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Al-Quds University

Prevalence and Determinants of Hyperlipidemia among Blood Donors: Gaza Governorates

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Prevalence and Determinants of Hyperlipidemia among Blood Donors: Gaza Governorates

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Dedication

I would like to express my sincere gratitude to my supervisor, to my husband, to my sons, to my daughter, to my parents, sisters and brothers, to my friends, who encouraged me all the way through this study … without their support and prayer, this work wouldn't be completed …

I would like to convey my deep appreciations to all those who contributed to the completion of this thesis.

Awatif Fayez Abd El Qader

Declaration

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

Signed:

Awatif Fayez Abd El Qader

Date: …/…./….

Abstract

Introduction: Hyperlipidemia is a medical condition characterized by an elevation of any or all lipid profile and/or lipoprotein in the blood, Exposure to Hyperlipidemia in all ages makes our health in risk for cardiovascular disease, cancer, diabetes mellitus, hypertension, and other diseases, which are considered the main causes of morbidity and mortality in the world.

Objective: The aim of this study is to determine the prevalence and determinants of hyperlipidemia among blood donors in the MoH hospitals among Gaza governorates.

Method: A cross sectional study was carried out among 379 males blood donors selected proportionally according to the total population in the five governorates of the Gaza Strip with age range between 20 - 50 years. Blood donors underwent an interviewed questionnaire regarding socio-demographic information, their medical history, family history, physical activity, smoking status, diet intake, and diet habits. Weight, height, waist circumferences, and blood pressure measurements were reported. Furthermore, blood samples from the participants were collected after fasting 12 - 14 hours for assessing the lipid profile.

Results: The prevalence of hypercholesterolemia, and hypertriglyceridemia was 22.7%, and 41.2% respectively. Low High Density Lipoprotein showed a prevalence of 11.9% and high Low Density Lipoprotein of 17%. The prevalence of Total Cholesterol, Triglyceride, low High Density Lipoprotein, and high Low Density Lipoprotein increased with age, marital status, Body Mass Index (BMI), and Waist Circumferences (WC), the relationships reached High statistical significant level ($P<0.001$). Lipid profile was increased in the individuals with positive family history of diabetes and obesity. Total Cholesterol and low High Density Lipoprotein were increased among individuals who consumed sweets, salty snacks, and fried food ($P<0.05$), while Triglyceride levels increased among participants who consumed salty snacks and meat, Low Density Lipoprotein levels decreased with consuming juice. Total Cholesterol, Triglyceride, and low High Density Lipoprotein levels were high in the serum of past smoking individuals. Total Cholesterol and Low Density Lipoprotein levels were low among the participants with high physical activity. Also there was statistically significant relationship between Total Cholesterol, Triglyceride, low High Density Lipoprotein levels and diastolic blood pressure ($P<0.05$).

Conclusion: This study reveals that high prevalence of hyperlipidemia, hypertriglyceridemia, and hypercholesterolemia were found. Hyperlipidemia is associated with non-modifiable determinants as age, marital status, and family history and group of modifiable variables as obesity, lack of physical activity, and smoking. Interventions to control modifiable determinants can reduce risk for hyperlipidemia and subsequently minimize associated morbidity and mortality.

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List of Abbreviations

BB	Blood Bank
BMI	Body Mass Index
CBBS	Central Blood Bank Society
CDC	Center for Disease Control
CHD	Coronary Heart Disease
CVD	Cardiovascular Disease
DALYs	Disability-Adjusted Life Years
DNA	Deoxyribonucleic Acid
DVT	Deep Vascular Thrombosis
EDTA	Ethylene Diamine Tetraacetic Acid
EGH	European Gaza Hospital
EMC	Erythrocyte Membrane Cholesterol
FBS	Fasting Blood Sugar
GG	Gaza Governorates
GIT	Gastro Intestinal Tract
GPAQ	Global Physical Activity Questionnaire
GS	Gaza Strip
HDL	High Density Lipoprotein
HTN	Hypertension
IDL	Intermediate Density Lipoprotein
LDL	Low Density Lipoprotein
MDS	Mediterranean Diet Score
MoH	Ministry of Health
NACO	National AIDS Control Organization-India
NCDs	Non-Communicable Disease

NGOs	Non-Governmental Organization
NIH	National Institutes of Health
PCBS	Palestinian Center Bureau Of Statistics
PHC	Primary Health Care
PHIC	Palestinian Health Information Centre
PRCS	Palestinian Red Crescent Society
RII	Relative Importance Index
SD	Standard Deviation
SoP	State of Palestine
SPSS	Statistical Package for Social Science
TC	Total Cholesterol
TG	Triglyceride
TSH	Thyroid Stimulating Hormone
UNRWA	United Nations Relief and Works Agency
VLDL	Very Low Density Lipoprotein
VOO	Virgin Olive Oil
WB	West Bank
WC	Waist Circumferences
WHO	World Health Organization
WHR	Waist Hip Ratio

Chapter 1:
Introduction

1.1 Backgrounds

Hyperlipidemia is a medical condition characterized by an elevation of any or all lipid profile and/or lipoprotein in the blood. It is divided into two subtypes familial Hyperlipidemia, also called primary and caused by specific genetic abnormalities, and acquired, also called secondary which is resulting from another underlying disorder that leads to alterations in plasma lipid and lipoprotein metabolism (Farooq, 2013). American heart association defined hyperlipidemia as high level of fats in the blood (Hassan, 2013). These fats, called lipids include Cholesterol and Triglycerides. There are different types of hyperlipidemia depending on which lipid levels are high in the blood. First is Hypercholesterolemia, in which there is a high-level of Cholesterol and the second is Hypertriglyceridemia, in which there is a high-level of Triglycerides, the most common fat form. In addition, hyperlipidemia may be idiopathic, that is without known cause. The fat-protein complexes in the blood are called lipoproteins. The best-known lipoproteins are Low-Density Lipoprotein (LDL) and High-Density Lipoprotein (HDL). Excess of Low Density Lipoprotein Cholesterol contributes to the blockage of arteries, which eventually leads to heart attack (Nirosha et al., 2014).

Globally, a third cause of ischemic heart disease is attributable to High Cholesterol level, raised Cholesterol is estimated to cause 2.6 million deaths (4.5% of total deaths) and 29.7 million disabilities, the global prevalence of raised Total Cholesterol among adults in 2008 was 39%, 37% for males, and 40% for female (WHO, 2008). Prevalence of Hypercholesteremia in Egypt, Jordan, and Iraq was estimated: 39%, 48.8%, and 44% among adults (Musaiger & Al-Hazzaa, 2012). On the other side, many factors that cause hyperlipidemia, like hereditary factors, a diet high in saturated fat and cholesterol increases blood cholesterol and triglyceride levels, diabetes mellitus, kidney disease, and hypothyroidism (Navar-Boggan et al., 2015). Certain drugs, such as estrogen, corticosteroids, retinoid, protease inhibitors, thiazide diuretics, and beta-blockers, may cause hypertriglyceridemia (Herink & Ito, 2015). Obesity, chronic, excessive alcohol use increases the risk of hypertriglyceridemia. Smoking and lack exercising may lead to hyperlipidemia (Perk et al., 2012). Some of these determinants are not modifiable like hereditary factors but others can be modifiable and preventable.

Blood donors are considered an important group in our country and they represent the healthy population. In our study, we try to identify the main determinants of hyperlipidemia among blood donors in Gaza Strip, which is considered the main cause of cardiovascular, coronary heart, and cerebrovascular disease.

1.2 Research problem

In the recent decades, Non Communicable diseases (NCDs), which called also chronic diseases, had been become the primary causes of mortality and morbidity for women and men in the world. According to Palestinian Ministry of Health, (2014) the 10 leading cause of deaths in West Bank was Cardiovascular diseases 29.5%, Cancer deaths 14.2%, Cerebrovascular diseases 11.3%, Diabetes mellitus 8.9%, Respiratory system diseases 5.4%, Prenatal Period Conditions 5.2%, Accidents 5%, Renal failure 3.9%, Infectious disease 3.3% and Senility 3.1%. Most of the NCDs like Cardiovascular, Cancer, Cerebrovascular, Diabetes Mellitus, and Hypertension are associated with Hyperlipidemia, There is no data available about Hyperlipidemia among healthy population in Gaza Strip, and we are not familiar with the variation of hyperlipidemia among the population in Gaza Strip. Blood donors reflect healthy population in Gaza, we will try to identify the prevalence and main determinants of Hyperlipidemia among these blood donors, this will help in putting plans in the future by decision makers to control Hyperlipidemia which is strong associated with NCDs.

1.3 Justification

Exposure to hyperlipidemia in all ages makes our health in risk for cardiovascular disease, cancer, diabetes mellitus, hypertension, and other diseases, which are considered the main causes of morbidity and mortality in the world. Hyperlipidemia is caused by several factors; most of them are preventable factors, so we need to conduct this study on the healthy population in Gaza Strip Governorates to identify the prevalence and determinants of hyperlipidemia. This will help to focus on the preventable factors to avoid Hyperlipidemia and this will help in future other researchers and decision makers to improve their programs and plans to prevent Hyperlipidemia and avoiding several diseases, which play the major causes of death in Gaza Strip.

1.4 General objective

Measuring of the prevalence and determinants of hyperlipidemia among blood donors in Gaza Strip

1.5 Specific objectives

1. To identify the prevalence of hyperlipidemia among blood donors in Gaza governorates
2. To identify the relationship between hyperlipidemia and sociodemographic factors
3. To verify the relationship between hyperlipidemia and lifestyle
4. To examine the relationship between hyperlipidemia and morbidity
5. To examine the relationship between hyperlipidemia and obesity
6. To examine the relationship between hyperlipidemia and family history

1.6 Study context

1.6.1 Demography and socioeconomic context:

Gaza Strip is located in the Middle East at (31°25′N, 34°20′E), on the eastern coast of the Mediterranean Sea, to the north of Egypt and the west southern edge of Palestine. It is approximately 41 km long, and between 6 and 12 km wide, with a total area of 362 km^2 (Arnon, 2007) . The Gaza Strip has an arid climate, with mild winters, and dry, hot summers subject to drought. Environmental problems include decertification; salinity of fresh water; sewage treatment; water-borne disease; soil degradation; and depletion and contamination of underground water resources.

The total population of Palestine at mid of 2015 was about 4.68 million, 2.38 million males and 2.3 million females. The estimated population of the Gaza Strip totaled 1.82 million of which 925 thousand males and 895 thousand females (PCBS, 2015).

The economic situation in the SoP is a complex problem as the economy has been deteriorating especially in the GS. The ongoing deterioration economic situation in the GS lead to rise in the unemployment rate to 44% in 2013 and to increase in the poverty rate to unprecedented level. In 2013, 80% of households live under the poverty line (UNRWA, 2015).

1.6.2 Health status context

The population in Palestine is in epidemiologic transition, with the burden of the no communicable disease rising. In 2014, heart disease was the leading cause of death in the West Bank, causing 31.2% of all reported deaths (PHIC, 2014). Cancers when combined together were the second leading cause of death, accounting for 14.2% of reported deaths, followed by cerebrovascular disease (11.3%), diabetes mellitus (8.9%) and infant diseases and prenatal conditions (5.2%). This disease burden has contributed to the increasing in costs in the health sector and necessitates a greater focus on health prevention and integrated disease management. In spite of the protracted crisis and as noted by the Palestinian Ministry of health with the support of the international community, achievements have been made in relation to some health indicators in recent years although they compare negatively to health indicators in Israel. In 2014 and according to Palestinian Health Information Centre PHIC (2014), life expectancy was 71.3 years for men and 74.1 years for women, under-5 mortality rate dropped to 14.9, and infant mortality rate decreased to 12.6 per 1000 live births. Vaccination coverage is close to 100%, women receive antenatal care, and 99.7% of registered newborns are delivered in hospitals. Communicable diseases are under control. The Gaza Strip experienced an outbreak mumps since April 2013, which has continued to spread at an increasing rate. In addition, viral meningitis outbreak, started in March 2014 and has continued to spread but at a decreasing rate. The incidence of tuberculosis is lower than in the surrounding countries and the Palestinian territory is poliomyelitis free (Palestinian National Institute of Public Health. Vaccine preventable diseases in Palestine & Health, 2014). In the Gaza Strip, more than 6000 people with disabilities and injuries that require rehabilitation are particularly vulnerable. According to the WHO estimates of up to 20% as the prevalence rate for mental disorders among emergency affected population, up to 360 000 people could be suffering psychological trauma and would need interventions. These numbers may underestimate the real burden of disease in Gaza Strip.

1.6.3 Health services

The ministry of health provides health services to Palestinians under its jurisdiction in accordance with the Palestinian Basic Low, which serves the interim constitutions, and the Public Health Low. Ministry of Health (MoH), UNRWA, Nongovernmental Organizations (NGOs) and the private sector, delivers health services in Gaza strip. The Ministry of

Health is responsible for the largest network of facilities, with 472 (PHCCs, 418 in the West Bank and 54 in Gaza Strip) and 26 hospitals (13 in the West Bank and 13 in Gaza Strip) with 2857 beds in the WB and GS (PHIC, 2014). Nongovernmental organizations play an important role in service delivery, especially in providing tertiary, ambulatory, and rehabilitative care services. In 2014, Nongovernmental Organizations operated 137 PHC centers (129 in the West Bank and 8 in Gaza Strip) and 34 hospitals (20 in the West Bank and 14 in Gaza Strip), supplying about one-third of bed availability, in the occupied Palestinian territory. They are important providers especially for mental health counseling, physical therapy, and rehabilitation.

UNRWA provides services mainly through fixed and mobile primary health care clinics, as well as contracted hospitals to registered refugees: to 727 471 people in the West Bank through 42 primary health centers and one hospital, and to 1 167 572 people in Gaza Strip through 22 primary health centers and about 74% of eligible refugees utilized UNRWA's health services in 2014 (UNRWA, 2014).

The private health sector is growing; in 2014 there were 16 private hospitals, supplying 8.6% of bed capacity, as well as pharmacies, laboratories and rehabilitation centers. A pharmaceutical industry has also developed, which is able to supply about one half of total Palestinian demand for prescription medicine (PHIC, 2014).

The Ministry of Interior runs 23 primary health care clinics and three hospitals for military employees, but not their families.

The surveillance system for communicable diseases in the occupied Palestinian territory is robust and well established. The Central Public Health Laboratory in Ramallah and its affiliate in Gaza Strip conduct public health related investigations concerning water and food safety, vector and waste control. In spite of the diverse access barriers within the occupied Palestinian territory, delays of transporting samples were reported as rare occurrences. A lack of reagents, some laboratory capacity and training opportunities was noted, however.

Emergency medical services are transitioning gradually to a system whereby all ambulances (including from private providers) will be registered with the Ministry of Health and coordinated by the Palestinian Red Crescent Society (PRCS), which is the main ambulance provider with 144 ambulances, 27 centers and sub-centers, two training institutes and about 350 employees. One ambulance center with three types of ambulances (for emergency transport, patient transportation and for dead bodies) per 30 000 inhabitants is planned. A fixed fee per kilometer will be charged to the patients.

1.6.4 Blood Donation

1.6.4.1 Importance and uses of Blood transfusion

Blood transfusion is an essential component of health care, which saves millions of lives each year. Every second, someone in the world needs blood for surgery, trauma, severe anaemia or complications of pregnancy/delivery (WHO, 2008).

World Health Organization (WHO) gives high priority to availability of adequate safe blood throughout the world. Realizing its universal importance, the theme of the WHO Day for the year 2000 and then for the year 2007 was dedicated to safe blood with thought provoking slogan of "*Safe blood starts with me. Blood saves life. Safe blood starts with the donor security*" (Sujatha, 2007) with great emphasis on safe blood for sick, injured and also safe motherhood.

The highest ratios of blood transfusions apply to hospitals with more specialized needs as complex surgical procedures, such as cardiac surgery (4 units at least per each patient). Blood is universally required for the management of patients suffering from cancer, kidney diseases and blood diseases such as Aplastic anaemia, Thalassaemia (around 300 patients in Gaza), sickle cell disease, haemophilia (around 100 patients in Gaza) severe iron deficiency anaemia and leukaemia (Hamad, 2010). However, the pattern of blood usage differs markedly across the globe. In developed countries, transfusion is most commonly used to support advanced medical and surgical procedures, including trauma, cardiovascular surgery, neurosurgery, and transplantation. In countries where diagnostic and treatment options are limited, a much greater proportion of blood is used to treat women with obstetric emergencies and children suffering from severe anaemia, often resulting from malaria and malnutrition. Globally, more than half a million women die each year during pregnancy, childbirth or in the postpartum period – 99% of them in the developing world (WHO, 2008). About 25% of those deaths are caused by severe bleeding during childbirth, making this the most common cause of maternal mortality (WHO, 2008).

1.6.4.2 Needs for blood donation

While the need for blood is universal, millions of patients requiring transfusion do not have timely access to safe blood and there is a major imbalance between developing and industrialized countries in access to safe blood. Of the estimated 80 million units of blood donated annually worldwide, less than 45% is collected in developing countries, home to 80% of the world's population (WHO, 2008). The average number of blood donations per 1,000 population is 10 times higher in high-income countries than in low-income countries. Developed countries use approximately one unit of RBCs for every 20 members of their population every year (around 5% of the population donate). Thus, the US with a population of 280 million, collects approximately 14 million units of RBCs each year and in Britain with 60 million, approximately 3 million. Almost all of this blood is used locally to provide routine medical care and treat victims of injury. Disasters and war both create additional injury victims in need of blood and remove individuals from the donor population (Hess and Thomas, 2003). Whole blood donors may donate every 56 days while plasma donors may donate twice a week. Platelets donors may donate a maximum of 24 times per year. Other specialized donations are subject to other rules (WHO, 2008).

Hess and Thomas, (2003) reported disasters and war also increase the inefficiencies in a blood supply system. Supplying the US force in Bosnia with RBCs for five years from 1995 to 2000 required approximately 5600 units to ensure that the 79 units actually used were available when needed.

Blood Banks/centers are responsible about organizing the blood service, recruitment of donors, collection, processing, storage and distribution of blood and blood components, in addition operate laboratory investigations, participation in clinical use of blood and blood components, teaching and training, finally research and development (National AIDS Control Organization-India -NACO, 2007). However, blood collection can be done either at a static donor session at the blood center or at outdoor mobile donor sessions. In addition, to guidelines for indoor collection of blood, standard operating procedures should also be provided for outdoor donor sessions, which should be monitored (WHO, 2008). Outdoor collections organized at crowded places, in open grounds, gardens and other places with unclean environment, may lead to contamination of blood, and should therefore be discouraged.

1.6.4.3 Types of blood donors

- **Voluntary Blood Donor (Non-Remunerated)**

A person who gives blood, plasma or other blood components of his, her own free will and does not receive payment for it, either cash or kind which could be considered a substitute for money, this includes time off work (WHO, 2008).

- **Regular voluntary donor**

A voluntary non-remunerated blood donor who donates blood on a regular basis without any break for a longer duration between two donations or a voluntary non-remunerated blood donor who has donated at least three times, the last year and continues to donate regularly at least once per year (NACO, 2007).

- **Family Replacement Blood Donor**

A family replacement donor is one who gives blood when a member of his, her family or community requires it (NACO, 2007). A member of the family or a friend of the patient who donates blood in replacement of blood needed for the particular patient without involvement of any monetary or other benefits from any source (Sujatha, 2007).

- **Paid professional Blood Donor**

A donor whose donates blood in exchange of money or other form of payment (NACO, 2007)**.**

- **Forced Blood Donor**

A person who is not willing to donate blood on his, her own but is being forced by their superiors or employer for donation, there is always a fear of losing one's own job or promotion (Sujatha, 2007).

- **Autologous Blood Donor**

A patient who donates his/her blood to be stored and rein fused, if needed during surgery to avoid or reduce the need for an allergenic blood transfusion. The patient themselves acts as a blood donor (NACO, 2007).

- **Aphaeresis' Donor**

A donor who donates only one of their blood components through the process of cell separation this donor may be either voluntary or replacement donor (Sujatha, 20007). Life-saving resource of blood from donors to recipients, blood is a unique resource in that it is supplied through volunteer donors (Cant, 2006). Donate blood save a life (NACO, 2007).

Cant (2006) wrote blood is not something that can be manufactured or produced by machines. It must be given by healthy, charitable adults who are willing to donate their own blood for the use of complete.

