الدماغ)		
e	اخرى (حدد) ----------		

S2_4 هل يعاني أي من أفراد العائلة أي من أمراض القلب لأسباب وراثية ؟

1) نعم 2) لا (اذا لا انتقل الى الجزء الثاني)

S1_5 إذا نعم، الرجاء التحديد من : (اختر كل ما ينطبق)

1) الأم \ الأب 2) أخ \ أخت 3) ابن \ ابنة

4) عم \عمة 5) حال\خالة 6)جد \جدة

(إذا نعم لأي سؤال من أسئلة الجزء الثاني اشكر المبحوث وانهي الاستمارة)

S3الجزء الثالث: التدخين

S3_1هل تدخن حاليا أي نوع من أنواع التبغ التالية مثل السجائر أو السيجار أو الغليون. , النارجيلة .....الخ 1) نعم 2) لا 88) رفض الإجابة

اذا كانت الاجابة لا او رفض الاجابة انتقل لاسئلة التدخين السابق، وإذا كانت الإجابة نعم ، أكمل الأسئلةالتالية:

S3_2هل تدخن أي من هذه الأنواع يوميا (أكثر من خيار)

	أنواع التبغ	1) نعم	2) لا
a	سجائر		
b	سجائر لف مصنعة يدويا		
c	نارجيلة		
d	غليون		
e	سيجار		

S3_3كم كان عمرك عندما بدأت التدخين:

العمر بالسنوات: _____ 2) لا أذكر 88) رفض الإجابة

S3_4في المتوسط كم من منتجات التبغ التالية تدخن يوميا خلال الشهر الماضي ؟(عدد)

(ملاحظة: إذا كانت الإجابة انه لا يدخن نوع معين من التالي نكتب كلمة (لا شيء) او صفر كتابة وليس ارقام)

	أنواع التبغ	الإجابة
a	سجائر	

b	سجائر لف مصنعة يدويا	
c	نارجيلة	
d	غليون	
	سيجار	

التدخـــــــين السابق X : SMOKER

S3_5في الماضي هل سبق لك التدخين يوميا

1) نعم 2) لا 88) رفض الإجابة

(إذا لا أو رفض الإجابة(انتقل إلى الجزء الرابع S4)، إذا نعم أكمل الأسئلة التالية

S3_6كم كان عمرك عندما توقفت عن التدخين ؟

العمر بالسنوات _____ 777) لا أتذكر

S3_7منذ متى توقفت عن التدخين ؟ (سجل إجابة واحدة فقط): _____

S4الجزء الرابع: ضغط الدم

S4_1 هل سبق وان تم تشخيصك من قبل الطبيب بارتفاع ضغط الدم ؟

1) نعم 2) لا 3) لا اعرف

(إذا لا أو لا يعرف (انتقل إلى الجزء الخامس S5)، إذا نعم أكمل الأسئلة التالية

S4_2منذ متى تم تشخيصك بارتفاع ضغط الدم ؟ (الفترة بالسنوات)؟ _____

(ملاحظة : إذا كانت المدة اقل من سنة الرجاء تحديد عدد الأشهر)

S4_3هل تتناول أدوية لعلاج الضغط موصوفة من الطبيب؟

1) نعم (انتقل إلى الجزء الخامس S5) 2) لا 3) لا اعرف

S5الجزء الخامس :الدهنيات

S5_1هل سبق وان تم تشخيصك من قبل الطبيب بارتفاع نسبة الكولسترول في جسمك ؟

1) نعم 2) لا 3) لا اعرف

(إذا لا أو لا يعرف (انتقل إلى الجزء السادس S6)، إذا نعم أكمل الأسئلة التالية

S5_2 منذ متى تم تشخيصك بارتفاع نسبة الكولسترول (الفترة بالسنوات)؟ _____

(ملاحظة : إذا كانت المدة اقل من سنة الرجاء تحديد عدد الأشهر)

S5_3 هل تتناول أدوية لخفض الكولسترول موصوفة من قبل الطبيب ؟

1) نعم (انتقل الى الجزء السادس S6) 2) لا 3) لا اعرف

S6الجزء السادس : الأنشطة البدنية أثناء وقت الفراغ

أولا : الأنشطة البدنية الشاقة

للباحث: الأسئلة التالية عن النشاطات التي تقوم بها خلال وقت فراغك أو الاستجمام كالرياضة , اللياقة البدنية ....الخ (والآن سوف أسألك عن الأنشطة البدنية الشاقة التي تقوم بها خلال هذا الوقت والتي تؤدي الي زيادة كبيرة في ضربات قلبك و التنفس).