1.6.4.4 Blood Bank Services in Gaza

In Gaza, the need for blood donation is increasing not only for ordinary cases such as delivery, operations, anaemia, chronic diseases, and so on but also to save patients injured from the political conflicts, internal division and un-intentional injuries. Both MoH and other sectors offer Blood bank services inside major hospitals. Each governorate in Gaza is almost self-sufficient of blood with few exchanges among them. In the Gaza Strip, there are 7 Blood banks within hospitals; six belong to MOH and one to an NGO's facility. In addition, MOH laboratories and Blood Bank Directorate is responsible for the overall blood transfusion services. The NGO's Blood banks are working under the MOH technical supervision (MOH, 2009).

MOH owns and operates 10 hospitals in Gaza Strip, which mostly receive victims and injured and also treat complicated cases which require sophisticated care including blood transfusions. MOH hospitals provide blood units to other NGOs such as Al-Awda, El Salam and Ahli Arab Hospitals. Also, people with bleeding tendencies such as Haemophilia (around 100 patients in Gaza) and Thalassaemia (around 300 patients in Gaza) are treated within the MOH hospitals. MOH reports indicate that the annual use of blood in the Gaza Strip is around 35,000 units; more than 60% of these units are provided through family replacement (MOH, 2009).

A study conducted in 2009 to evaluate the blood bank services during the OCL revealed that health providers reported that stocks and consumables ran out during the war, screening kits ran out as reported by 46% of lab staff, 16% reported that blood bags ran out (Abu Zanada, 2010). Additionally, 9% reported lack of blood group typing reagents, and 24% reported lack of alcohol. More importantly, 26% reported experiencing shortages of blood units needed for rescuing victims. 39% reported shortages in O- Negative (O-ve) blood units, 34% reported shortages of fresh frozen plasma, and 28% faced shortages of cryoprecipitate during the war. In addition, 72% reported shortages of items needed for separating blood components (Abu Zanada, 2010).

According to the same study, 68.8% of the blood bank director's reported absence of national guidelines on donation and transportation of blood and blood products, no national guidelines on storage of blood and blood components were available. Regarding hazardous wastes disposable, 34% discarded wastes into the sewage system, 33%-discarded wastes with other domestic wastes (general wastes) and 21% discarded liquids in the sink.

90% of blood bank managers and staff reported inadequacy of the donation areas. Regarding blood donation chairs, 10% of blood bank staff reported not having any donation chairs, and 87% disagreed that the number of donation chairs were sufficient for working during crises (Abu Zanada, 2010).

The increased number of injuries has resulted in increasing the demand for the blood units, and managers compensated that by volunteers donation (93.8%), 37.5% by camping during the war, 75% were supplied by other local blood banks, 31.3% had encouraged volunteers inside hospitals to donate during the war. In addition, 87.5% received blood units from regional countries particularly from Egypt, Jordan, Saudi Arabia, Turkey and Lebanon. Donations from charity organizations including MAP and Arab countries beside the blood included; disposable (64.3%), blood bags (35.7%) reagents (28.6%) as reported by Abu Zanada (2010).

The Central Blood Bank Society in Gaza has been established in 1971 with the aim of ensuring the availability of blood units and its derivatives to the needy population. The CBBS succeeded in its fight to compact blood trade (Remunerated professional blood donors) which was common phenomenon in Gaza in sixties and seventies. CBBS also increases awareness of the local population about the importance of blood donations. So far, CBBS is regarded as a key player for the supply of hospitals with blood units and works with all providers regardless of their affiliation, sector, and status. The organization operates through its three offices located in Gaza Strip as follows; Gaza centre (the main office), Khanyounis centre and Rafah centre. Each year, around 7000-8000 blood units are dealt with at the CBBS (CBBS records). CBBS contributed to saving the life of tens of thousands of sick and injured. Around 20 persons work as full timers in CBBS plus many volunteers among them, 16 are laboratory technicians. Historically, the organization is recognized as a well-respected delivering high quality blood donation services to all the people of the Gaza Strip. Recently, the organization developed an electronic database record of blood donations and for rare blood groups (Hamad, 2010).

According to Palestinian ministry of health there are 26 blood banks in Palestine (WB: 19/GS: 7). Seven B.B. belong to MoH, twelve to NGOs and private hospitals in west bank (WB). While, in Gaza Governorates (GG) there are one belongs to NGOs facility (the central B.B. Society with two branches is only NGOs blood bank) and other blood banks to MoH. Services of B.B. are mostly hospital based. Each governorate is almost self sufficient of blood and blood products with minimal exchange among them. In Palestine MoH laboratories and B.B. directorates is responsible for overall blood transfusion services. Private and NGOs B.B. are supervised by MoH and follow the same regulations and rules as MoH blood banks do (Abu-Zinada, 2010). The total number of blood donors was 42 406, of whom 30.7% were voluntary donors, while 69.3% donated blood to a relative or friend. Laboratory tests for blood-borne diseases are carried out on all units of donated blood prior to transfusion (MoH, 2013).

1.7 Operational definitions

Hypercholesterolemia

Cholesterol is a fat-like substance produced by our bodies and found only in food of animal origin. Our tissues make 75% of the cholesterol in our bodies. The rest comes from the foods we eat. A total cholesterol level of less than 200 mg/dl is normal, a total cholesterol level of 200 to 239 mg/dl is borderline high, and if a total cholesterol level greater than or equal to 240 mg/dl is high (Williams, 2002).

Hypertriglyceridemia

Triglycerides are also fatty substances found in your bloodstream, coming from food and liver, Triglyceride levels are divided as follows: Normal is less than 150 mg/dl, borderline high 150 to 199 mg/dl, high level 200 to 499 mg/dl, and very high greater than 500 mg/dl (Williams, 2002).

High Density Lipoprotein (HDL)

Lipoproteins are combination of fats and proteins, and they are the form in which lipids are transported in the blood, HDL transports cholesterol from tissue of the body to the liver, a level greater than or equal to 60 mg/dl is excellent, while levels of HDL cholesterol less than 40 mg/dl are lower than desired (Williams, 2002).

Low Density Lipoprotein (LDL)

Lipoproteins, which are combination of fats and proteins, are the form in which lipids are transported in the blood. LDL transports the cholesterol from the liver to the tissue of the body, and good levels are <130 mg / dl (Grundy et al., 2004)**.**

Hypertension (HTN)

Hypertension is defined as any individuals who have a blood pressure reading equal or greater than 140/90 or who has reported by a physician that have hypertension (Perk, et al., 2012).

Smoker

According to CDC, smoker defined as anyone who smoked 100 cigarettes in their lifetime and currently smokes cigarettes every day or some days (CDC, 2010).

Never smoker

According to CDC, never smoker defined as anyone who never smoked a cigarette or who smoked fewer than 100 cigarettes in their entire lifetime (CDC, 2010).

Body mass index (BMI)

Body mass index (BMI) is a measure of body fat based on height and weight that applies to adult men and women; it can be derived from the formula:

BMI= weight (kg)/height^2(m^2), Normal BMI range: 18.5 kg/m^2 - 25 kg/m^2 (Barba, et al., 2004).

Obesity

Obesity is defined as any individuals who have a BMI equal or greater than 30 kg/m^2 (CDC, 2011).

Overweight

Over weight defined in this study as any individuals who have a BMI between 25 and 29.9 kg/m^2 (CDC, 2011).

Normal weight

Normal weight defined in this study as any individuals who have a BMI between 18.5 and 24.9 kg/m^2 (CDC, 2011).

Waist circumferences (WC)

According to the National Institution of health (NIH) protocol, WC measurement is taken at the level of the superior border of the iliac crest and parallel to the floor (NIH, 2006). Cut off was ≥ 94 cm.

Physical activity

It's defined as any body movement produced by skeletal muscles and require energy expenditure (WHO, 2009). It's classified as vigorous, moderate, light activity or in active (Al Asadi, 2010)

Chapter 2:

Literature Review

Hyperlipidemia poses one of the greatest public health problems for the 21st century, with particularly alarming trends in several parts of the world.

This chapter starts with the explanation of the conceptual framework of the study. Definitions classification and consequences of hyperlipidemia are presented. Then prevalence of hyperlipidemia internationally and in some Arabic regions is also discussed. Moreover, the determinants associated with hyperlipidemia are explained based on the review of the related literature.

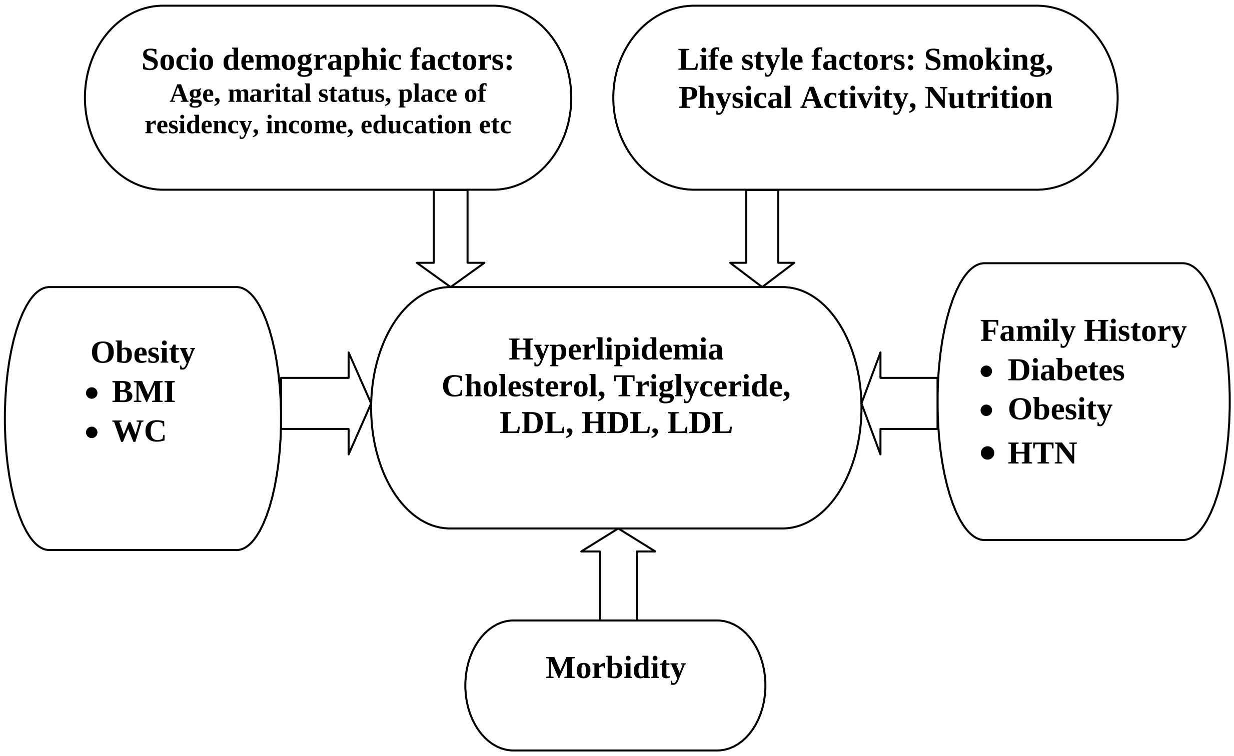

Figure (2.1): The Study Conceptual Framework

2.1 Conceptual framework

The researcher constructed the conceptual framework that addresses the major aspects of the study after reviewing the available literature about the concept under investigation.

The researcher described the most common factors that could be associated with hyperlipidemia and select some of these determinants, which may affect hyperlipidemia in the community such as socio demographic factors, life style factors include smoking, nutrition, and physical activity; also, we have obesity, family history, and morbidity.

- **Socio demographic variables**

Several studies highlight the associations between socio demographic factors and hypercholesterolemia as a risk factor of cardiovascular disease these sociodemographic factors refer to age, sex, place of residence, religion, educational level, marital status, and total income (Ghazali et al., 2015).

- **Life style variables**

The available information comes from too many studies illustrated that hyperlipidemia patients can lower their lipid profile by changing their life style, which includes physical activity, smoking, and nutrition (Mannu et al., 2013).

- **Obesity variables**

Obesity is commonly associated with hyperlipidemia based on clinical and epidemiological studies (Sullivan et al., 2008). Obesity here is expressed with body mass index and waist circumferences.

- **Family history variables**

Family members share genes, behaviors, lifestyles, and environments that can influence their health and their risk for disease. High cholesterol can run in a family, and risk for high cholesterol can increase (CDC, 2014).

- **Morbidity variables**

Morbidity is defined as the incidence of disease, many studies explained that hyperlipidemia could be resulted from several diseases like thyroid disorders, liver disease, diabetes, and genetic disorders (Jin & Teng, 2014).

2.2 Hyperlipidemia:

Hyperlipidemia is a medical condition characterized by an elevation of any or all lipid profiles and/or lipoproteins in the blood (Farooq et al., 2013). Lipid profiles are the levels of serum triglyceride (TG), total cholesterol (TC), high density lipoprotein cholesterol (HDL-C), low density lipoprotein cholesterol (LDL-C) and very low density lipoprotein cholesterol (Agrawal et al., 2015).

2.2.1 Definition of Hyperlipidemia

Hyperlipidemia is defined as elevations of fasting total cholesterol concentration, which may or may not be associated with elevated TG concentration. However, lipids are not soluble in plasma, but are instead transported in particles known lipoproteins (Sheeler, 2013). Hyperlipidemia is characterized with elevated lipids in the blood; this condition is also called hypercholesterolemia and hyperlipoproteinemia (Gupta et al., 2011). According to Zenni, (2013) Hyperlipidemia is characterized by an excess of lipids in the blood, these lipids include cholesterol, cholesterol esters, phospholipids, and triglycerides. Lipids are transported in the blood as large lipoproteins, including five major classes, based on density: Chylomicrons, Very Low-Density Lipoproteins (VLDL), Intermediate-Density Lipoproteins (IDL), Low-Density Lipoproteins (LDL), and High-Density Lipoproteins (HDL). Most triglyceride is transported in Chylomicrons or VLDL, and most cholesterol is carried in LDL and HDL.

Atherogenic dyslipidemia characterized by abnormal changes in lipid profile, a study was conducted in Turkey to evaluate the levels of lipid profile and (EMC) which is erythrocyte membrane cholesterol content (Uydu et al., 2014), the researcher compared these markers in normal and dyslipidemic subjects; in order to investigate whether (EMC) is a useful marker to predict atherogenic dyslipidemia. Finally, he concluded that (EMC) and TG are useful markers to predict small-dense LDL in hypercholestrolemic patients.

2.2.2 Classification of hyperlipidemia

Hyperlipidemia is divided into primary hyperlipidemia caused by genetic factors, and secondary hyperlipidemia may result from diseases such as diabetes, thyroid disease, renal disorders, liver disorders, and Cushing's syndrome, as well as obesity, alcohol consumption, estrogen administration, and other drug-associated changes in lipid metabolism. Hyperlipidemia is a major, modifiable risk factor for atherosclerosis and cardiovascular disease, including coronary heart disease; this is true both of disorders involving hypercholesterolemia and hypertriglyceridemia. Although hyperlipidemia does not cause symptoms, it can significantly increase your risk of developing cardiovascular disease, including disease of blood vessels supplying the heart (coronary artery disease), brain (cerebrovascular disease), and limbs (peripheral vascular disease). These conditions lead to chest pain, heart attacks, strokes, and other problems (Rosenson, 2015).

2.2.3 Causes of hyperlipidemia

Causes of hyperlipidemia may include excessive drinking of alcohol, side effects of medications such as hormones or steroids, diabetes, kidney disease, underactive thyroid gland, and pregnancy (Davis, 2015). Beside this, several factors can make patients more likely to develop hyperlipidemia, including a diet high in saturated fats and cholesterol; family history; being overweight or obese; and getting older. Increasing of cholesterol level may lead to a buildup of plaque inside the arteries known as atherosclerosis; this condition narrows the space available for blood flow and can trigger heart disease. The well established association between lipid concentrations and the risk of cardiovascular disease (CVD), the leading cause of death in the United States make the health provider more concerned with hyperlipidemia (Hoyert & Xu, 2012).

Landmark study is an intervention study; the basic of this study depends on lowering cholesterol level in order to reduce the risk of cardiovascular morbidity and mortality. The medical communities and scientific took several decades to agree that this relation is exists (Graversen et al., 2014) and exposure to hyperlipidemia in young adulthood increases the risk in future with coronary heart disease. A study was carried out in Iran, Togha et al., (2011) to compare lipid profile among three groups of stroke: hemorrhagic group, ischemic group, and control one. The study found that age, cholesterol, and low-density lipoprotein influenced the risk of developing an ischemic stroke; high triglyceride level has a protective role against hemorrhagic events. Also high lipid profiles influence plasma viscosity which is strongly related to common carotid elasticity indexes (Levin, 2006).

According to study, of Pirih et al. (2012) hyperlipidemia affects bone regeneration and mechanical strength, because the increase of lipids from high fat diets influences the risk for generation of lipid oxidative products which accumulate in the sub endothelial spaces of vasculature and bone, also induces secondary hyperparathyroidism and impairs bone regeneration and mechanical strength. Cardiovascular disease CVDs, are the most common cause of death worldwide, including (40%) in high-income countries, and (28%) in low and middle-income countries (Donelly, 2012).

According to Palestinian Ministry of Health, cardiovascular diseases are accounting for 29.5% of total deaths in the west bank (MoH, 2014). The most common manifestation of cardiac disease is coronary heart disease (CHD), where the number of deaths resulting from ischemic heart disease and hypertensive heart disease in the Middle East and North Africa region was 294/100,000 and 115/100,000 respectively. Also, the number of Disability-Adjusted Life Years (DALYs) resulting from ischemic and hypertensive heart disease is 3702/100,000 and 1389/100,000, respectively, in the same region (Lawes et al., 2008).

2.2.4 Hyperlipidemia in the world

Global variations in the prevalence of elevated cholesterol among patients with history of hyperlipidemia are associated with country-level economic development and health system indices. These results support the need for strengthening efforts toward effective cardiovascular disease prevention and control and may provide insight for health policy setting at the national level, no significant associations were found for patients without history of hyperlipidemia (Venkitachalam et al., 2012).

According to global health observatory data a 10% reduction in serum cholesterol in men aged 40 has been reported to result in a 50% reduction in heart disease within 5 years; the same serum cholesterol reduction for men aged 70 years can result in an average 20% reduction in heart disease occurrence in the next 5 years. In Ireland, a 30% reduction in the heart disease death rate has been attributed to 4.6% reduction of the population mean for total cholesterol. In Finland, 50% of the decline in heart disease mortality has been explained by the reduction of cholesterol level among the population, also the prevalence of raised total cholesterol increased noticeably according to the income level of the country. In low income, countries around a quarter of adults had raised total cholesterol, in lower middle-income countries this rose to around a third of the population for both sexes. In high-income countries, over 50% of adults had raised total cholesterol; more than double the level of the low-income countries (WHO, 2016).

According to the (WHO, 2014) Europe has the highest prevalence of high cholesterol in the world and with 54% for both men and women. High cholesterol or 'bad' cholesterol contributes to 2.6 million deaths per year, worldwide and statistics found that the main causes for high cholesterol are both an unhealthy lifestyle and/or genes.

According to study of Deng, et al., (2012) which was carried out in China with sample size 1415 individuals aged 22 – 84 years to assess prevalence of hyperlipidemia which was (49.3%). A study was conducted in Kuwait republic among the university students with sample size 484, and age of 17 – 24 years to determine the prevalence of elevated levels of lipid profile and obesity (AlMajed et al., 2011). The researcher findings were, prevalence of dyslipidemia, overweight, and obesity were 10.5%, 30.6%, and 19.8% respectively, high cholesterol was found in 2.3% of the subjects, and high triglyceride was found in 8.7% of them. Also AlMajed et al., (2011) found that waist circumference was found in 41.8% of the subjects. The researcher here took his sample from young population so the results were lower comparing with other studies using older age.

A study was conducted in north Jordan, the subjects ages were 25 and more, (Khader et al., 2010). The study aimed to estimate the prevalence of different types of dyslipidemia and their related factors, findings were 48.8% had high TC level, 40.7% had high LDL-C, 40.1% had low HDL-C, 43.6% had high triglyceride levels, and 75.7% had at least one abnormal lipid level. The researcher also found that Age was associated with high triglycerides, high LDL-C, and high TC.

2.2.5 Lipids metabolism

The two main lipids in the plasma are cholesterol and triglyceride. The primary function of TGs is to store energy in adipocytes and muscle cells; cholesterol is a ubiquitous constituent of cell membranes, steroids, bile acids, and signaling molecules. Lipids are hydrophobic, insoluble in water; require transporting within hydrophilic, spherical structures called lipoproteins, which possess surface proteins (apoproteins, or apolipoproteins) that are cofactors and ligands for lipid-processing enzymes. The main apolipoproteins, apo B-100/48, apo A-I, apo A-II, apo E, and the apo Cs, are integral components. Apo B is a component of all atherogenic lipoproteins (chylomicron remnants, VLDL and their remnants, lDL, lipoprotein (a) [Lp(a)] and LDL), whereas apo A-I and apo A-II are components of HDL. The apo B-containing lipoproteins and the apo A-I/A-II lipoprotein classes are closely interrelated via several metabolic pathways (Chapman et al., 2011).

- **Exogenous lipid metabolism**

Over 95% of dietary lipids are TGs; the rest are phospholipids, free fatty acids, cholesterol (present in foods as esterified cholesterol), and fat-soluble vitamins. Dietary TGs are digested in the stomach and duodenum into monoglycerides and free fatty acids by gastric lipase, emulsification from vigorous stomach peristalsis, and pancreatic lipase. Dietary cholesterol esters are de-esterified into free cholesterol by these same mechanisms. Monoglycerides, free fatty acids and free cholesterol are then solubilized in the intestine by bile acid micelles, which shuttle them to intestinal villi for absorption. Once absorbed into enterocytes, they are reassembled into TGs and packaged with cholesterol into chylomicrons, the largest lipoproteins (Goldberg, 2015).

- **Endogenous lipid metabolism**

Lipoproteins synthesized by the liver transport endogenous TGs and cholesterol. Lipoproteins circulate through the blood continuously until the TGs they contain are taken up by peripheral tissues or the lipoproteins themselves are cleared by the liver. Factors that stimulate hepatic lipoprotein synthesis generally lead to elevated plasma cholesterol and TG levels (Goldberg, 2015).

2.2.6 Cholesterol

Cholesterol is an essential component of cell membranes, brain and nerve cells, and bile, which helps the body absorb fats and fat-soluble vitamins. The body uses cholesterol to make vitamin D and various hormones, such as estrogen, testosterone, and cortisol. The body can produce all the cholesterol that it needs, but it also obtains cholesterol from food. A high total cholesterol level can increase your risk of cardiovascular disease. However, decisions about when to treat high cholesterol are usually based upon the level of LDL or HDL cholesterol, rather than the level of total cholesterol. The total cholesterol level can be measured any time of day. It is not necessary to fast (avoid eating for 12 hours) before testing (Miller et al., 2011). A study was conducted to test the hypothesis that elevated nonfasting remnant cholesterol is a causal risk factor for ischemic heart disease independent of reduced high-density lipoprotein (HDL) cholesterol, suggests that a 1 mmol/l (39 mg/dl) increase in nonfasting remnant cholesterol is associated with a 2.8-fold causal risk for ischemic heart disease, independent of reduced HDL cholesterol (Varbo et al., 2013).

2.2.7 Triglyceride

Triglycerides, which are contained in fat cells, can be broken down, and then used to provide energy for the body’s metabolic processes, including growth. Triglycerides are produced in the intestine and liver from smaller fats called fatty acids. Some types of fatty acids are made by the body, but others must be obtained from food (Hallberg et al., 2015)**.** Triglyceride is the most common type of fat in the body. Normal triglyceride levels vary by age and sex. A high triglyceride level combined with low HDL cholesterol or high LDL cholesterol is associated with atherosclerosis, the buildup of fatty deposits in artery walls that increases the risk for heart attack and stroke. Triglycerides should be measured after fasting for 12 to 14 hours.

2.2.8 Lipoproteins

Cholesterol, triglycerides, and high-density lipoproteins are important constituents of the lipid fraction of the human body. Cholesterol is an unsaturated alcohol of the steroid family of compounds; it is essential for the normal function of all animal cells and is a fundamental element of their cell membranes. It is also a precursor of various critical substances such as adrenal and gonadal steroid hormones and bile acids. Triglycerides are fatty acid esters of glycerol and represent the main lipid component of dietary fat and fat depots of animals. Cholesterol and triglycerides, are non-polar lipid substances (insoluble in water), need to be transported in the plasma associated with various lipoprotein particles. Plasma lipoproteins are separated by hydrated density; electrophretic mobility; size; and their relative content of cholesterol, triglycerides, and protein into five major classes: chylomicrons, very low-density lipoproteins (VLDL), intermediate-density lipoproteins (IDL), low-density lipoproteins (LDL), and high-density lipoproteins (HDL). Since the levels of plasma lipids have a bell-shaped distribution in the general population, the definition of either a high or a low value of these substances has remained an arbitrary statistical decision. High values have been traditionally considered as those in the 90th and 95th percentiles; low values were considered to be those below the 5th percentile.

The NIH Consensus Conference has recently revised the values concerning cholesterol, however, in view of clear evidence of an increased risk of coronary atherosclerosis in persons falling in the 75th to 90th percentiles. According to this last statement, cholesterol levels below 200 mg/dl are classified as "desirable blood cholesterol," those 200 to 239 mg/dl as "borderline-high blood cholesterol," and those 240 mg/dl and above as "high blood cholesterol" Cholesterol is fat like substance, located in our bodies, the body makes 75%, and the remain 25% is obtained by food (Clark & Kruse, 1990). Cholesterol is vital in our life, because it enters in the cell membrane, helps in the functions of cells, and it is essential for making vitamins and hormones, but if it is found in high amounts it will make risk for human health and leads to serious diseases and heart attacks (Donelly, 2012). Hyperlipidemia is a hidden or silent risk factor because it has no symptoms, one of the biggest health burdens on our society today. High concentration of LDL and low concentration of HDL are strongly associated with cardiovascular disease because they promote atheroma (plaque) formation in arteries, which is atherosclerosis, and this leads to myocardial infarction, stroke, and peripheral vascular disease. High levels of LDL and low levels of HDL contribute more to this process than total cholesterol levels. LDL are termed bad cholesterol because they have been linked to atheroma formation while high concentrations of HDL can remove cholesterol from cells and reverse atheroma formation, hence it offers protection from atherosclerosis and is referred to as good cholesterol.

2.2.8.1 Low Density Lipoprotein

A low LDL cholesterol level is considered good for your heart health. However, your LDL number should no longer be the main factor in guiding treatment to prevent heart attack and stroke, according to new guidelines from the American Heart Association. For patients taking statins, the guidelines say they no longer need to get LDL cholesterol levels down to a specific target number. A diet high in saturated and Tran's fats raises LDL cholesterol.

2.2.8.2 High Density Lipoprotein

High-density lipoproteins (HDL) are one of the five major groups of lipoproteins. Lipoproteins are complex particles composed of multiple proteins, which transport all fat molecules (lipids) around the body within the water outside cells. They are typically composed of 80-100 proteins per particle (organized by one, two, or three Apo A; more as the particles enlarge picking up and carrying more fat molecules) and transporting up to hundreds of fat molecules per particle. Unlike the larger lipoprotein particles, which deliver fat molecules to cells, HDL particles remove fat molecules from cells, which need to export fat molecules. The fats carried include cholesterol, phospholipids, and triglycerides; amounts of each are quite variable. Increasing concentrations of HDL particles are strongly associated with decreasing accumulation of atherosclerosis within the walls of arteries. This is important because atherosclerosis eventually results in sudden plaque ruptures, cardiovascular disease, stroke and other vascular diseases. HDL particles are sometimes referred to as "good cholesterol" because they can transport fat molecules out of artery walls, reduce macrophage accumulation, and thus help prevent or even regress atherosclerosis. However, studies have shown that HDL-lacking mice still have the ability to transport cholesterol to bile, suggesting that there are alternative mechanisms for cholesterol removal (Sheeler, 2013).

HDL is the smallest of the lipoprotein particles. It is the densest because it contains the highest proportion of protein to lipids. Its most abundant apolipoproteins are apo A-I and apo A-II (Zenni, 2013). The liver synthesizes these lipoproteins as complexes of apolipoproteins and phospholipid, which resemble cholesterol-free flattened spherical lipoprotein particles; the complexes are capable of picking up cholesterol, carried internally, from cells by interaction with the ATP-binding cassette transporter A1(Aljefree & Ahmed, 2015). A plasma enzyme called lecithin-cholesterol acyltransferase converts the free cholesterol into cholesteryl ester (a more hydrophobic form of cholesterol), which is then sequestered into the core of the lipoprotein particle, eventually causing the newly synthesized HDL to assume a spherical shape. HDL particles increase in size as they circulate through the bloodstream and incorporate more cholesterol and phospholipid molecules from cells and other lipoproteins. With HDL cholesterol, higher levels are better. Low HDL cholesterol puts you at higher risk for heart disease. People with high blood triglycerides usually also have lower HDL cholesterol. Genetic factors, type 2 diabetes, smoking, being overweight, and being sedentary can all result in lower HDL cholesterol. Similar to total cholesterol, the HDL-cholesterol can be measured on any blood specimen. It is not necessary to be fasting.

2.2.8.3 VLDL

Very-low-density lipoprotein (VLDL) is a type of lipoprotein made by the liver. VLDL is one of the five major groups of lipoproteins that enable fats and cholesterol to move within the water-based solution of the bloodstream (Fauci A, 2008). VLDL is assembled in the liver from triglycerides, cholesterol, and apolipoproteins. VLDL is converted in the bloodstream to low-density lipoprotein (LDL). VLDL particles have a diameter of 30-80 nm. VLDL transports endogenous products, whereas chylomicrons transport exogenous products. Very low-density lipoproteins transport endogenous triglycerides, phospholipids, cholesterol, and cholesteryl esters. It functions as the body's internal transport mechanism for lipids. In addition, it serves for long-range transport of hydrophobic intercellular messengers, like the morphogen Indian hedgehog protein (Queiroz et al., 2010).

2.2.8.4 Treatment of Hyperlipidemia

Some people, diet, and lifestyle changes may be enough for them but medication may also be needed. Various medications can lower blood cholesterol levels. Statins are recommended for most patients because they are the only cholesterol-lowering drug class that has been directly associated with reduced risk for heart attack and stroke. The drug works in the liver to prevent the formation of cholesterol, thus lowering the amount of cholesterol circulating in the blood. Statins are most effective at lowering LDL cholesterol, but also have modest effects on lowering triglycerides and raising HDL. Most side effects are mild and generally go away as the body adjusts. Muscle problems and liver abnormalities are rare, but doctor may order regular liver function tests. Patients who are pregnant or who have active or chronic liver disease should not take statin (Gupta et al., 2011).

2.3 Socio demographic factors and hyperlipidemia:

Demographic characteristics can refer to age, sex, and place of residence, religion, educational level, marital status, household total income, and family members.

2.3.1 Hyperlipidemia and age

AL-Ajlan, (2011) study concluded that the correlation between age and all lipid parameters were statistically non-significant. According to Sun et al.,(2014), the prevalence of total cholesterol increases significantly with advancing of age. The researcher concluded that higher HDL cholesterol levels were significantly associated with survival to 85 years of age.

Rahilly-Tierney, et al., (2011) tried to determine whether high-density lipoprotein (HDL) cholesterol levels are associated with survival to 85 years of age in a prospective cohort of aging men. The researcher selected 652 men with mean age 65 years, and categorized initial HDL cholesterol into <40 mg/dl (reference group), 40 to 49 mg/dl, or ≥50 mg/dl. Information on co-morbidities, lifestyle factors, measured lipid parameters, and medications were collected during triennial visits. Rahilly-Tierney, et al., (2011) used proportional hazards to determine hazard ratios (HRs) for mortality before age 85 years for each category of initial HDL cholesterol compared to the reference adjusting for co-morbidities, calculated low-density lipoprotein cholesterol, medications, smoking, body mass index, and alcohol consumption. Treating HDL cholesterol as a continuous predictor, also determined the HR for each 10-mg/dl increment in HDL cholesterol. Fully adjusted HR (95% confidence interval) for survival to 85 years of age for participants with an initial 10-mg/dl increment in HDL cholesterol was associated with a 14% (HR 0.86, 0.78 to 0.96) decrease in risk of mortality before 85 years of age.

2.3.2 Hyperlipidemia and marital status

A study was carried out in Iran (Charan & Biswas, 2013) in order to assess the effect of marital status on metabolic syndrome disease which include diabetes, dyslipidemia, abdominal obesity, and hypertension. The researcher selected his population with age 15 – 90 years and categorized them into consistent married status, and transition married status, then calculate metabolic z score of WC, SBP, DBP, FBS, TC, TG, and HDL concentrations and compare the results and found that marital status may affect metabolic syndrome risk z score in differently among the two genders.

2.3.3 Hyperlipidemia and years of education

According to Schneider et al., (2006) a study was conducted in Argentina, which is considered the fourth highest rate of cardiovascular mortality in the Americas. The study aimed to study the associations between lipid profiles and socio-demographic risk factors. It found that the women with less than 7 years of education 39% had normal cholesterol and 61% had borderline and high levels but the percentage of normal cholesterol among the women with more than 7 years of education was 50%. According to Egeland et al., (2003), the levels of cholesterol and triglyceride decreased with the increasing of years of education.

2.3.4 Hyperlipidemia and total family income

Al-Daghri et al., (2014) in his study in Saudi Arabia revealed that there was a positive relationship between high income and metabolic disease. Another study was carried out to evaluate the association between socioeconomic status and the presence of cardiovascular risk factors in children from Madrid (Arias et al., 1992), found that there was a positive correlation between socioeconomic status and total cholesterol, Apo A, Apo B and Apo A/Apo B, whereas socioeconomic status and triglycerides were inversely related. Arias et al., (1992) concluded that children belonging to high socioeconomic status have a more atherogenic lipid profile than those of middle low or low socioeconomic levels.

A study was carried out to evaluate the lipid profile of schoolchildren attending private (paid) and public/philanthropic (free) schools (Scherr et al., 2007) demonstrated the positive correlation of total cholesterol and its LDL fraction with eating habits and more intense and regular physical activity, benefiting the most needy children, compared to those enrolled in private schools. A study was carried out in order to estimate the socioeconomic status and coronary heart disease (Egeland et al., 2003) found that cholesterol, and triglyceride levels decreased with the increase of total income.

2.4 Life style:

Lifestyle is a way of living or the manner in which people conduct their day-to-day activities. It includes smoking, physical activity, and nutrition, lifestyle and individuals behaviors is considered the best choice to influence the health (Hassan, 2013).

2.4.1 Life style and hyperlipidemia

A cross-sectional study was done in India, search for the associations between diets, exercise, and lipid profiles. The results confirm that diet and exercise routines significantly affect the serum lipid profile (Chitra et al., 2012). Another study concluded that adolescents of Birjand in Iran republic have high prevalence of dyslipidemia. Preventive measures are recommended to improve lifestyle, including healthy nutrition, encouraging adolescents to exercise, and more mobility (Taheri et al., 2015).

2.4.1.1 Smoking and hyperlipidemia

Previous studies showed that smoking is related with heart disease, and it influence the fat in the body, also it affects the lining layers of the blood vessels, in addition smoking cessation increase HDL and decrease the risk of heart disease (Gepner et al., 2011). Howard (1998) found that active smoking and environmental tobacco smoke exposures are associated with the progression of an index of atherosclerosis, also smoking is of particular concern for patients with diabetes and hypertension. Howard concluded that pack-years of smoking but not current vs. past smoking is related with developing of atherosclerosis suggest that some adverse effects of smoking may be cumulative and irreversible. Another study was carried out on three groups of males subjects (Rao, 2013), the first was non smokers and non chewers, the second was smokers and non-chewers, the third group was chewers and non smokers. The study results revealed that serum TC and low-density lipoprotein is significantly increased in tobacco users comparing with non-users.

There was a study carried out in China among all residents aged 90 years or more in a district, and there were 2,311,709 inhabitants in 2005 (Mannu et al., 2013). Mannu et al., found that among Chinese nonagenarians/centenarians, cigarette-smoking habits were not associated with increased risk for dyslipidemia, which was different from the association of smoking habits with dyslipidemia in general population. Current smokers had lower levels of TC (4.05 ± 0.81 vs. 4.21 ± 0.87, $t = 2.403$, $P = 0.017$) and lower prevalence of hypercholesterolemia (9.62% vs. 15.13%, $\chi^2 = 3.018$, $P = 0.049$) than nonsmokers. Unadjusted and adjusted multiple logistic regressions showed that cigarette smoking was not associated with risk for abnormal serum lipid/lipoprotein.

A study was conducted in India to test the association between smoking and the lipids levels among 100 selected smokers and nonsmokers (Lyons & Langille, 2000). The study shows that as the intensity and duration of smoking increases a significant increase in the levels of very low-density lipoprotein -cholesterol, low-density lipoprotein -cholesterol, triglyceride, and total cholesterol are noted in almost all groups of cigarette smokers as compared to nonsmokers. Simultaneously a significant reduction in the level of High-density lipoprotein-cholesterol is observed in cigarette smokers as the intensity and duration is increased. These findings add another health enhancing benefit by the cessation of smoking (Grundy, et al., 2004).

According to Tayem et al.,(2012) in the West Bank the prevalence of smoking among 553 students from Al-Quds university aged 17 – 26 years was 29.1%. On the other side there was a study conducted in the Gaza Strip, (Abed & Abu-Haddaf, 2013), to determine risk factors of hypertensive among UNRWA health care centers, the study found that the former smokers percentage was 15.5% among the cases.

2.4.1.2 Physical activity and hyperlipidemia

Several research was studied the relation between training and physical activity and lipid profile levels which is the marker of hyperlipidemia. A follow up study was conducted to assess the effect of exercise training on lipid profile (Shriram et al., 2015), the researchers suggested that regular physical activity and increasing in duration of exercise training period improve the lipid profile; in addition regular physical activity decreases the risk of diseases like diabetes type 2 and coronary heart disease.

A study included 51 obese adults with sedentary lifestyle (Perk, et al., 2012), one group follow moderate intensity and the other follow high intensity the researcher found there was significant reduction in LDL among the high intensity exercise, and there was a significant difference in BMI, lipid profile and blood pressure in both the moderate and high intensity exercise group.

2.4.1.3 Nutrition and hyperlipidemia

Lipid profile and obesity are one of risk factors for cardiovascular disease, and atherosclerosis begins from the childhood, a cross sectional study was conducted among 147 overweight and obese children in Botucatu city in Brazil, the study aimed to investigate the relationship between dietary intake and blood lipids levels in overweight and obese schoolchildren (Rinaldi et al., 2012). Rinaldi et al., (2012) found that total Cholesterol levels positively related to full-fat dairy products, while triglycerides levels were positively associated to saturated fat percentage. These results support that the necessity of healthy dietary habits among childhood in order to reduce the risks of cardiovascular diseases in adulthood. Randomized clinical trial was conducted on hyperlipidemic patients in Iran, sample size was fifty eight subjects (51 female and 7 males) by Noroozi, et al., (2012), who aimed in this study to see the effect of using olives oil on the lipid profile. The researcher concluded that olive oil with low-calorie diet, as a part of healthy diet, lowered the LDL levels. This was after using olive oil as treatment for 4 weeks and measure lipid profile and anthropometric measurements before and after the intervention, but there was no significant association between the use of olive oil and other measurements.

According to Damasceno et al., (2011), the study was carried out in Spain, the three intervention diets were associated with significant reductions from baseline of total cholesterol, LDL-cholesterol and the LDL/HDL ratio. The mean reduction in LDL-cholesterol was 0.36 mmol/L (7.3%) with the VOO diet, 0.51 mmol/L (10.8%) with the walnut diet, and 0.61 mmol/L (13.4%) with the almond diet. No changes were observed in HDL-cholesterol, triglycerides. Bradlee et al., (2014) confirmed in their study that higher intake of fruit and non starchy vegetable are associated with favorable lipid profile than lower intakes. Also, they found that diet included higher intakes of lean red meat in combination with higher intakes of fruits and non-starchy vegetables were also associated with a more favorable lipid profile as well as a lower risk of having abnormal lipid levels. Fruit and non-starchy vegetable consumption, has beneficial effect on LDL-C while diets were the participants whose diets were higher in both red meat and fruits and non-starchy vegetables had higher HDL levels and a slightly lower risk of an abnormal LDL: HDL ratio. Consumption of lean red meat was associated with lower triglyceride levels. Eating fatty fish can be heart healthy because of its high levels of omega-3 fatty acids, which can reduce your blood pressure and risk of developing blood clots. In people who have already had heart attacks, fish oil or omega-3 fatty acids may reduce the risk of sudden death. Although omega-3 fatty acids don't affect LDL levels, because of their other heart benefits, the American Heart Association recommends eating at least two servings of fish a week (Mayo-Clinic, 2015).

A study was conducted to examine the relation between MDS and hyperlipidemia, the study revealed that few gender-specific associations were found between the MDS components and blood lipids; MDS was negatively related with LDL cholesterol and the ratio TC/HDL cholesterol while positively with HDL cholesterol. In women cereals, and in men three (fruits & nuts, meat and alcohol) of the nine MDS components were related with blood lipids (Mertens et al., 2014).