S6_1هل تقوم في وقت فراغك بنشاط بدني شديد شاق كالرياضة مثل: الجري بسرعة أو حمل اشياء ثقيلة ،الحفر ، العمل في المزرعة أو ورشة بناء) لمدة 10 دقائق مستمرة على الأقل

1) نعم 2) لا 3) لا أعرف 4) رفض الأجابة

(إذا كانت الإجابة لا , لا أعرف أو رفض الإجابةتنقلإلى سؤال الأنشطة البدنية المتوسطة. إذا كانت الإجابة نعم أكمل)

S6_2في الأسبوع العادي كم يوما تقوم بممارسة هذه الأنشطة البدنية الشديدة

(الرجاء الاختيار من 1 – 7 عدد أيام الأسبوع)

الإجابة: _____ 77) لا أعرف 88) رفض الإجابة

S6_3في اليوم العادي، كم من الوقت(ساعة / دقيقة) تقوم بممارسة الأنشطة البدنية الشديدة

الوقت: ساعة: _____ دقيقة: _____ 77) لا اعرف 88) رفضالإجابة

ثانيا الأنشطة البدنية المتوسطة

وهي التي تؤدي إلى زيادة قليلة في ضربات قلبك أو تنفسك مثل : المشي السريع أو السباحة أو ركوب دراجة أو لعب الكرة الطائرة

S6_4هل تقوم في وقت فراغك بنشاط بدني متوسط الشدة بسيط للمحافظة علي اللياقة لمدة لا تقل عن 10 دقائق مستمرة في اليوم ؟

1) نعم 2) لا 3) لا أعرف 4) رفض الإجابة .

(إذا كانت الإجابة نعم أكمل، إذا كانت الإجابة لا أو لا أعرف أو رفض الإجابة، أنتقلإلى سؤال الخمول البدني)

S6_5كم يوما في الأسبوع العادي تقوم بممارسة هذه الأنشطة البدنية المتوسطة ؟

الرجاء الاختيار من 1 – 7 عدد أيام الأسبوع)

الإجابة: _____ 77) لا أعرف 88) رفض الإجابة

S6_6في اليوم العادي: كم من الوقت(ساعة / دقيقة) تقوم بممارسة الأنشطة البدنية المتوسطة.؟

الوقت: ساعة: _____ دقيقة: _____ 77) لا اعرف 88) رفض الإجابة

سلوكيات الخمول البدني.

السؤال التالي يتعلق بالجلوس أو الاستلقاء خلال العمل أو في البيت أو الذهاب من وإلى الأماكن المختلفة ، أو وأنت مع الأصدقاء وهذا يشمل الوقت الذي تقضية جالسا أو القراءة أو مشاهدة التلفاز أو استخدام الكمبيوتر ، عمل أشياء يدوية (رسم أو تطريز) ...الخ لكن لا تشمل أوقات النوم

(يحسب المجموع الكلي للوقت الذي يقضيه جالسا في العمل , او القراءة , او مشاهد ة التلفزيون , أو الكومبيوتر ..الخ)

S6_7في اليوم العادي كم من الوقت (ساعة / دقيقة) تمضي جالسا أو مستلقيا (ما عدا وقت النوم).

الوقت: ساعة: _____ دقيقة: _____ 77) لا اعرف 88) رفضالإجابة

S7 الجزء السابع : الفحوصات المخبرية

A1 رقم الاستمارة: _____ A2 اسم العيادة :_____

A3 رقم العينة في الدراسة : _____ A4 رقم الموبايل للمشارك (اذا رغب) :_____

قياس ضغط الدم والطول والوزن(Physical Measurements)

ضغــط الـــدم

القياس الاول للضغط

S7_1الضغط الانقباضي =

S7_2الضغط الانبساطي =

القياس الثاني للضغط

S7_3الضغط الانقباضي =

S7_4الضغط الانبساطي =

القياس الثالث للضغط

S7_5 الضغط الانقباضي =

S7_6 الضغط الانبساطي =

<u>قياس الطول والوزن</u>

S7_8 قياس الطول (لأقرب سم)

S7_9قياس الوزن (لأقرب كغم)

المؤشر الدليلي لكتلة الجسم (Body Mass index)

<u>الفحص المخبري للسكري والكوليسترول والدهنيات (Lab Tests)</u>

ملاحظة : يجب ان يكون المبحوث صائم من 12-14 ساعة

<u>السكـــري:</u>

S7_11 تاريخ سحب عينة الدم / /

S7_12 نسبة السكر التراكمي في الدم %

<u>الكوليستـــــرول:</u>

S7_14 نسبة الكولسترول الكلي في الدم: ملغم / دل

S7_15 نسبة HDL-C في الدم : ملغم / دل

S7_16 نسبة LDL-C في الدم : ملغم / دل

S7_17 يعاني من ارتفاع الكولسترول الكلي في الدم 1) نعم 2) لا

S7_18 يعاني من انخفاض HDL-C في الدم 1) نعم 2) لا

S7_19 يعاني من ارتفاع LDL-C في الدم 1) نعم 2) لا

الدهنيـــات : Triglyceride

S7_20 نسبة الدهنيات في الدم : ملغم / دل

S7_21 يعاني من ارتفاع الدهنيات في الدم 1) نعم 2