Hirose et al, (2015) study was conducted in Tokyo medical and dental university, among 95 women with age 40 – 60 years. The study aimed to estimate the effect of tomato juice on resting energy and improving triglyceride levels, the study concluded that taking tomato juice alleviating menopausal symptoms, including anxiety, increased heart rate, and lowered high baseline serum TG levels in middle-aged women.

A study was carried out in Sao Paulo in Brazil (Júnior et al., 2012) to investigate the relationship between skipping meals and biochemical variables among obese children and adolescents revealed that action of skipping meals especially breakfast enhances the risk to increase glucose, and lipid profile among these participants.

A according to Huangs' study (2011), the consumption of nuts, a diet high in carbohydrates and protein, green tea, and red wine, as well as the supplementation with red yeast rice extract, improve the lipid profile, while the supplements of garlic, chromium, vitamin C, magnesium-pyridoxal-phosphate-glutamate, cannot be recommended (Huang et al., 2011).

2.5 Obesity:

Overweight or obesity refers to the excess of weight, and is measured by body mass index. BMI is the ratio of weight in kilograms divided by the height in meters squared. Overweight is defined as BMI between 25.0 and 29.9 kg/m^2 and obesity is defined as BMI higher than 30.0 kg/m^2 (Ellulu et al., 2014), Waist circumference is the simplest and most common way to measure “abdominal obesity”-the extra fat found around the middle that is an important factor in health, even independent of BMI. It’s the circumference of the abdomen, measured at the natural waist (in between the lowest rib and the top of the hip bone), the umbilicus (belly button), or at the narrowest point of the midsection (Barba et al., 2004). A study was carried out in Palestine by using the data of survey from 1999 to 2000, among 3617 adults aged 18 – 64 years and the results were prevalence of overweight, and obesity was 35.5%, 31.5% among women, and 40.3%, 17.5% among men respectively (Abdeen et al., 2012).

2.5.1 Obesity and hyperlipidemia

Hyperlipidemia is commonly associated with obesity, which is known as a risk factor for CVD, (Ito et al., 2004). Estimates from the World Health Organization (WHO) suggested that CVDs contributed to approximately 17.5 million individuals deaths in 2012 (WHO, 2015). Obesity is a worldwide health problem. It is associated with excessive fat accumulation in the body to the extent that health and well-being are adversely affected. With changing food habits and sedentary lifestyles, the prevalence of obesity has increased markedly in Western countries faster than the developing one (Antipatis & Gill, 2001). According to WHO, (2011) study which conducted in EMR by WHO Stepwise survey (2003-2007) found that, Kawait showed the highest prevalence of overweight (75.4%) followed by KSA (68.6%), while Oman has the lowest score (29.6%) followed by Iran (42.8%). The prevalence rate of overweight and obesity in Sudan was 53.9%, Egypt 66%, in comparison to Syrian Arab Republic 56.3%, Jordan 57% and Iraq 66.9% (WHO, 2011).

According to Hu, (2004) obesity epidemic first started in the United States and industrialized nations then spreading to the developing countries especially their urban areas. Obesity may increase the risk of many diseases such as diabetes, atherosclerosis, hypertension, hyperlipidemia, gall bladder diseases, and cardiovascular diseases (Saeed, 2013)

Also in Zawawi study, (2014) the body mass index was classified into the same categories. Study results suggested that lipid, obesity-inflammation, and insulin sensitivity domains predominantly exist among obese children. These factors might be applied to predict the outcomes of cardiovascular diseases in the future (Chang et al., 2014). According to the WHO, unhealthy diet, physical inactivity, tobacco use, and harmful use of alcohol affect heart disease and stroke. These effects on the risk individuals appear as raised blood pressure, raised blood glucose, raised blood lipids, and overweight and obesity. These intermediate risks factors can be measured in primary care facilities and indicate an increased risk of developing a heart attack, stroke, heart failure and other complications (WHO, 2015)**.**

A cross sectional study was conducted in China (Rao et al., 2016) aimed to explore the association between anthropometric measures and hyperlipidemia, the sample size was 21,435 subjects (aged 18 - 79 years) the prevalence of overweight and obesity was 31.89% and 6.23% respectively, this study results were that body mass index variance associated significantly with hyperlipidemia.

A study was carried out among Swiss conscripts from 2006 to 2012 (N=174,872, mean age =19.75 years), revealed that the mean of total cholesterol increased by increasing of the body mass index among study participants. Whereas mean TCL was lower than 4.0 mmol/l among underweight young men (3.919 mmol/l, 95 % CI 3.902–3.936), mean TCL was ≥ 4.6 mmol/l in all WHO subcategories of (CDC, 2014).

Another study was conducted in Egypt on 384 university students to estimate the prevalence of lipid profile and associated factors may lead to dyslipidemia (Wahed et al., 2016). Wahed et al., (2016) found that there was highly statistically association between waist circumferences and high cholesterol ($P<0.001$), statistically significant relationship between WC and high triglyceride ($P=0.01$), statistically significant relationship between WC and high LDL ($P=0.002$), and statistically significant relationship between WC and low HDL ($P=0.011$). Body mass index was statistically significant related with lipid profile except low HDL ($P=0.67$).

In Jordan, there was a study among 1121 participants aged 25 years and older to estimate the various types of dyslipidemia, and determine their associated factors among adults in north of Jordan (Khader et al., 2010). Khader, et al., (2010) found that triglyceride levels increased with the increase of body mass index and waist circumferences. The World Health Organization (WHO) estimated that 43 million children are overweight and obese even in their preschool years and 35 million of these children are in developing countries (Gepner, et al., 2011).

Many studies were carried out in Saudi Arabia to estimate the prevalence of obesity, one of them was (Issa, 2014) and his results was that the prevalence of obesity and overweight were 16.1% and 28.5%, respectively among 1473 male students.

According to a cohort study was conducted in Finland among children to test the associations between preschool weight and body mass index (BMI) and adult BMI, central obesity and metabolic alterations the findings were that there was a relation between low level of high density lipoprotein and body mass index (Graversen et al., 2014).

2.6 Family history:

A family history is a record of medical information about an individual and their biological family. Human genetic data is becoming more prevalent and easy to obtain. Increasingly, this data is being used to identify individuals who are at increased risk for developing genetic disorders that run in families (NHGRI, 2015).

2.6.1 Family history and hyperlipidemia

A study was conducted to examine the lipid profile in children born to parents with history of premature ischemic heart disease and studied the effect of diet, lifestyle factors, and obesity among them. The study concluded that these children have significant incidence of dyslipidemia. The risk factors like BMI, diet and physical activity increase the incidence of dyslipidemia. Therefore, all children of premature IHD patients should be screened for dyslipidemia (Savitha & Sandeep, 2011). Another study was carried out in Gambia (Van der Sande et al., 2001) consists of 5389 adults aged ≥ 15 years, the study aimed to examine if family history has significant risk factor for non-communicable disease, that individuals with family history of diabetes had higher levels of cholesterol and there were highly statistically significant ($P=<0.001$). Also mean of cholesterol among participants of family history of obesity was (184.6 ± 40.4), and it is more than the mean of cholesterol among the participants of no family history of obesity (169 ± 37.1). The difference in means here was highly statistically significant ($P=<0.001$), but it did not reach statistically significant in Van der Sande study. There was a significant relation between cholesterol levels and the subjects with positive family history of hypertension, compared with those without family history of hypertension but it doesn’t reach statistically significant level ($P=0.48$). According to Berentzen et al. (2016) which was carried out in the Netherlands among

1374, 12 years children to examine how a family history of CVD and/or diabetes relates to cardio metabolic markers in offspring, and to what extent these diseases independently contribute to cardio metabolic markers. Berentzen, (2016) in his study found that One-third of the children had a strong family history of CVD and/or diabetes. These children had higher TC levels and TC/HDL ratios than children with no family history did. A strong family history of MI or diabetes was independently associated with unfavorable cardio metabolic markers specific to those diseases.

Parents are responsible for not only genetic structure but also the behavior of their children in their lives. There was a study (Charan & Biswas, 2013) to examine the relationship between school-age children obesity and their parents obesity and also the children obesity and their parents educational level. An inverse relationship was observed between the parents' educational level and child obesity, the lowest educational level corresponding to the highest prevalence of obese children: 9.3% for mothers with a low educational level compared to 5.8% for mothers with a high educational level ($p = 0.15$); similarly, the corresponding prevalence for fathers was 9.5% compared to 4.5% ($p = 0.03$).

2.7 Morbidity:

Morbidity is referred to any departure, subjective or objective, from a state of physiological or psychological well - being. Morbidity rates measure the frequency of illness within specific populations. Time and place must always be specified. The most commonly used morbidity rates include: prevalence, point prevalence, period prevalence, incidence, and attack rate (Abed, 2013).

2.7.1 Morbidity and hyperlipidemia

According to the World Health Organization (WHO), morbidity could be measured in terms like: number of persons who were ill, illnesses these persons experienced, and the duration of these illnesses. Deng et, al, (2012) determines the prevalence of hyperlipidemia among the populations living at moderate altitude on the Yunnan-Kweichow Plateau in Southwestern China, this study reveals a higher prevalence of hyperlipidemia, hypercholesterolemia, hypertriglyceridemia, increased BMI and WHR values in men, as well as a slightly higher prevalence of low HDL-C and high LDL-C in women from Yunnan-Kweichow Plateau. The incidence of hyperlipidemia also increased with age, as did the prevalence of an abnormal TC, TG, LDL-C, and WHR. A high BMI, and less healthy living habits and dietary preferences thus play significant roles in the onset of hyperlipidemia. Shahnam et al., (2010), conducted his study on adults population living in rural and urban areas in central Iran in order to assess the correlation between stress level and lipid profile disorders concluded that interventions activities must be applied to lowering the level of stress and this may be useful as a part of strategies of cardiovascular disease prevention.

Akkaloori et al., (2014) found that there is a relation between chronic periodontitis and cardiovascular risk factors like hyperlipidemia. LDL-cholesterol was significantly increased in participants with chronic periodontitis than in healthy individuals, which is risk factor for cardiovascular diseases. HDL-cholesterol levels were significantly increased in healthy individuals than in individuals with chronic periodontitis. Total cholesterol levels were increased in chronic periodontitis patients than in healthy individuals, but there was no significant difference between chronic periodontitis group and healthy group related to total cholesterol levels. Triglycerides and VLDL Cholesterol levels were increased in individuals with chronic periodontitis than in individuals without periodontitis, but there was no significant difference between them. Hence, chronic periodontitis patients may have high risk of getting cardiovascular diseases like atherosclerosis and angina pectoris, which can lead to high morbidity and mortality among periodontitis patients.

A study in Turkey, (Kepez et al., 2015) found that participants with hyperlipidemia were observed to have significantly depressed heart rate variability compared to participants with normal lipid profile, and the study suggests that patients with hyperlipidemia, in particular with hypertriglyceridemia display higher subtle cardiac sympathetic activity which may be associated with increased cardiovascular morbidity and mortality.

A study was conducted to explore the effects of insulin resistance on lipid levels in relation to atherosclerotic coronary artery disease, found that patient populations show statistically significant relationships between changes in glucose or hemoglobin A1c and changes in the various components of the lipid panel over the same time period. The only component that did not show statistical significance in both groups was that of HDL (Gierach et al., 2014).

Mixed Hyperlipidemia also called multiple lipoprotein-type hyperlipidemia is a genetic disorder in which a combination of high cholesterol and high triglycerides is inherited and passed down from family members. This is one of the most common contributors to early heart attacks. The condition may be worsened by other disorders, like hypothyroidism, diabetes, and alcoholism.

Many patients with mixed hyperlipidemia are asymptomatic, others do experience symptoms, including chest pain or angina; xanthoma which is a condition in which fat builds up under the skin's surface; xanthelasma of the eyelid which is the same as a xanthoma, but is located on the eyelid; pain in the abdomen; spleen enlargement; and enlarged liver (Grundy, 1999). Patients with mixed hyperlipidemia are at a higher risk of developing early coronary artery disease and heart attacks, and have an increased rate of glucose intolerance and obesity. In patients with mixed hyperlipidemia, the elevated triglycerides are generated by an increase in fatty acid flux to the liver. This increase is caused either by enhanced free fatty acid release from excess visceral adipose tissue or by increased remnant lipoprotein delivery of triglycerides to the liver by excess caloric consumption, leading to increased hepatic lipogenesis, which stimulates increased assembly and secretion of VLDL. A study was carried out in Bangladesh to assess the relationship between serum lipid profiles in hypertensive patients with normotensive control participants, (Wahiduzzaman, 2014). The logistic regression analysis showed that hypertensive patients had 1.1 times higher TC and TG, 1.2 times higher LDL, and 1.1 times lower HDL than normotensives, which was statistically significant (P=0.05).

A study was carried out in the United Kingdom, (Marcovecchio et al., 2009) on the diabetes type one subjects, the researcher wanted to explore prevalence of lipid abnormalities and their relationship with albumin excretion and microalbuminuria in adolescents with type 1 diabetes. The results were that lipid profile tests higher in females than males, this longitudinal study of adolescents with type-1 diabetes, concluded that sustained lipid abnormalities were related to age, duration, BMI, and A1C. Furthermore, albumin creatine ratio was related to both total cholesterol and non-HDL cholesterol, indicating a potential role in the pathogenesis of diabetic nephropathy.

A case control study was carried out in Bangladesh to study lipid profile among 100 hypertensive participants and equal number of normotensive as a control group (Sarwar et al., 2014). Sarwar explored that hypertensive patients have higher level of TC, TG, LDL and VLDL cholesterol but lower level of HDL cholesterol than the normotensive participants. Many studies found that there were strong relations between abnormal lipid profile and type 2 diabetes, which include reduced HDL cholesterol, a predominance of small dense LDL particles, and elevated triglyceride levels (Krauss, 2004). These abnormal lipids are associated to cardiovascular disease the leading cause of death in patients with type 2 diabetes. Hypothyroidism is associated with coronary heart disease and this is due to elevated of lipid profile among the hypothyroidism patients, lipid profile are decreased when hypothyroidism is treated with thyroid hormone (Obrien et al., 1993).

A study was carried out to determine lipid profile in patients with cirrhosis and to asses if it relates to the severity of the cirrhosis (Mohammad, et al., 2010) concluded that Serum total, LDL and HDL cholesterol level in patients with cirrhosis is inversely correlate with severity of cirrhosis.

Also according to Chawda et al., (2011) study that was conducted in order to investigate the alterations and clinical significance of plasma lipid profiles in untreated head and neck cancer patients, an inverse relationship was found between the lipid levels and the occurrence of oral cancer. Hence, the lower plasma lipid status may be a useful indicator to detect the initial changes seen in neoplastic process.

Chapter 3:
Methodology

This chapter describes methodology, which is defined as the way at which relevant information is gathered in ordered to answer the research questions or analyze the research problem including research approach, research design, instrument modification, recruitment sample, study population, eligibility criteria, pilot study, data collection procedure and plan for data analysis and ethical and administrated approval. Finally, it describes limitation of the study.

3.1 Study design

Descriptive and analytical cross-sectional study was conducted on blood donors who attend blood banks centers in Gaza for donating blood and they reflect healthy population in ordered to determine risk factors of hyperlipidemia among healthy group. A cross sectional study had been selected because it is rapid, quick, cheap, and easily undertaken. It is generally carried out at a point of time or over a short period. Cross sectional study gives more insight into the association between variables in the study. This design is limited, because it is carried out at one point of time, so there is no sequences of events and we cannot judge that whether exposure come before or after the disease. This being so, it is impossible to infer causality (Levin, 2006).

3.2 Setting of the study

The Gaza strip is consisted from five main Governorates, which are North Gaza, Gaza, Middle Zoon, Khanyounis and Rafah Governorates. The main hospitals in Gaza strip are Al Shifa hospital serving both Gaza governorate and North Gaza, Nasir hospital and European Gaza hospital in Khanyounis governorate, Shohadaa Al Aqsa hospital in the Middle Zoon governorates and al Najjar hospital in Rafah. Every hospital contains a blood bank center so we will conduct this study in these central blood banks.

3.3 Study population

The population is the set of entities under study, but sample is subsets of this population use this sample to draw inferences about the population under study. According to BCPS (2015), total population in Gaza Strip was 1,82 million, total males population was 925 thousands. Study population of this study was the males from the age of 20 to 50 years who were in total 336,509 thousands of Gaza Strip population in 2015. Our study was carried out on blood donor's males who donate their blood in blood banks centers of the main hospitals of the Ministry of Health in Gaza Strip with the age between 20 and 50 years.

3.4 Sample size formula:

n = $Z^2_{1-\alpha/2}$ P(1-P)/d^2, where:

n = sample size

$Z^2_{1-\alpha/2}$ = confidence interval

P = estimated proportion

d = desired precision

In our study sample size = $(1.96)^2(0.44)*(0.56)/(0.05)^2$

Sample size = 379 participants

This formula was from: (Charan & Biswas, 2013)

3.5 Sampling

The sample was proportional sample for the difference localities in the Gaza Strip as shown in table (3.1), and the participants were selected based to their positive response for the researcher phone call.

Table (3.1): Distribution of the Study Sample According to Gaza Governorate

Governorate	Population %	Sample
North Gaza	20	76
Gaza	34	129
Mid Zone	15	57
Khan Younis	19	72
Rafah	12	45
Total	100	379

In addition, it must be accurate. Gaza strip consists of five governorates, here we took the population in each one of these governorates, and we calculated the percentage of our study population, which included the males with ages from 20 to 50 years. In every governorate, we calculated the exactly number of subjects from the whole sample size. There are five major hospitals in the Gaza strip. We selected our sample for study as proportional sample from blood bank centers in every hospital according to every region population, which follow this hospital. This table will be express the exactly numbers of the participants in our study as proportional sample depends on the number of population of every governorate in Gaza strip and the number of males with age from 20 to 50 years who were our study population**.**

3.6 Eligibility criteria

These criteria specify the characteristics that people in the population must possess in order to be included in the study; inclusion criteria are a set of predefined subjects who were included in a research study. Inclusion criteria, along with exclusion criteria, make up the selection or eligibility criteria used to rule in or out the target population for a research study (Salkind, 2010).

3.6.1 Inclusion criteria

The participants of this study were males with age between 20 years and 50 years who attended blood banks centers of the main MoH hospitals for blood donation.

3.6.2 Exclusion criteria

Male donors with age less than 20 years and over 50 years were excluded; also, females were excluded from this study.

3.7 Ethical and administrative consideration

1. Approval letter was obtained from School of Public Health at Al Quds University
2. Approval letter from hospitals General Directorate of MoH in Gaza Strip
3. An official letter of approval to conduct the study was obtained from Helsinki Committee in the Gaza strip
4. Informed consent form was taken from blood donors who agreed to participate in this study. This consent included details about the purpose of the study, and every one received personally his results. According to Polit and Beck, consent should entail the following: anonymity, confidentiality, the right to privacy, protection from harm and discomfort, and the right to withdraw from the study at any time (Polit & Beck, 2004).

3.8 Research instrument

Two types of research instrument were used in this study:

3.8.1 Direct instrument

Hyperlipidemia risk factors were measured by assessment of anthropometric measures, like body mass index (BMI) and waist circumferences (WC). In addition, blood samples of the participants were taken after fasting between 12 to 16 hours. Serum was tested for measuring total cholesterol TC, triglycerides TG, High-density lipoprotein HDL, and low-density lipoprotein LDL. The tests was carried out by using Diasys reagents which were programmed on the Mendary 300 Chemistry Analyzer. Quality control was performed with every run of participant's samples to ensure that we obtained accurate results.

3.8.1.1 Kits/ DiaSys company

3.8.1.1.1 Cholesterol

a- Method

CHOD-PAP: Enzymatic photometric test

b- Principle

Determination of Cholesterol after enzymatic hydrolysis and oxidation, the colorimetric indicator is quninemine which is generated from 4-aminoantipyrine and phenol by hydrogen peroxide under the catalytic action of peroxidase.

Cholesterol ester + H_2O ---CHE----> Cholesterol + fatty acid

Cholesterol + O_2 --CHO--> Cholesterol -3-one + H_2O_2

2 H_2O_2 + 4-aminoantipyrine + Phenol --POD--> Quninemine + 4H_2O_2

c- Specimen

Serum, heparin plasma or EDTA plasma

StaVbility 7 days at 20-25 °C or 7 days at 4-8 °C or 3 months at -20 °C.

d- Sample procedures

Add 10 µL of serum to 1000 µL from reagents mix; incubate for 20 minutes at 37 °C. Read absorbance within 60 minutes against blank.

e- Calculations:

The analyzer will divide absorbance of sample and absorbance of standard and multiply with the concentration of the standard to get the concentration of the cholesterol in the sample (DiaSys, 2014a).

f- Normal range:

Desirable	< 200 mg/dl
Borderline high risk	200 – 240 mg/dl
High risk:	> 240 mg/ dl

3.8.1.1.2 Triglyceride

a- Method

Colorimetric enzymatic test using glycerol-3-phosphate-oxidase (GPO)

b- Principle

Determination of triglyceride after enzymatic splitting with lipoprotein lipase. Indicator is quninemine which is generated from 4-aminoantipyrine and 4-chlorophenol by hydrogen peroxide under the catalytic action of peroxidase.

c- Specimen

Serum, heparin plasma or EDTA plasma

Stability 2 days at 20-25 °C or 7 days at 4-8 °C or at least one year at -20 °C.

d- Sample procedures

Add 10 µL of serum to 1000 µL from reagents mix; incubate for 20 minutes at 37 °C. Read absorbance within 60 minutes against blank.

e- Calculations:

The analyzer will divide absorbance of sample and absorbance of standard and multiply with the concentration of the standard to get the concentration of the cholesterol in the sample.

f- **Normal range:**

Desirable < 200 mg/dl

Borderline high risk 200 – 400 mg/dl

High risk: > 400 mg/ dl (DiaSys, 2009)

3.8.1.1.3 HDL precipitant

a- Principle

Chilomicrons, VLDL, LDL are precipitated by adding phosphotungestic acid and magnesium ions to the sample. Centrifugation leaves only HDL in the supernatant, the concentration of which is determined enzymatically by using Diasys cholesterol FS.

b- Specimen

Serum, heparin plasma or EDTA plasma

Stability 2 days at 20-25 °C or 7 days at 4-8 °C or at least one year at -20 °C.

c- Sample procedures

Add 200 µL of serum to 500 µL from reagents mix; and stand for 15 minutes at room temperature, then centrifuge for 20 min at 2500 g. within 2 hours after centrifugation transfer 0.1 ml of the supernatant to the reaction solution for the determination of cholesterol.

After centrifugation, the supernatant should be clear. Serum or plasma with triglyceride contents > 1000 mg /dl tends to produce turbid supernatant or flouting precipitates. In this case dilute the sample 1 + 1 with NaCl solution (9 g/L) and then perform the precipitation. Multiply the result by 2.

d- Calculations:

The analyzer will divide absorbance of sample and absorbance of standard and multiply with the concentration of the standard to get the concentration of the cholesterol in the sample.

e- **Normal range:**

HDL- Cholesterol ≥ 35 mg/L (DiaSys, 2014b)

3.8.1.1.4 LDL

Low density lipoprotein was measured after measuring Cholesterol, Triglyceride, and HDL levels in the serum of participants by calculation:

LDL = Cholesterol – HDL- (triglyceride/ 5)

3.8.2 Questionnaire

The questionnaire consisted of closed end type question; all cases were interviewed to explain the questionnaire, which included many variables like:

1. Socio demographic factors such as age, governorate, marital status, years of education, family income, and family members.
2. Morbidity and family history were assessed also in this tool

Donors were questioned if they suffer from any disease like diabetes, heart disease, liver, kidney, thyroid disordered, cerebrovascular, stomach, GIT, cancer, and depression.

The participants were asked about their family history, this part was included questions if their parents or siblings suffered from obesity, diabetes, hypertension, and heart disease.

3. Life style, this mean questions about smoking, physical activity, and nutrition.

a- **Smoking part**

The researcher used CDC questions that adopted to identify the state of smoking (see annexes), then the questions can categories the subjects into one of four categories: (1) smoker, (2) past smoker, (3) passive smoker, and (4) nonsmoker (Ellulu et al., 2014).

b- Physical activity

The researcher used Global Physical Activity questionnaire, which developed and approved by WHO (2002) as the tool for physical activity surveillance. GPAQ collect data in three main domains activity at work, travel to and from places, and recreational activity. Four-analysis purpose these domains have broken into five different sub-domais. These sub domains are: Work vigorous (codes P1-P3), Work moderate (codes P4-P6), Travel (codes P7-P9), Recreational vigorous (codes P10-P12), and Recreational moderate (codes P13-P15). So the questionnaire divided into 3 parts and 15 questions (see annexes). Finally the GPAQ can categorized the population into three groups high, moderate, and low activity (Ellulo et al., 2014).

3.9 Reliability and Validity

3.9.1 Reliability

Reliability means repeatability, and this means how far the researcher will repeat the same measurement if the investigations are conducted more than one time. It was defined as "the degree of stability exhibited when a measurement is repeated under identical conditions (Last, 1983).

3.9.2 Validity

Validity in general means the degree to which an instrument measures what is supposed to measure (Polit & Beck, 2004). As a process, validation involves collecting and analyzing data to assess the accuracy of an instrument. There are numerous statistical tests and measures to assess the validity of quantitative instruments, which generally involves pilot testing.

3.9.2.1 Face validity

The instrument should be clear well organized free from gaps that lead to mistakes in measuring the study variable. The Questions were organized with enough spaces to answer. Sequence of question was logic and we had to avoid leading questions.

3.9.2.2 Content validity

Content validity is concerned with sample adequacy of the content area being measured (Polit, 2004). Also content validity is defined as the extent to which a test reflects the variables it seeks to measure (Holm & Llewellyn, 1986). This necessitates review of the variable measures; international recognized criteria for measurements are preferable. Adaptations of instrument for the local use are commonly used by local experts and necessitate improvement of the validity by other experts. Holm, (1986) considered that content validity requires judgment matter that the items reflect the defined variable. Practically it is advised that the investigator be given enough chance to construct his instrument.

The questionnaire of this study was sent to ten experts related to the research process and experts of statistical analysis to correct and judge it.

After one to two weeks, we returned the questionnaire and making revising besides correcting.

We selected 20 participants in the study, filed the questionnaires with them, enter their data on the SPSS file, and examine the variables and frequencies.

3.9.2.2.1 Standardization of measuring techniques

Anthropometry

The weight and height of each donor under investigation were taken according to the following criteria:

Weight was measured using electronic digital scale (Kg), Height (to the nearest 0.1 cm) was measured using a wall fixed stadiometer. Body mass index (BMI) was computed by dividing weight on square of height in meter (Kg/m^2) and BMI of 25 was considered as the cut-off level for assessing the prevalence of overweight or obesity. BMI of the participants was categorized into four groups underweight (< 18.5), normal weight (18.5 – 24.9), over weight (25 – 29.9), and obese (≥ 30), (Brown et al., 2000).

Waist circumferences was measured at minimal inspiration to the nearest 0.1 cm, midway between the last rib and the iliac crest (Janssen et al., 2000). It indicated the abdominal obesity. The WC was categorized into two groups: normal < 94 cm, and abnormal group ≥ 94 cm.

Blood pressure was measured for the participants by using Mercurial Sphygmomanometer, Systolic blood pressure was considered normal if <140 mm mercury, and abnormal if it was ≥ 140 mm mercury. Diastolic blood pressure was normal if it was < 90 mm mercury and abnormal if it was ≥ 90 mm mercury

Laboratory methods

Blood samples were taken in the morning after a fasting period of 10–14 hours. Fasting serum total cholesterol and triglyceride were tested enzymatically. Total cholesterol, total triglyceride, high-density lipoprotein concentrations were determined in the Biochemistry Laboratory of European Gaza Hospital, KhanYunis, Gaza. Total cholesterol, triglyceride, and high density lipoprotein were done by using (Mendry 380- Chemical Auto Analyzer), low density lipoprotein and very low density lipoprotein levels were calculated from specialized formula.

3.10 Pilot study

A piloting process was done before starting the data collection. This process aimed to help in identifying problems in the research design, validity, reliability, sensitivity and objectively of the data collection tools. Pilot process was done on 20 blood donors who were involved in the beginning of data collection.

3.11 Data collection

Accurate and precise data was collected by using well-prepared questionnaire with close-ended questions, which was collected by researcher; the researcher explained the questions to the participants in his study and asked them. The researcher filled the questionnaire by himself in a detailed explanation. The questionnaire included clear and short questions, and it included most the variables that considered determinants of hyperlipidemia.

The participants were asked about socio demographic variables as age, marital status, residency, years of education, total income, and family members. The next questions were about the medical history of the participants, and if they have any morbidity condition that are present.

Another part was about family history of the participants, they were asked if their parents and siblings have high levels of cholesterol, triglyceride or not. In addition, if the parents and the siblings suffer from obesity, diabetes, hypertension, death due cardiac disease before the age 60.

The next part was to collect data about the life style of the participants; first, the researcher asked them about physical activity at work, travelling to/from the work, and recreational activities. Second, the participants were questioned about smoking, and then the researcher obtained nutritional information by using food frequency questionnaire and questions about their dietary habits.

The researcher measured the blood pressure, weight, height and waist circumferences of the participants, every variable was taken as the mean of the tow readings then we recorded them carefully.

The researcher wanted to run lipid profile tests like cholesterol, triglyceride, high-density lipoprotein, and low-density lipoprotein, so he asked them for fasting 12 – 16 hours.

Blood samples were drawn and sent to the laboratory where they were analyzed by the biochemical-automated analyzer. The results were obtained for cholesterol, triglyceride, and high-density lipoprotein, and then low-density lipoprotein level was calculated.

3.12 Data management

Data management is the process by which we will make our research data is more intensive, more use in the future, and reach more benefits. It includes data entry and data analysis.

3.12.1 Data entry

Fist we checked up of all the filled questionnaires. Reviewed questionnaires were entered into the computer using SPSS (Statistical Package for Social Science) software version 20 in ordered to analyze the data. Data was entered correctly and accurately then the data cleaning process was performed, by selecting then checking random numbers of filled questionnaires, and making frequencies and descriptive statistics for all variables.

3.12.2 Statistical analysis

Data was analyzed by using SPSS (Statistical Package for Social Science) version 20. Descriptive analysis was done for individual characters and descriptive results were expressed with mean ± SD (standard deviation). Prevalence of hypercholesterolemia, and triglyceridemia, among healthy population in Gaza governorates were obtained from the distribution of lipid profile among blood donors, who reflect healthy population group. Participants were classified into Hyperlipidemic or not according to their cholesterol and triglyceride laboratory results. This depended if total cholesterol was ≥ 200 mg/dl, or triglyceride reached the level ≥ 150 mg/dl, so we used Chi-square test between categorical variables like socio demographics, which were age, place of residency, marital status, years of education, family income and family members and lipids profile categorical variables. Chi square tests also were done between BMI, WC, and physical activity as independent variables and lipid profile groups as dependent variables. We used t- test also between lipid profile as a continuous variables and categorical variables like family history, and smoking. Correlation test was done between continuous variables like lipid profile and blood pressure. P-value was considered statistically significant when it is lower than 0.05 with confidence interval 95%. Interpretation of data was based on the conceptual framework and the objectives of the study.

3.13 Limitation of the study

- Participants in this study were blood donors, they had to attend fasting at least 12 hours to the hospitals of the Ministry of Health, I took their mobile numbers from the records in blood banks and phoned them, explain my research purpose and what was required from them. Many of them were not pleased with my phone, another group refused to share in research, some were not have money to come, and others were in their work. Others cannot fast 12 -16 hours but we told them that we prepared juice and chocolate for them, also we paid for cars brought some of them and we told them that we will give them all the results about their serum lipid profile.
- It is difficult to infer causality because the nature of cross sectional study by the fact that it is carried out at one time point and gives no indication of the sequence of events whether exposure occurred before, after or during the onset of the disease outcome.
- Lack of resources including budget and facilities.
- Time limitation because of the nature of researcher work and life condition.

Chapter 4:
Results and Discussion

This chapter clarifies the main results of the study variables that achieve the study objectives in away using statistical testing as chi square, and independent sample t- testing as statistical tools of measurement and p-value as a measure for statistical significant level. This prevalence and determinants provided an opportunity to establish baseline information by exploring the most common hyperlipidemia determinants and risk factors among healthy population in Palestinian community. These factors include demographic factors, socioeconomic, family history, medical history, obesity, and life style pattern which include smoking, dietary intake, and physical activity. A cross sectional study was carried out at the Ministry of Health hospitals in the five governorates in the Gaza strip. Our analysis is based on a sample of 379 males of blood donors who are used to visit blood banks for blood donation as a healthy group. The findings based on (379) interview questionnaires with response rate of 97.5% and results of serum lipid profile blood tests for the participants, and anthropometric measures.

In this chapter, the researcher highlights the findings of this study compared with other global and regional studies and attempt to interpret the results of the study and its implication. The result could help in development of preventive health education and health promotion programs.

4.1 Demographic and socioeconomic characteristics of the study population

The sample distribution by age, place of residency, years of education, marital status, family members, and total income are presented in table (4.1).

4.1.1 Ages groups

Total population was 379 participants from blood bank donors in all governorates of Gaza Strip. The age of the study population was 20 – 50 years old with mean of 31.8 ± 9.1. Half of the participants who are blood donors were 20 - 30 years and the other half was with the age 30 - 50 years. These ages are the acceptable ages for donation in blood banks.

Table (4.1): Summary of socio-demographic characteristics of the study population

Variable	NO.	%
Age		
20 - 30 years	193	50.9
30 and above	186	49.1
Total	379	100%
Place of residency		
North	75	19.8
Gaza	130	34.3
Mid –Zone	57	15
Khan –younis	72	19
Rafah	45	11.9
Total	379	100%
Years of education		
Less than 12 years	153	40.4
12 and above	226	59.6
Total	379	100%
Marital status		
Not Married	126	33.2
Married	253	66.8
Total	22	100%
Family members		
Less than 6	196	51.7
6 and above	183	48.3
Total	379	100%
Income		
Less than 1000 NIS	121	31.9
1000 – 2000 NIS	162	42.7
2000 and above NIS	96	25.4
Total	379	100%

A study was conducted to determine the prevalence of dyslipidemia in Kuwait republic among university students (AlMajed, et al., 2011), the population was healthy from the universities nearly 484 students aged 17-24 years (mean = 18.4±1.4). 35.7% of subjects were males, 64.3% females. Population was from students so all of the participants were in this level of age, but the participants in our study were males because they are main public group of blood donation in hospitals and blood banks. Another cross sectional study was conducted in Jeddah among preparatory and secondary school teachers aged up to 60 years to determine prevalence and determinants of pre hypertension and hypertension. Teachers age <30 was 37.9%, (30 - <40) was 36.7%, and (40 - <60) was 21.9 (Ibrahim et al., 2008). Here the researcher conducted his study on this group in order to cover all ages of the teachers in these schools but we conduct our study on the excellent and suitable age for blood donation.

4.1.2 Place of residency

In this study the researcher, select the population proportional to the last census of population of Gaza Strip and distribution of males with age 20 – 50 years among the five governorates in the Gaza Strip, which is explained in the table (4.1). Taheri et al. (2015), tried to know lipid profile and prevalence of hyperlipidemia. He selected the participants of the study from middle and high school students of Birjand city, with considering the distribution of schools in different districts of the city, but Togha, (2011) selected the population from the consecutive patients with acute stroke admitted to the neurology department of Sina hospital, and affiliated to Tehran University of Medical Science. This action was to compare the difference of lipid profile among the three groups which were hemorrhagic stroke (group 1), ischemic stroke (group 2), and control (group 3). Control group was chosen from the healthy individuals who were living in the same community and matched for age and sex. Toga et al, (2011) differ from our study in his target population because he wanted to determine lipid profile as a risk factor of stroke so the population was selected from hospital population not from healthy community in the different governorates.

4.1.3 Years of education

In our study the education years were divided into 2 groups <12 years which was 40.4% and 12 years and more (59.6%). A according to Shahnam, et al., (2012) study, she categorized her study population into three groups depending on the years of education <5 years 6 - 12, and >12 to explore the correlation between lipid profile and stress level among these groups. Lazzeri (2013) study was carried out in order to examine the relationship between the education level of the parents and obesity of children in the age of 8/9 years. Lazzeri, et al., (2013) categorized the parents into 3 groups according to their educational level high level, medium, and low and compared the effect of educational levels on the obesity of children, because the children obesity is connected with the behavior and attitude of the child which are accepted from his parents.

4.1.4 Marital status

In our study, marital status was categorized into two groups: married and not married. Married group was 66.8%, while not married was 33.2%. Hosseinpour-Niazi et al., (2013) study aimed to examine the potential effects of marital status and marital transition on metabolic syndrome during a 9.6-year follow-up in Tehran Lipid and Glucose Study. The sample was selected from males and females aged 15 – 90 years, marital status was categorized as consistent marital status and marital transition, the percentages of married, and not married of men were 74.9%, 25.1% respectively. There was a difference; married group in our study was less than the same group in the other study, because of the target population in both studies. Hosseinpour-Niazi et al, (2013) population include layer of age between 50 - 90 years which may was from married men category.

Zawawi, (2014) conducted his study by selecting 177 individual from three women fitness centers in Al Zarga governorate which located in Jordan, married and not married women percentages were 51.4%, and 48.6 with minimum age 20 years. There was a difference in the percentages of marital status, married group was higher than not married group, may be due to the reason that marriage is too costly and the men are get married in older ages. Another study was conducted among Taif university students in Sudia Arabi, (Issa, 2014), all the participants were male according to Saudian community roles in their universities, the age of them was 19 – 25 years, the participants were categorized into single and married with percentages of 91.8%, 8.2% respectively. Issa, (2014) in his categories differed from ours; because he selected his participants from students of the university, making the most of population not married.

4.1.5 Family members

Our population was categorized according to family members into < 6 members (51.7%), and ≥ 6 members (48.3%). Also in his study, Issa, (2014) categorized the population into two groups < 5 was (10.3%), and ≥ 5 was (89.7%). In our study, the two categories in our study are near together but not in (Issa, 2014) study. This may had come from early marriage in Saudian community and multi numbers of wives there.

4.1.6 Total income

In our study the participants were divided into three groups according to the monthly income of the family, < 1000 NIS (31.9%), 1000 – 2000 NIS (42.7%), and ≥ 2000 NIS (25.4%), Issa (2014) also divided his participants into three groups low, middle, and high which were 19.6%, 34.4%, and 46% respectively. There was a difference between the categories in the two studies and this belongs to the difference of economic level between the two countries.

4.2 Medical history of the population

Table (4.2): Summary of medical history of the population

Disease	NO.	%
Hypertension	19	5
Heart disease	4	1.1
Diabetes	5	1.3
GIT problems	9	2.4
Psychiatric disease	2	0.5
Vision	1	0.3
Headache	1	0.3
DVT	1	0.3

In this study, 5% of the participants were hypertensive, 1.1% were heart disease, 1.3% were diabetes, 2.4% were GIT problems, 0.5% were psychiatric. There were low levels of diseases among the participants because of the study participants were from blood donors who are considered the healthiest group in our community. A study was carried out at Recep Tayyip Erdog University in Turkey (Uydu, et al., 2014), about 165 participants; 86 men and 79 women, were included in the study. They were from cardiology department of the medical school at the university. The study aim was to explain the tendency of hyperlipidemic individuals, develop atherogenic dyslipidemia by analyzing plasma lipids and lipoproteins sub fractions. Medical history of the participants was recorded in this study, we can notice that from non hyperlipidemic individuals the percentage of hypertension was 42% and 43% from hyperlipidemic participants, another one was the percentages of diabetes among non hyperlipidemic and hyperlipidemic were 16%, and 11% respectively. These percentages of hypertension and diabetes were higher than in our study because the participants were patients from cardiology department.

4.3 Family history

The table (4.3) explains numbers and percentages of variables and diseases among participant's parents and siblings. Most of diseases in the family history of our study were obesity (41.7%), diabetes (43%), and hypertension (51.2%). Obesity was 41.7% among parents of blood donors, where in (Issa, 2014) study was 40.9% among students in Taif University because both population were healthy. In (Jin & Teng, 2014) study the family history of diabetes was 180 participants who were 3.3% from the whole population in that study.

Table (4.3): Summary of family history of the population

Disease	Parents		Siblings	
	No.	**%**	**No.**	**%**
High Cholesterol	55	14.5	15	4
High Triglyceride	51	13.5	14	3.7
Obesity	158	41.7	86	22.7
Diabetes	163	43	36	9.5
Hypertension	194	51.2	39	10.3
Death from HD before 60	24	6.3	7	1.8

Also, hypertension among family history was 51.2% while according to (Abed & Abu-Haddaf, 2013) family history of the participants of their study about risk factors of hypertension was 85.8% and this percentage was higher than the percentage in our study because cases were hypertensive and not healthy population as in our study.

4.4 Life style

Participants in our study were questioned about their life style, so questionnaire included nutrition, smoking, and physical activity questions. Nutrition part includes two sections: one for dietary intake, and the other was about dietary habits.

4.4.1 Nutrition

4.4.1.1 Dietary Intake

The table (4.4) shows dietary intake score among participants of the study population, the highest scoring belongs to bread (98.2%) and coffee-tea intake (90.2%). Moderate scoring was noticed among olives oil, vegetables, fruits, and sweet intake, which were 66.6%, 61.0%, and 60.4% respectively.

Table (4.4): Summary of dietary intake of the population

Food		> once/day	Once/day	2-3/week	Seldom	Never	Mean	RII*
Milk	**No.** **%**	2 0.5	42 11.1	58 15.3	189 49.7	88 23.2	2.2	43.2 %
Cheese, yogurt	**No.** **%**	3 0.8	101 26.6	178 46.8	90 23.7	7 1.8	3.0	60 %
Ice cream	**No.** **%**	0 0	9 2.4	33 8.7	312 82.1	25 6.6	2.1	41.2 %
Meat, Fish, Poultry	**No.** **%**	1 0.3	35 9.2	303 79.9	39 10.3	1 0.3	2.9	59.6 %
Eggs	**No.** **%**	4 1.1	91 24	148 48.5	91 24	9 2.4	2.9	59.4 %
Peanut butter, nuts	**No.** **%**	4 1.1	41 10.8	137 36.1	189 49.9	8 2.1	2.6	51.8 %
Dry beans, peas, soy	**No.** **%**	2 .5	16 4.2	172 45.4	175 46.2	14 3.7	2.5	50.2 %
Citrus fruits, juice	**No.** **%**	2 0.5	84 22.2	163 43	124 32.7	6 1.6	2.9	57.6 %
Vegetables	**No.** **%**	1 0.3	171 45.1	152 40.1	53 14	2 0.6	3.3	66.2 %
Fruits	**No.** **%**	12 3.2	87 23	193 50.9	85 22.4	2 0.5	3.0	61.0 %
Bread, cereals, rice,	**No.** **%**	350 92.3	26 6.9	1 0.3	2 0.5	0 0	4.9	98.2 %
Sweets	**No.** **%**	17 4.5	110 29	120 31.7	128 33.8	4 1.1	3.0	60.4 %
Salty snacks	**No.** **%**	7 1.8	35 9.2	65 17.2	235 62	37 9.8	2.3	46.2 %
Soda pop, Kool-Aid	**No.** **%**	18 4.7	86 22.7	89 23.5	152 40.1	34 9	2.7	54.8 %
Olives oil	**No.** **%**	15 4	175 46.2	122 32.2	57 15	10 2.6	2.3	66.6 %
Coffee	**No.** **%**	4 1.1	16 4.2	4 1.1	5 1.3	350 92.3	4.5	90.2 %
Fast food	**No.** **%**	2 0.5	19 5	56 14.8	261 68.9	41 10.8	2.2	43.0 %
Fried food	**No.** **%**	8 2.1	64 16.9	158 41.7	144 38	5 1.3	2.8	56.2 %

*RII: Relative Importance Index= mean * 20%

Participants were found to take meat, eggs, juice, fried food, and soda as 59.6%, 59.4%, 57.6%, 56.2% and 54.8% respectively, lower percentages of dietary intake were found in nuts, beans, milk, salty snacks, and fast food.

4.4.1.2 Dietary Habits

Results in table (4.5) explain that 13.2% from the study population follow diet regimen, 86.8% were not, the percentage of the participants taking three regular meals was 30.3%, when comparing with the percentage of those who do not take three regular meals 69.7%.

About daily breakfast 60.4% of the participants take always the meal, 28.8% answered sometimes, and 10.8% were never taking breakfast. About 53.3% of the population was sometimes taking meals outside home vs. 43.3% who never eat outside home.

Júnior, et al., (2012) in his study, found that prevalence of eating breakfast daily was low in boys (47.5%), and girls (44.7%) among the obese population, and the results showed that there was a negative correlation between taking breakfast and levels of triglyceride, and low density lipoprotein.

Table (4.5): Summary of dietary habits of the population.

Dietary habits	**Yes**		**No**	
	No.	**%**	**No.**	**%**
Diet regimen	50	13.2	329	86.8
3 regular meals	115	30.3	264	69.7

Dietary habits	Always		Sometimes		Never	
	No	%	No	%	No	%
Daily breakfast	229	60.4	109	28.8	41	10.8
Meals outside home	13	3.4	202	53.3	164	43.3
Eating during watch TV	33	8.7	137	36.1	209	55.1
Eating during internet	15	4	72	19	292	77

4.4.2 Smoking

Table (4.6): Distribution of smoking types among the population

Smoking types	**Yes**	
	No.	**%**
Smoking cigarette	92	24.3
Smoking argella	58	15.3
Smoking cig + argella	104	27.4
Past smoking	108	28.5
Smoking Exposed	341	90

Findings explained that percentage of smoking cigarette was 24.3% in this study, Issa, (2014) found that smokers percentage was 29.1%, it was higher than the percentage of smokers among our participants because his study population were from young age between 19 – 25 years. Also Tayem et al., (2012) conducted a study in the West Bank, which aimed to determine the prevalence and correlates of obesity and hypertension among students at a central university there. Tayem et al., (2012) found that the percentage of smoker was 29.1%, it was higher than 24.3% because the population in his study was from the students of university 17 - 26 years and it was include the female smokers. Abed &

Abu-Haddaf, (2013) in their case control study among hypertensive patients in UNRWA primary health care clinics, found that (8.3%) were smokers, and (93.3%) were exposed to smoking. There is clear difference in the percentage of current smokers, because of the increase in awareness of hypertensive patients about the danger of smoking on their health. This explained why in Abed & Abu-Haddaf, findings showed that the former smoker was 15.5% among cases, and 1% among controls, diseased people tend to stop smoking. Our study found that past smokers were 28.5%. May this increase is due to the population in our study was larger or to increase of cigarette price at the present time.

4.4.3 Physical activity

Results in table (4.7) show that 28.8% of the study population was classified as low physical activity, 61.4% were moderate physical activity, and 9.8% of them were high physical activity.

Table (4.7): Distribution of physical activity among study population

PA categories	No.	%	Cumulative Percent
Low	109	28.8	28.8
Moderate	233	61.4	90.2
High	37	9.8	100.0
Total	379	100.0	

4.5 Biochemical tests

Results in table (4.8), show that the means of total cholesterol, triglyceride, high-density lipoprotein, low-density lipoprotein, and very low-density lipoprotein were (175.95 ± 39.25), (160.2 ± 112.5), (44.96 ± 4.26), (99.34 ± 36.1), and (32.04 ± 22.5), respectively.
According to Khader, et al. (2010), North Jordanians' means of lipid profile were 197.8 ± 39.25), (185.7 ± 116.1), (38.2 ± 8.1), (122.4 ± 34.7), respectively. The means in Khader, (2010) study, were higher because of the increasing age among the participants.

Table (4.8): Population means, (SD) and percentage of high biochemical tests

Biochemical tests	Mean (mg/dl)	(SD)	High %
Cholesterol	175.95	39.25	22.7
Triglyceride	160.2	112.5	41.2
HDL	44.96	4.26	11.9
LDL	99.34	36.10	17

The mean of cholesterol (175.95) mg/dl was in the range of the acceptable normal value for cholesterol level which is up to 200 mg/dl, where the mean of triglyceride (160.2) mg/dl was higher than the normal range which is up to 150 mg/dl. High-density lipoprotein mean was 44.95 mg/dl in the normal range for HDL which is ≥40.0 mg/dl where the mean of low-density lipoprotein was 99.34 mg/dl and it is in the normal range for LDL which is <130 mg/dl.

According to the table (4.9) hypercholesterolemia among blood donors was 22.7%, Hypertriglyceridemia was 41.2%, low level of HDL was 11.9%, and high level of LDL was 17%.

Table (4.9): Prevelance of lipid profile among the study population

Tests	Groups	No	%
Cholesterol	< 200 ≥ 200	293 86	77.3 22.7
Triglyceride	< 150 ≥ 150	223 156	58.5 41.2
HDL	< 40 ≥ 40	45 334	11.9 88.1
LDL	< 130 ≥ 130	313 64	83 17

In Abed & Abu-Haddaf, (2013) study the percentages of hypercholesrolemia, triglycerdemia, low HDL, and high LDL were 29.2%, 35.3%, 38.3%, and 24.3% respectively, the percentages in the last study were highest because of the second study participants were hypertensive. Khader, et al., (2000) found that 48.8% had high TC level, 40.7% had high LDL, 40.1% had low HDL, 43.6% had high triglyceride levels, this difference in prevalence with our study because the participants were of age from 25 to 85 years and this increase the risk to have hyperlipidemia.

4.6 Anthropometric parameters

Table (4.10): Means and (SD) of anthropometric parameters among the population

Anthropometric parameters	Mean	Standard deviation (SD)
Weight (kg)	83.37	16.85
Height (m)	174.80	6.56
Waist circumferences (cm)	96.08	13.73
Body Mass Index kg/ m^2	27.89	14.63

The population here was examined to determine the weight, height, waist circumferences (WC), and body mass index (BMI). The means of these parameters were (83.37), (174.8), (96.08), and (27.89) respectively. A cross sectional study was conducted among 839 patients of metabolic syndrome (Gierach et al., 2014), men in Gierach, (2014) study were 41.1% of total participants, with age (63.0±13.8) years and the study aimed to demonstrate a correlation between waist circumference (WC) and body mass index (BMI) in patients with metabolic syndrome in relation to hypertension, lipid disorders. The means of height, weight, BMI, and WC were 173, 92.5, 30.8, and 110.8 respectively. The BMI and WC in our study are lower than in Gierach, (2014), this difference is due to the type of population, which was taken in the two studies.

Table (4.11): BMI categories among population

BMI Cat.	Frequency No	Percent %
Normal weight + Underweight*	138	36.4
Overweight	134	35.4
Obese	107	28.2
Total	379	100.0

*Normal weight cases were 137 and only one case was underweight.

Body mass index categories in the study shows that 36.1% of population was normal weight, 35.4% overweight, and 28.2% were obese. Taheri et al., (2015), found that normal body mass index percentage was 84.4%, overweight was 7.5% and obese was 8.1%, this was different from this study findings because Taheri et al., (2015) studied lipid profile and prevalence among adolescent with low age 11-18 years. According to Abdeen et al., (2012) cross sectional study, the data was used from the First National Health and Nutrition Survey (1999-2000) in order to provide a baseline data on the prevalence and distribution of overweight and obesity and their associations among adults in Palestine. For all the population (n = 3378): 1.5% were underweight, 36.1% were in the normal range, 38.0% were overweight, and 24.4% were obese. There was slightly difference in the percentages of BMI categories, due to large number of participants in (Abdeen et al., 2012) study. Another study was conducted in the West Bank (Tayem, et al., 2012) showed that the percentages of the four BMI categories among male students of university were 2.1%, 57.1%, 31.1%, and 9.4%. Normal BMI in Tayem, (2012) was higher because the population here was younger than our study what is making the normal percentage higher.

- **Blood Pressure (BP)**

Population was classified according to the systolic blood pressure into two groups, normal or high systolic blood pressure. Normal took the value < 140, and high was ≥ 140. Diastolic blood pressure also, classified into two groups, < 90, and ≥ 90. The mean of systolic blood pressure here was 115.9 with SD (11.9), and The mean (SD) of diastolic were 74.53 (10.27). Hypertensive participants were 2.1% among diastolic and 4.0% among systolic.

Table (4.12): Systolic blood pressure (SBP) categories among population

SBP	No.	%	Cumulative %
<140	371	97.9	97.9
≥140	8	2.1	100.0
Total	379	100.0	

Table (4.13): Diastolic blood pressure (DBP) categories among population

DBP	No.	%	Cumulative %
<90	364	96.0	96.0
≥90	15	4.0	100.0
Total	379	100.0	

Cross sectional study was conducted among 234 participants including 159 hypertensive patients and 75 normal hypertensive controls in the National Centre for Control of Rheumatic Fever and Heart Disease in Dhaka, Bangladesh (Wahiduzzaman, 2014). The study aimed to determine the association between serum lipid profiles in hypertensive patients with normotensive control group of participants. Wahiduzzaman, (2014) found that means (SD) of systolic and diastolic were 137.49 (9.58), and 94.42 (8.81), in respectively. The means in Wahiduzzaman, (2014) study were too higher because here the participants were from hypertensive patients and not from healthy population as in our study.

4.7 Lipid profile and socio demographic variables

4.7.1 Cholesterol and socio demographic variables

4.7.1.1 Cholesterol and Age

Results in table (4.14) show the relation between Cholesterol groups and age groups. Cholesterol was classified into two categories normal cholesterol level (< 200 mg/dl), and high cholesterol level (≥ 200 mg/dl). Findings revealed that among population with age group (20 - 30) years, 89.1% were normal, 10.9 % were hypercholesterolemia, while normal, and high levels among age group ≥ 30 years were 65.1%, and 34.9% respectively. There was an association between age groups and cholesterol groups, Hypercholesterolemia was significantly higher in age group (≥ 30 years) than other group with (P = 0.00). Wahed, et al., (2016) study was conducted to determine the prevalence of dyslipidemia among healthy group in El - Fayoum governorates in Egypt. Population were from university students, with age (17 - 24) years, high total Cholesterol among ages < 20, and ≥ 20 was 38.7%, and 38.9% respectively.

Table (4.14): Relation between Cholesterol level and Socio demographic Variables

	Normal Cholesterol < 200 mg/dl		High Cholesterol ≥ 200 mg/dl		χ^2	P value
Age groups	**No**	**%**	**No**	**%**		
20 – 30 years	172	89.1	21	10.9	31.2	< 0.01
≥ 30 years	121	65.1	65	34.9		
Place of residency						
North	60	80	15	20	3.93	0.91
Gaza	97	74.6	33	25.4		
Mid – Zone	42	73.7	15	26.3		
Khan – younis	61	84.7	11	15.3		
Rafah	33	73.3	12	26.7		
Years of education						
< 12 years	119	77.8	34	22.2	0.90	0.48
≥ 12 years	174	77.0	52	23		
Marital status						
Not Married	120	95.2	6	4.8	34.6	<0.01
Married	173	68.4	80	31.6		
Family members						
< 6	148	75.5	48	24.5	0.39	0.23
≥ 6	145	79.2	38	20.8		
Total income						
< 1000 NIS	99	81.8	22	18.2	4.82	0.09
1000 – 2000 NIS	127	78.4	35	21.6		
≥ 2000 NIS	66	69.5	29	30.5		

There was slightly difference in the two means but it does not reach statistically significant (P = 0.98), because the population were healthy and there was not a big difference between the means of ages between both groups. A study was conducted in Jordan by Hammoudeh et al., (2008) on lipid profile among individuals ≥ 18 years of age, who were presented for routine check-up, or for management of coronary disease-related admission. Findings revealed that in the six age groups, for both sexes, median levels of TC, TG, and LDL increased with age and peaked around 50 years of age in men and around 60 years in women. At a younger age (< 45 years), men had higher levels of TC, TG, and LDL than women did. Another study was conducted in China (Sun, et al., 2014) to estimate the prevalence of dyslipidemia, found that prevalence of high TC increases significantly with advancing of age.

4.7.1.2 Cholesterol and place of residency

Normal and high levels of Cholesterol were distributed among the population of the five governorates in the Gaza strip. High cholesterol levels among five governorates of the Gaza Strip: North, Gaza, Mid - Zone, Khan Younis, and Rafah, were 20%, 25.4%, 26.3%, 15.3%, and 26.7% respectively. There was an association between total Cholesterol and place of residency but it did not reach statistically significant, because of Gaza strip is small area and there is no difference in the living circumstances among the population.

4.7.1.3 Cholesterol and years of education

In our study, population was classified according to the years of education into two groups, the first was < 12 years of education, and the second was ≥ 12 years. High Cholesterol level was found in 22.2% of the first group, and 23% in the second group. There was an association but it did not reach statistically significant difference in cholesterol levels between the two groups (P = 0.48). This may due to the lack of nutritional programs in curriculum, poor educational plan of the country, and wrong habits in our diets. Agreement with Schneider, et al. (2006) Among the low educated women 39% had normal total blood cholesterol levels and 61% presented either borderline high or high levels. Among the high educated women (more than 7 years); 50% had normal blood cholesterol levels, There were no statistically significant differences between these groups (p= 0.46). According to Sun, et al., (2014) study, high total cholesterol was inversely related with years of education, high levels were among illiterate population (24.9%) and the lowest among primary and middle school educated individuals (18.4%), and (12.8%) respectively and returned to increase among high school educated or above (14.8%).

4.7.1.4 Cholesterol and marital status

Results in the table (4.14) show that normal Cholesterol among not married population was 95.2%, while high cholesterol was 4.8%. On the other side, normal cholesterol levels were found among 68.4% of married population, while high levels were 31.6%. There was an association between cholesterol levels and marital status, high cholesterol level was higher in the married group than in not married; oppositely, the normal levels in married group were less than not married group. This difference between cholesterol and married status reached highly statistically significant level ($P \leq 0.01$). This difference because of married participants was older than not married and this makes the risk for having high cholesterol is more. Disagreement with Sun, et al. (2014) study, the results found that there was a significant association between the prevalence of high total cholesterol and marital status, comparing with married or widowed participants, unmarried persons had greater odds of having high cholesterol ($P=0.02$).

4.7.1.5 Cholesterol and family members

Family members were classified into two groups < 6, and ≥ 6 members**.** Normal cholesterol levels formed 75.5%, and 79.2% among both groups' respectively, but high levels of cholesterol formed 24.5%, and 20.8% among them. There was an association between cholesterol levels and family members groups in this study but this relation does not reach statistically significant ($P = 0.23$).

4.7.1.6 Cholesterol and total income

Total income in our study was classified into three groups: < 1000 NIS, 1000 - 2000 NIS, and ≥ 2000 NIS. Normal Cholesterol was 81.8 %, 78.4%, and 69.5% among the groups respectively. High Cholesterol was distributed as 18.2%, 21.6%, and 30.5% among groups respectively. There was significant association between the cholesterol level and total income. High level of cholesterol was the highest among the third group ≥ 2000 NIS, but this association does not reach statistical significant level ($P = 0.09$). According to Al-Daghri et al., (2014) there was positive association between high income and prevalence of metabolic syndrome disease among males in the study, and this belong to sedentary life. Furthermore, males in the lower income class seem to be involved with more physically demanding occupations and hence present a lower prevalence of metabolic syndrome. Sun et al, (2014) in his study found that family income was associated with increased odds of having high total cholesterol.

4.7.2 Triglyceride and Socio demographic Variables

Table (4.15): Relation between Triglyceride level and Sociodemographic Variables

	Low < 150 mg/dl		High ≥ 150 mg/dl		χ^2	P value
Age groups	**No**	**%**	**No**	**%**		
20 – 30 years	140	72.5	53	27.5		
≥ 30 years	83	44.6	103	55.4	30.5	<0.01
Place of residency						
North	34	45.3	41	54.7		
Gaza	88	67.7	42	32.3		
Mid – Zone	38	66.7	19	33.3		
Khan – younis	41	56.9	31	43.1		
Rafah	22	48.9	23	51.1	13.2	0.01
Years of education						
< 12 years	86	56.2	67	43.8		
≥ 12 years	137	60.6	89	39.4	0.73	0.23
Marital status						
Not Married	102	81	24	19		
Married	121	47.8	132	52.2	38.1	<0.01
Family members						
< 6	107	54.6	89	45.4		
≥ 6	116	63.4	67	36.6	3.0	0.051
Total income						
< 1000 NIS	80	66.1	41	33.9		
1000 – 2000 NIS	79	48.8	83	51.2		
≥ 2000 NIS	63	66.3	32	33.7	11.6	0.01

4.7.2.1 Triglyceride and Age

The participants in the study were tested to determine the level of triglyceride in their blood, and they were classified according to their results into two groups, normal which is < 150 mg/dl, and high triglyceride ≥ 150 mg/dl. Normal triglyceride was distributed among both categories of participants' ages as 72.5% among 20-30 years group, and 44.5% among ≥ 30 years group. Also, high triglyceride was distributed among both categories of participants' ages as 27.5% among 20-30 years group, and 55.4% among ≥ 30 years group.

There was a relationship between triglyceride and age in our study, and there was difference of triglyceride among age categories. High levels of TG were found among ≥ 30 years group more than the younger group. The association here was significant with (P=0.00), this significant difference belongs to the nature of food, level of physical activity or sports which is higher in young age. We agree with Marcovecchio et al., (2009) who found in his study that there were overall increase in lipid parameters with age was found and this was particularly evident in male participants and he concluded that Lipid levels were significantly influenced by age.

4.7.2.2 Triglyceride and place of residency

Findings in our study explained the distribution of normal and high triglycerides among the five governorates in the Gaza strip. The percentages of normal triglyceride among North, Gaza, Mid Zone, Khan Younis, and Rafah were 45.3%, 67.7%, 66.7%, 56.9%, and 48.9% respectively while percentages of high levels of triglyceride were 54.7%, 32.3%, 33.3%, 43.1%, and 51.1% respectively. There was an association between TG and place of residency. High levels of triglyceride were in North (54.7%) and Rafah (51.1%), and Gaza was lower in high level of TG (32.3%). The difference between governorates reach statistically significant level (P=0.01). This difference may due to the age group difference among the participants in the study; the participants of young age in Gaza governorates were more than the old age. Mean age of North, Gaza, Mid Zone, Khan yunis, and Rafah were (37.04 ± 8.1), (29.7 ± 9.4), (29.9 ± 8.5), (30.9 ± 8.2), (32.9 ± 8.1) respectively. Moreover, may the difference due to distribution of sports and stadiums in Gaza more than other governorates. Wahed, et al., (2016) tried in his study to determine the prevalence of dyslipidemia in Al Fayoum governorates in Egypt, and classified the population according to place of residency into rural and urban, and results showed that high levels of TG found in rural than urban (P=0.007).

4.7.2.3 Triglyceride and years of education

Triglyceride levels were distributed among the two classes of education as it is shown in table (4.15). There was a relationship between triglyceride levels and years of education. Normal levels of triglyceride were 56.2%, and 60.6% among < 12 years, and ≥ 12 years groups respectively, and high levels were 43.8%, and 39.4% respectively among both groups. This difference does not reach statistically significant level (P=0.23). This may due to the lack of nutritional programs in curriculum, poor educational plan of the country, and wrong habits in our diets. Agreement with Schneider et al., (2006) Among the low educated women 80% had normal total blood TG levels, and among the high educated women (more than 7 years); 70% had normal blood TG levels, There were no statistically significant differences between these groups (p= 0.15).

4.7.2.4 Triglyceride and marital status

Results in our study revealed that normal levels of TG were 81% among not married blood donors, and 47.8% among the married blood donors. High levels of TG were 19% among not married, and 52.2% among married participants. There was an association between triglyceride levels and married status in our study, hypertriglyceridemia was higher in married group than not married. This difference between the two groups reached a statistically significant level (P= 0.00).

4.7.2.5 Triglyceride and family members

Results in the table (4.15) explain the percentages of normal and high levels of triglyceride among two groups of population according to the number of family members. Normal TG was 54.6%, and 63.4% among < 6 and ≥ 6 groups respectively. High levels of TG were 45.4% and 36.6% among both groups also. There was an association between TG levels and family members, and there was difference between the two classes < 6 and ≥ 6 but it did not reach statistically significant difference (P=0.051).

4.7.2.6 Triglyceride and total income

Table (4.15) also shows the distribution of normal and high levels of triglyceride among three population categories, which were classified according to total family income. Normal TG levels were found as 66.1%, 48.8%, and 66.3% among < 1000, 1000 - 2000, and ≥ 2000 groups respectively. There was a relationship between triglycerides levels and income. Population with income (1000 - 2000 NIS) has the highest percentege of high TG. This difference exists because this group was the largest group (42.5%) of population and half of population with age ≥ 30 years. The difference was statistically significant (P=0.003).

4.7.3 HDL and Socio demographic Variables

4.7.3.1 HDL and Age

Findings in our study show that there was an association between level of HDL and age in our study. Low levels of High Density Lipoprotein were 4.7% and 19.4% among age groups (20 - 30) years, and (≥ 30) years, respectively. High levels of HDL were 95.3%, and 80.6% among the two groups of age respectively. Age group ((≥ 30) years had larger percent of low HDL levels, but the younger group had large percent of high HDL. The difference between groups was significant (P=<0.001). This significant difference belongs to the nature of food, level of physical activity or sports which is higher in young age.

Table (4.16): Relation between HDL level and Sociodemographic Variables

	Low < 40 mg/dl		High ≥ 40 mg/dl		χ^2	P value
Age groups	**No**	**%**	**No**	**%**		
20 – 30 years	9	4.7	184	95.3		
≥ 30 years	36	19.4	150	80.6	19.5	<0.01
Place of residency						
North	11	14.7	64	85.3		
Gaza	13	10	117	90		
Mid – Zone	6	10.5	51	89.5		
Khan – younis	6	8.3	66	91.7		
Rafah	9	20	36	80	4.7	0.32
Years of education						
< 12 years	20	13.1	133	86.9		
≥ 12 years	25	11.9	201	88.9	0.35	0.33
Marital status						
Not Married	2	1.6	124	98.4		
Married	43	17	210	83	19	<0.01
Family members						
< 6	26	13.3	170	86.7	.75	0.24
≥ 6	19	10.4	164	89.6		
Total income						
< 1000 NIS	9	7.4	112	92.6		
1000 – 2000 NIS	23	14.2	139	85.8		
≥ 2000 NIS	13	13.7	82	86.3	3.4	0.18

4.7.3.2 HDL and place of residency

HDL levels were distributed among Gaza strip governorates from low levels of HDL (<40 mg/dl) and high levels (≥ 40 mg/dl). North, Gaza, Mid Zone, Khan Younis, and Rafah had low levels of HDL as 14.7%, 10%, 10.5%, 8.3%, and 20% respectively. While high levels of HDL were 85.3%, 90%, 89.5%, 91.7%, and 80% among the five governorates respectively. An association was found between HDL levels and place of residency, but the relationship between HDL levels and governorates didn't reach statistically significant (P=0.32).

4.7.3.3 HDL and years of education

Table (4.16) illustrates that there was a statistical relationship between HDL level and years of education, levels of low and high HDL were 13.1%, and 86.9% among < 12 years group while levels of low and high HDL were 11.9%, and 88.9% among ≥ 12 years group. However, this relationship was not statistically significant (P=0.33).

4.7.3.4 HDL and marital status

From the results, in table (4.16) we can conclude that there was a statistical relationship between the level of HDL and marital status, low and high levels of HDL were 1.6%, and 98.4% among not married group, were the percentages of low and high levels were 17%, and 83% among married group. Low levels of HDL were higher in the married group while high levels were noticed to be higher in not married group. This difference reached statistically significant level (P=<0.001). This difference exists because of the difference in ages between two groups, and their physical activity. Atiku & Yusuf, (2011) found that high levels of HDL was vary with marital status, but oppositely married men had higher mean of HDL than not married.

4.7.3.5 HDL and family members

According to family members which was grouped into < 6 and ≥ 6 members low and high levels of HDL were 13.3%, and 86.7% among (< 6) members and 10.4%, 89.6% among (≥ 6) members. There was an association between both categories and the levels of HDL, but no statistically significant relationship was found between family members and HDL percentages' (P=0.24).

4.7.3.6 HDL and total income

HDL was distributed among population with their classes according to the total family income. There was a significant relationship between High-density lipoprotein and family income. While low levels of HDL were 7.4%, 14.2%, and 13.7% among (< 1000 NIS), (1000 – 2000 NIS), and (≥ 2000 NIS) groups, high levels were distributed as 92.6%, 85.8%, and 86.3%, among them respectively. This difference does not reach statistically significant level (P=0.18). According to Sun, et al. (2014), family income was associated with increased odds of having high total cholesterol and low high-density lipoprotein (P<0.05).

4.7.4 LDL and Socio demographic Variables

4.7.4.1 LDL and Age

Results in our study show that there was a relationship between levels of Low-density lipoprotein and age groups. Low levels of Low-density lipoprotein were 89.6% and 76.1% among age groups (20 – 30) years, and (≥ 30) years, respectively. High levels of LDL were 10.4%, and 23.9% among groups of age respectively. Age group (20 – 30) years had larger percent of low LDL levels, but the (≥ 30) group had large percent of high LDL. The difference between groups reaches statistically significant level (P<0.001). This significant difference belongs to the nature of food, level of physical activity or sports, which is higher

Table (4.17): Relation between LDL level and Socio demographic Variables

	Low < 130 mg/dl		**High ≥ 130 mg/dl**		χ^2	**P value**
Age groups	**No**	**%**	**No**	**%**		
20 – 30 years	173	89.6	20	10.4		
≥ 30 years	140	76.1	44	23.9	12.2	<0.01
Place of residency						
North	64	85.3	11	14.7		
Gaza	104	80	26	20		
Mid – Zone	47	82.5	10	17.5		
Khan – younis	62	86.1	10	13.9		
Rafah	36	83.7	7	16.3	1.6	0.81
Years of education						
< 12 years	127	84.1	24	15.9		
≥ 12 years	186	82.3	40	17.7	0.21	0.38
Marital status						
Not Married	119	94.4	7	5.6		
Married	194	77.3	57	22.7	17.5	<0.01
Family members						
< 6	163	83.6	32	16.4	0.09	0.43
≥ 6	150	82.4	32	17.6		
Total income						
< 1000 NIS	104	86.7	16	13.3		
1000 – 2000 NIS	135	83.9	26	16.1		
≥ 2000 NIS	73	76.8	22	23.2	3.7	0.15

In young age. According to Deng, et al. (2012) study which was conducted in China to determine the prevalence and determinants of hyperlipidemia, findings explained that prevalence of LDL increase by increasing of age.

4.7.4.2 LDL and place of residency

LDL levels were distributed among Gaza strip governorates from low levels of LDL (<130 mg/dl) and high levels (≥ 130 mg/dl). There was statistically difference between LDL levels and place of residency. North, Gaza, Mid Zone, Khan Younis, and Rafah had low levels of LDL as 85.3%, 80%, 82.5%, 86.1%, and 83.7% respectively. While high levels of LDL were 14.7%, 20%, 17.5%, 13.9%, and 16.3% among the five governorates respectively. The relationship between levels of low and high LDL levels among governorates was not statistically significant (P=0.81).

4.7.4.3 LDL and years of education

Table (4.17) explains the levels of low and high LDL among population classes according to the years of education. There was a significant relationship between LDL levels and years of education. Levels of low and high LDL were 84.1%, and 15.9% among < 12 years group while levels of low and high LDL were 82.3%, and 17.7% among ≥ 12 years group. This relation was not statistical significant (P=0.38).

4.7.4.4 LDL and marital status

Results, in table (4.17) indicate that there was a statistically relationship between Low-density lipoprotein and marital status. We noticed that low and high levels of LDL were 94.4%, and 5.6% among not married group, were the percentages of low and high levels were 77.3%, and 22.7% among married group. Low levels of LDL were higher in the not married group while high levels were higher in married group. The difference between groups was statistically significant (P<0.001), because of the difference in ages between two groups, and their physical activity.

4.7.4.5 LDL and family members

Family members were grouped into < 6 and ≥ 6 members. There was statistically relationship between LDL levels and family members in this study. Low and high levels of LDL were 83.6%, and 16.4% among (< 6) members and 82.4%, 17.6% among (≥ 6) members. However this difference in LDL levels between groups does not reach statistically significant level (P=0.43).

4.7.4.6 LDL and total income

LDL was distributed among population with their classes according to the total family income; there was a statistically relationship between LDL and family income. While low levels were 86.7%, 83.9%, and 76.8% among (< 1000 NIS), (1000 – 2000 NIS), and (≥ 2000 NIS) groups, high levels were distributed as 13.3%, 16.1%, and 23.2%, among them respectively, however, this difference doesn't reach statistically significant level (P=0.15).

4.8 Lipid profile and family history

Participants in our study were questioned about family history; the most problems were diabetes, obesity, and hypertension. They were categorized into two groups: yes, if they have family history of disease, and no, for free family history of this disease, chi square was done to examine the relation between lipid profile and family history.

4.8.1 Cholesterol and family history

Table (4.18): Relation between Cholesterol level and Family history

Family history variables	Cholesterol				
	No.	Mean	SD	t	P value
Diabetes					
Yes	163	181	40		
No	216	170	38	2.65	0.01
Obesity					
Yes	158	184.6	40.4		
No	221	169.1	37.1	3.9	<0.01
Hypertension					
Yes	194	176.9	33.9		
No	185	174.1	44.1	0.71	0.48

Table (4.18) explains that there was a statistically relationship between family history of diabetes and cholesterol level, the mean of cholesterol among participants with positive family history of diabetes was (181 ± 40) and it was more than the mean of cholesterol among the negative group for family history of diabetes, which was (170 ± 38), this difference in means was statistically significant (P=0.01). Berentzen et al., (2016) in his study, found that there is independently association between children with strong family history of diabetes and higher levels of cholesterol. We agree with Van der Sande et al., (2001), in his study about if, family history has significant risk factor for non-communicable disease, that individuals with family history of diabetes had higher levels of cholesterol and there were highly statistically significant (P=<0.01).

In addition, mean of cholesterol among participants of family history of obesity was (184.6 ± 40.4), and it is more than the mean of cholesterol among the participants of no family history of obesity (169 ± 37.1). The difference in means here was highly statistically significant (P=<0.01), but it did not reach statistically significant level in (Van der Sande, 2001) study.

There was a statistically relationship between cholesterol levels and the participants with positive family history of hypertension, compared with those without family history of hypertension, but it doesn't reach statistically significant level (P=0.48), here we disagree with (Van der Sande, 2001), who found highly statistically significant relationship between cholesterol level and the family history of hypertension (P=<0.01).

4.8.2 Triglyceride and family history

Table (4.19): Relation between Triglyceride level and Family history

Family history variables	**Triglyceride**				
	No.	**Mean**	**SD**	**t**	**P value**
Diabetes					
Yes	163	178.9	128.2		
No	216	146.1	96.9	2.83	0.01
Obesity					
Yes	158	177.1	129.5		
No	221	148.2	97.1	2.48	0.01
Hypertension					
Yes	194	164.8	114.7		
No	185	155.4	110.3	0.817	0.41

Results in table (4.19) show that there was a statistically relationship between triglyceride level and family history of diabetes. Mean of triglyceride among participants of positive family history of diabetes was (178.9 ± 128.2), and it was more than the mean among participants of no family history of diabetes which was (146.1± 96.9). This difference between means was statistically significant (P=0.01).

The table also explains that there was a statistically relationship between triglyceride level and family history of obesity. Mean of triglyceride among participants of positive family history of obesity was (177.1 ± 148.2), and it was more than the mean among participants of no family history of obesity which was (129.5 ± 97.1). This difference between means was statistically significant (P=0.01).

Findings also explain that there was statistical relationship between the family history of hypertension and triglyceride levels. However, the relationship does not reach statistically significant level. Comparing our results to Van der Sande et al., (2001) study, we agree with him in statistically significant relationship between family history of diabetes and triglyceride levels (P <0.01), and disagree with him in the results about family history of obesity and triglyceride levels which was not statistically significant. Finally, we agree with him with his results about the relation of family history of hypertension and triglyceride levels, which was not statistically significant.

4.8.3 High Density Lipoprotein and Family history

Table (4.20): Relation between HDL level and Family history

Family history variables	High Density Lipoprotein				
	No.	Mean	SD	t	P value
Diabetes					
Yes	163	44.3	4.4		
No	216	45.5	4.1	-2.7	0.01
Obesity					
Yes	158	44.3	4.2		
No	221	45.5	4.3	-2.68	0.01
Hypertension					
Yes	194	44.9	4.1		
No	185	45.1	4.5	-.56	0.58

The results in table (4.20) show that there was a statistically relationship between HDL level and family history of diabetes. The mean of High Density Lipoprotein among the individuals who have positive family history of diabetes was (44.3 ± 4.4) lower than the mean of HDL levels among the individuals of no family history of diabetes (45.5 ± 4.1). This association was statistically significant (P=0.01).

Results also show that the mean of High Density Lipoprotein among the individuals who have positive family history of obesity was (44.3 ± 4.2) and it was lower than the mean of HDL levels among the individuals of no family history of obesity (45.5 ± 4.3). And this relation reach statistically significant level (P=0.01).

There was a statistically relationship between HDL level and family history of hypertension. The mean of High-density lipoprotein among the participants of positive history of hypertension is different from the mean in the other group but this difference does not reach statistically significant level (P=0.58).

4.8.4 LDL and Family history

The results in table (4.21) explain that there was a statistically relationship between low-density lipoprotein level and family history of diabetes. Mean of low-density lipoprotein among the individuals who have positive family history of diabetes was (103.5 ± 37.8) higher than the mean of LDL levels among the individuals of no family history of diabetes (96.3 ± 34.5). This association was not statistically significant (P=.056).

Results also show that the mean of low-density lipoprotein among the individuals who have positive family history of obesity was (106.9 ± 38.8) and it was higher than the mean of LDL levels among the individuals of no family history of obesity (94.03 ± 33.1). This relation reaches statistically significant level (P=0.01). The mean of Low-density lipoprotein among the participants of positive history of hypertension is different from the mean in the other group but this difference does not reach statistically significant level (P=0.47).

Table (4.21): Relation between LDL level and Family history

Family history variables	**Low density lipoprotein**				
	No.	**Mean**	**SD**	**t**	**P value**
Diabetes					
Yes	161	103.5	37.8		
No	116	96.3	34.5	1.92	0.055
Obesity					
Yes	156	106.9	38.8		
No	221	94.03	33.1	3.45	0.01
Hypertension					
Yes	192	100.7	33.2		
No	185	97.9	38.9	0.732	0.465

4.9 Lipid profile and obesity

4.9.1 Cholesterol and obesity

Table (4.22): Relation between Cholesterol level and Obesity: BMI, WC

	Normal Cholesterol < 200 mg/dl		High Cholesterol ≥ 200 mg/dl		χ^2	P value
BMI	**No**	**%**	**No**	**%**		
Normal+Underweight	130	94.2	8	5.8		
Overweight	99	73.9	35	26.1		
Obese	64	59.8	43	40.2	42	<0.01
WC						
< 94 cm	157	92.4	13	7.6		
≥ 94 cm	136	65.1	73	34.9	39.7	<0.01

According to Body Mass Index, population was classified into four groups, under weight, normal weight, overweight and obese. Also the population was classified according to waist circumferences measure into normal and abnormal. Results in table (4.22) indicate that there was a statistically relationship between cholesterol levels and body mass index, normal and high levels of cholesterol were 94.2%, 5.8% among participants of normal weight+underweight, 73.9%, 26.1% among the participants of overweight and 59.8%, 40.2% among the obese, respectively. The association was highly statistically significant (P<0.01). The difference between categories may return to the difference in diet habits, diet intake, and physical activity among the participants.

Results also show that there was a statistically relationship between cholesterol levels and waist circumferences, normal and high cholesterol levels were distributed as 92.4%, 7.6% among normal group of waist circumferences (< 94 cm) and 65.1%, 34.9% among the abnormal group of waist circumferences (≥ 94 cm). The difference between categories reaches highly statistically significant level (P<0.01).

4.9.2 Triglyceride and obesity

Results in table (4.23) show that there was a statistically association between triglyceride levels and body mass index, normal and high levels of triglyceride were 81%, 19% among participants of normal weight+underweight, 53.7%, 46.3% among the participants of overweight and 36.4%, 63.6% among the obese, respectively. The association was highly statistically significant (P<0.001). The difference between categories may return to the difference in diet habits, diet intake, and physical activity among the participants.

Results also explain that there was a statistically relationship between triglyceride levels and waist circumferences, normal and high triglyceride levels were distributed as 77.1%, 22.9% among normal group of waist circumferences (< 94 cm) and 44%, 56% among the abnormal group of waist circumferences (≥ 94 cm).

Table (4.23): Relation between Triglyceride level and Obesity: BMI, WC

	LowTriglyceride < 150 mg/dl		**High Triglyceride ≥ 150 mg/dl**		χ^2	**P value**
BMI	**No**	**%**	**No**	**%**		
Normal+Underweight	112	81	26	19		
Overweight	72	53.7	62	46.3		
Obese	39	36.4	68	63.6	52.1	<0.01
WC						
< 94 cm	131	77.1	39	22.9		
≥ 94 cm	92	44	117	56	42.2	<0.01

The difference between categories reaches highly statistically significant level (P<0.001). Deng, et al. (2012), found that hypertriglyceridemia increased with the increase of Body Mass Index. Also in Khader et al., (2010), revealed that there was significant difference in means of triglyceride among body mass index categories, means of TG were increase from (34 ± 7) among normal weight group to (154 ± 31.7) among overweight group and (298 ± 61.3) among obese group. Khader, et al. (2010), found also that there was a significance difference in the means of triglyceride among the waist circumferences of participants. The mean of TG among the group of high abdominal obesity was (283 ± 57.9) and it was higher than the mean of TG among the group of low abdominal obesity.

4.9.3 HDL and Obesity

Table (4.24): Relation between HDL level and Obesity: BMI, WC

	Low HDL < 40 mg/dl		**High HDL ≥ 40 mg/dl**		χ^2	**P value**
BMI	**No**	**%**	**No**	**%**		
Normal+ Underweight	3	2.2	135	97.8		
Overweight	19	14.2	115	85.8		
Obese	23	21.5	84	78.5	22.6	<0.01
WC						
< 94 cm	6	3.5	164	96.5		
≥ 94 cm	39	18.7	170	81.3	20.5	<0.01

Results in table (4.24) show that there was a statistically relationship between high-density lipoprotein levels and body mass index, low and high levels of HDL were 2.2%, 97.8% among participants of normal weight, 14.2%, 85.8% among the participants of overweight and 21.5%, 78.5% among the obese, respectively. The association was highly statistically significant (P<0.001). The difference between categories may return to the difference levels of physical activity among the participants.

Results also explain that there was significant relation between HDL levels and waist circumferences, low and high HDL levels were distributed as 3.5%, 96.5% among normal group of waist circumferences (< 94 cm) and 18.7%, 81.3% among the abnormal group of waist circumferences (≥ 94 cm). The difference between categories reaches highly statistically significant level (P<0.01). In Graversen, et al., (2014) study he found inverse relation between HDL and BMI.

4.9.4 LDL and Obesity

Results in table (4.25) show that there was a statistically relationship between low density lipoprotein levels and body mass index, low and high levels of LDL were 94.2%, 5.8% among participants of normal weight, 80.5%, 19.5% among the participants of overweight and 71.7%, 28.3% among the obese, respectively.

Table (4.25): Relation between LDL level and Obesity: BMI, WC

	Low < 130 mg/dl		High ≥ 130 mg/dl		χ^2	P value
BMI	**No**	**%**	**No**	**%**		
Normal +Underweight	130	94.2	8	5.8		
Overweight	107	80.5	26	19.5		
Obese	76	71.7	30	28.3	22.5	<0.01
WC						
< 94 cm	159	93.5	11	6.5		
≥ 94 cm	154	74.4	53	25.6	24.3	<0.01

The association was highly statistically significant (P<0.01). The difference between categories may return to the difference levels of physical activity among the participants. Results also explain that there was a statistically relationship between waist circumferences and LDL levels, low and high LDL levels were distributed as 93.5%, 6.5% among normal group of waist circumferences (< 94cm) and 74.4%, 25.6% among the abnormal group of waist circumferences (≥94cm). The difference between categories reaches highly statistically significant level (P<0.01).

From the results in our study we can see that body mass index and waist circumferences are closed related to the hyperlipidemia, the relationship was highly statistically significant (P=<0.01). We agree with Rao et al., (2014) in his findings that there were statistical significant relationships between BMI and WC with individuals with hyperlipidemia and this was higher than those without hyperlipidemia (P=<0.01). Another study was conducted by Bruggisser, et al., (2014) revealed that the mean of total cholesterol increased by increasing of the body mass index among study participants. Whereas mean total cholesterol level was lower than 4.0 mmol/l among underweight young men (3.919 mmol/l, 95 % CI 3.902–3.936), mean total cholesterol was ≥ 4.6 mmol/l in all WHO subcategories of obesity. Our results agreed with Wahed, et al., (2016) who found that there was highly statistically association between waist circumferences and high cholesterol (P<0.01), statistically significant relationship between WC and high triglyceride (P=0.01), statistically significant relationship between WC and high LDL (P=0.002), and statistically significant relationship between WC and low HDL (P=0.01). Body mass index was statistically significant related with lipid profile except low HDL (P=0.67). We agree with a study that was conducted in China, (Deng, et al., 2012) in the presence of highly statistically significant relationship between increasing BMI and hypercholesterolemia (p<0.001).

4.10 Lipid profile and life style

4.10.1 Lipid profile and nutrition

4.10.1.1 Cholesterol and Nutrition

Results explain the relation between cholesterol levels and diet intake see Annex (9). Mean of taking milk among the participants of normal cholesterol was 2.17, and the mean of taking milk among high cholesterol level participants was 2.1, there was a statistically difference but it did not reach statistical significant level (P=0.46). There was a statistically association between the mean of taking cheese among the participants of normal cholesterol (2.98), and the mean of taking cheese among high cholesterol level participants (3.1), it does not reach statistical significant level (P=0.37).

The mean of taking ice cream among the participants of normal cholesterol was (2.1), and the mean of taking ice cream among high cholesterol level participants was (1.97), this difference doesn't reach statistical significant level (P=0.06). Mean of taking meat, poultry, and fish among the participants of normal cholesterol was (2.98), and the mean of taking meat, poultry, and fish among high cholesterol level participants was (3.0), this relationship was statistical, but it did not reach statistical significant level (P=0.06).

Mean of taking eggs among the participants of normal cholesterol was (2.98), and the mean of taking eggs among high cholesterol level participants was (2.92), this difference was statistical but it did not reach statistical significant level (P=0.81). Mean of taking nuts among the participants of normal cholesterol was (2.6), and the mean of taking nuts among high cholesterol level participants was (2.5), this difference was statistical but it did not reach statistical significant level (P=0.26).

Mean of taking beans among the participants of normal cholesterol was (2.6), and The mean of taking beans among high cholesterol level participants was (2.4), this difference did not reach statistical significant level (P=0.21). Mean of drinking juice among low level cholesterol participants was lower than the mean among high level cholesterol participants, this difference wasn't statistically significant (P=0.12).

There were slightly significant difference in means of taking vegetables, fruits, and bread among participants with normal and high cholesterol levels but these differences in means did not reach statistically significance level (P=0.29, 0.43, 0.13) respectively.

There was a statistically relationship between taking sweets, salty snacks and levels of cholesterol, the mean difference reaches statistical significant level (P=0.01), and (P=0.02).

There were slightly statistically differences in means of taking soda, olives oil, coffee, tea, herbs, and fast food among the participants of different levels of cholesterol but these differences weren't statistically significant (P>0.05). A statistically relationship was found between the means of taking fried food and levels of cholesterol among the participants, the difference in means reaches statistically significant level (P=0.02).

4.10.1.2 Triglyceride and Nutrition

There was a statistically relationship between the Mean of taking milk among the participants of normal triglyceride (2.18), and the mean of taking milk among high TG level participants (2.1), however, this difference did not reach statistical significant level (P=0.52) see Annex (10).

Also a statistically relationship was found between the mean of taking cheese among the participants of normal TG (2.99), and the mean of taking cheese among high TG level participants (3.0), this difference did not reach statistical significant level (P=0.73). The mean of taking ice cream among the participants of normal TG was (2.07), and the mean of taking ice cream among high TG level participants was (2.0), this difference wasn't significant (P=0.6).

A statistical relationship was found between the mean of taking meat, poultry, and fish among the participants of normal TG (2.95), and the mean of taking meat, poultry, and fish among high TG level participants (3.0), this difference reached statistical significant level (P=0.05). Mean of taking eggs among the participants of normal TG was (2.97), and the mean of taking eggs among high TG level participants was (2.96), however this difference did not reach statistical significant level (P=0.91).

A statistical relationship was obtained between the mean of taking nuts among the participants of normal TG was (2.61), and it is higher than the mean of taking nuts among high TG level participants (2.55), but this relationship doesn't reach statistical significant level (P=0.46). The mean of taking beans among the participants of normal TG was (2.5), and the mean of taking beans among high TG level participants was (2.47), however there was a statistical relationship it did not reach statistical significant level (P=0.29).

Mean of drinking juice among low-level TG participants was lower than the mean among high-level TG participants, this difference wasn't statistical significant (P=0.41). There was slightly statistically difference in means of taking, fruits, vegetables, bread, and sweets among participants with normal and high TG levels but these differences in means did not reach statistically significance level (P>0.05). There was a statistically relationship between taking salty snacks and levels of cholesterol, the relationship was statistically significant (P=0.02).

There were slightly differences in means of taking soda, olives oil, coffee, tea, herbs, and fast food, fried food among participants with normal and high levels of TG but these differences weren't statistically significant (P>0.05).

4.10.1.3 HDL and Nutrition

Findings show that there were relationship between High-density lipoprotein levels and diet intake. Mean of taking milk among the participants of low HDL was (1.98), and the mean of taking milk among high HDL level participants was (2.2), the relationship between the two means was statistical but it did not reach statistical significant level (P=0.16) see Annex (11).

There was a statistical relationship between taking cheese and HDL levels. Mean of taking cheese among the participants of low HDL was (2.98), and it was lower than the mean of taking cheese among high HDL level participants (3.0), this relationship did not reach statistical significant level (P=0.82). Another statistically relationship was found between taking ice cream and HDL levels, the mean of taking ice cream among the participants of low HDL was (1.93), and the mean of taking ice cream among high HDL level participants was (2.1), this difference was statistically significant (P=0.04).

A statistically relationship was noticed between taking meat, poultry, and fish vs. HDL levels. The mean among the participants with low HDL levels was (2.98), it was lower than the mean of taking meat, poultry, and fish among high HDL level participants which was (2.99). The relation did not reach statistical significant level (P=0.86).

There was a statistical relationship between taking eggs and HDL levels. Mean of taking eggs among the participants of low HDL was (2.7), and the mean of taking eggs among high HDL level participants was (3.0), this difference reached a statistically significant level (P=0.03). Mean of taking nuts among the participants of low HDL was (2.4), and the mean of taking nuts among high HDL level participants was (2.6), this relationship was statistical but it did not reach statistical significant level (P=0.07).

There was a statistically relationship between consumption of beans and high-density lipoproteins levels. The mean of taking beans among the participants of low HDL was (2.4), and the mean of taking beans among high HDL level participants was (2.5), this relationship did not reach a statistically significant level (P=0.31).

Mean of drinking juice among low level HDL participants was lower than the mean among high level HDL participants, this significant difference wasn't statistical significant (P=0.17). There were statistically relationships between the consumption of vegetables, fruits and bread among participants with low and high HDL levels but these differences in means did not reach statistically significance level (P>0.05). There was a statistically significant relationship between taking sweets, salty snacks and levels of HDL, the mean difference reached statistically significant level (P=0.01), and (P<0.01) respectively.

There were slightly statistically differences in means of taking soda, olives oil, coffee, tea, herbs, and fast food, vs. levels of low and high HDL but these relationships weren't statistically significant (P>0.05). A statistically relationship was found between taking fried food and levels of HDL among the participants, the difference in means reaches statistically significant level (P=0.04).

4.10.1.4 LDL and Nutrition

Means of taking milk, cheese, ice cream, meat, eggs, and nuts among the participants of low LDL were (2.17), (2.99), (2.1), (3.0), (2.99), and (2.59) respectively and the means of taking these kinds of food among high LDL level participants were (2.1), (3.1), (2.0), (2.9), (2.9), and (2.6). These differences were not statistically significant (P>0.05). There was a statistically relationship between taking beans and LDL levels. Mean of taking beans among the participants of low LDL was (2.5), and it was higher than the mean of taking beans among high LDL level participants which was (2.4), this difference did not reach statistical significant level (P=0.09). Oldewage-Theron, et al., (2007) found that the daily consumption of 40 g of whole soybean, had no significant positive effect on TC, but had a beneficial effect on LDL.

Results show that mean of drinking juice among low level LDL participants was higher than the mean among high level LDL participants, this difference in means reached statistical significant (P=0.03). There were a statistically relationships between the means of taking vegetables, fruits and bread among participants with low and high LDL levels but these relationships did not reach statistically significance levels (P>0.05).

There was a statistically relationship between taking sweets, and levels of LDL, the mean of taking sweets among the participants of low LDL was higher than the mean among the participants of high LDL level. The relationship reached statistically significant level (P=0.03). There were slightly differences in means of taking salty snacks, soda, olives oil, coffee, tea, herbs, and fast food, fried food among the participants of low and high LDL levels, however these differences weren't statistically significant (P>0.05).

According to Deng, et al. (2012) there was significant difference in percentage of taking fried food among hyperlipidemic men comparing with the percentage of nonhyperlipidemic participants, and there was significant difference between the two groups in taking vegetables. Deng also found the hyperlipidemic group was higher in percentage to have salty foods, late night snacks comparing with non-hyperlipidemic group. According to Afshan, et al.(2011) there was significant increase in TC, TG, LDL, and VLDL levels among the study group which used fast food and low level of HDL among the same group when compared with lipid profile among control group which was vegetarians group.

4.10.2 Lipid profile and Smoking

Table (4.26): Lipid profile and Current cigarette smoking

	Smoker	N	Mean	Std. Deviation	P value
TC	Yes	92	172.1	45.1	
	No	287	176.7	37.2	0.37
TG	Yes	92	171.2	135.9	
	No	287	156.7	103.9	0.28
HDL	Yes	92	45.1	4.5	
	No	287	44.9	4.2	0.80
LDL	Yes	90	95.9	38.9	
	No	287	100.4	35.2	0.29

Results in the table (4.26) illustrated that there were statistically relationships between the means of lipid profile and current smoking groups. The relationships were not statistically significant. Our results were not in linear with (Rashan, et al., 2016) because, he found that there were statistically significant relationships between LDL, TC, TG, and HDL among smokers and non smokers. The means of all lipid profiles among smokers were higher than the means in non-smokers but there was decrease in HDL mean among smokers than non-smokers (P=<0.001). We agree with (Barba, et al., 2004) in his study about influence of smoking on lipid profile, in the part of not statistical significant relationship between total cholesterol and smoking but we differ with him in his results which were belonged to statistical significant association between TG, HDL, and LDL and smoking. Similar to Al-Ajlan, (2013) study, in his results, there were differences in means of total cholesterol, high density lipoprotein, and low density lipoprotein among smokers and non smokers and theses relationships didn’t reach statistically significant level.

Table (4.27): Lipid profile and Past cigarette smoking

	Past Smoker	No.	Mean	Std. Deviation	P value
TCL	Yes	108	184.9	42.8	
	No	271	171.9	37.2	<0.01
TG	Yes	108	187.9	116.3	
	No	271	149.2	109.2	<0.01
HDL	Yes	108	44.2	4.7	
	No	271	45.3	4.1	0.02
LDL	Yes	108	103.1	36.1	
	No	269	97.8	36.1	0.20

In the table (4.27) results reflect that there were statistically relationships between lipid profile and past smoking, the means of TC, TG, and LDL among past smokers were higher than among non past smokers. The mean of HDL among past smokers was lower than among non-smokers. These relationships were highly statistically significant between TC, and TG, vs. the past smoking (P=<0.001). Also, statistically significant association was obtained between HDL, and past smoking (P=0.02), but the difference of means of LDL doesn't reach statistically significant level (P=0.2). These statistical significant may be due to that past smokers had smoked high numbers of cigarettes and for long period and they quitted smoking because they afraid that they were at high risk.

Results in table (4.28) show that there were statistically relationships between lipid profiles and exposure to smoke.

Table (4.28): Lipid profile and exposed to smoking.

	Exposed to Smoke	No.	Mean	Std. Deviation	P value
TC	Yes	341	176.5	39.3	
	No	38	167.6	38.3	0.19
TG	Yes	341	162.2	108.8	
	No	38	142.7	141.9	0.31
HDL	Yes	341	44.9	4.2	
	No	38	45.3	4.7	0.59
LDL	Yes	339	99.9	36.1	
	No	38	93.7	36.5	0.31

Mean of cholesterol, among the participants who exposed to smoking was (176 ± 39.3) and it is higher than the mean of cholesterol among non-exposed participants (167 ± 38.3).

However, this difference in means did not reach statistically significant level (P=0.19). In addition, the mean of High-density lipoprotein, among those exposed to smoking was (44.9 ± 4.2) and it is lower than the mean of HDL among not exposed participants (45.3 ± 4.7). However, this difference in means was not statistically significant (P=0.59). Comparable to non-exposed participants the mean of Low-density lipoprotein among the participants who exposed to smoking was (99.9 ± 36) and it is higher than the mean of LDL among non-exposed (93.7 ± 36.4). Nevertheless, this difference in means did not reach statistically significant level (P=0.31). Zakhar, (2016) found that there were difference in Triglyceride and Low density lipoprotein levels between smoking exposed group and unexposed but this difference didn't reach levels of confirmatory statistical significance. Holay, et al., (2004) in his study, found that total cholesterol, and LDL, in passive and active smokers were significantly more than in nonsmokers while total triglyceride and HDL cholesterol levels did not show statistically significant difference in all the three groups.

4.10.3 Lipid profile and physical activity

Table (4.29): Lipid profile and physical activity

Lipid profile	Physical activity categories						χ^2	P value
	Low		Moderate		High			
	No.	%	No.	%	No.	%		
Cholesterol								
< 200	74	67.9	186	79.8	33	89.2		
≥ 200	35	32.1	47	20.2	4	10.8	9.3	<0.01
Triglyceride								
< 150	59	54.1	138	59.2	26	70.3		
≥ 150	50	45.9	95	40.8	11	29.7	3.0	0.22
HDL								
< 40	18	16.5	24	10.3	3	8.1		
≥ 40	91	83.5	209	89.7	34	91.9	3.3	0.19
LDL								
< 130	82	75.2	197	85.3	34	91.9		
≥ 130	27	24.8	34	14.7	3	8.1	7.6	0.02

Results in the table (4.29) show that there was a statistical relationship between cholesterol levels and physical activity levels. Among the participants with low physical activity 67.9% found to be, normal cholesterol level, and 32.1% was high cholesterol. Normal and high Cholesterol levels were 79.8%, 20.2% among the group of moderate physical activity and 89.2%, 10.8 among the high physical activity group respectively. This difference reached statistically significant level (P<0.01), this due to the positive effect of physical activity on cholesterol level. A statistically relationship between triglyceride levels and degree of physical activity was found in our study, normal TG levels increase from 54.1% among low physical activity group to 59.2% among moderate physical activity and reach 70.3% among high physical activity group where high levels of Triglyceride were: 45.9%, 40.8%, and 29.7% among low, moderate and high physical activity respectively. This relationship was not statistical significant (P= 0.22), because of the extent of other factors like the nature of diet intake and diet habits among the participants.

Low and high levels of high-density lipoproteins were distributed as 16.5%, 83.5% among low level of physical activity, 10.3%, 89.7% among moderate level of physical activity and 8.1%, 91.9% among high physical activity group. The difference in HDL levels between PA groups did not reach statistically significant level (P=0.19), maybe this due to lack of continuous physical activity.

Normal percentages of Low-density lipoproteins increased by the increasing of physical activity level: 75.2%, 85.3%, and 91.9% among low, moderate and high PA. High levels of LDL decreased as 24.8%, 14.7%, and 8.1% among low, moderate, and high levels respectively. This relationship between LDL levels and PA was statistically significant (P=0.02), and this happened because of LDL levels depend on practicing of walking and running sports.

Abhayaratna & Flores (2011) found that sufficient PA levels were predictive of lower levels of TG (p=0.028) and HDL-C (p=0.003). also, Kannan et al (2010) studied the effect of exercise intensity on lipid profile in sedentary obese adults and found that there were significant changes in all lipid profile parameters and moderate and intensity physical activities. Deng, (2012) also in his study found that percentage of PA among hyperlipidemic participants was 59.8%, and it was lower than the percentage of PA among nonhyperlipidemic group.

4.11 Lipid profile and blood pressure

Table (4.30): Correlation between Lipid profile and Systolic blood pressure

Lipid profile	Mean	SD	r	P value
Cholesterol	175.6	39.3	0.094	0.07
Triglyceride	160.2	112.5	0.11	0.03
HDL	44.9	4.3	-0.12	0.02
LDL	39.3	36.1	0.05	0.32

The table (4.30) explains that there was a correlation between lipid profile and systolic blood pressure. The relationships were statistical significant with triglyceride, and high-density lipoprotein. The relationship did not reach statistical significant with cholesterol and low-density lipoprotein.

Table (4.31): Correlation between Lipid profile and Diastolic blood pressure

Lipid profile	Mean	SD	r	P value
Cholesterol	175.6	39.3	0.22	0.00
Triglyceride	160.2	112.5	0.22	0.00
HDL	44.9	4.3	-0.27	0.00
LDL	99.3	36.1	0.14	0.005

The table (4.31) explains that there was a correlation between lipid profile and diastolic blood pressure. The relationships between diastolic blood pressure and lipoprotein levels reached statistical significant level. Wahiduzzaman (2014) in his study found that TC, TG , and LDL means were higher in hypertensive participants when comparing with normotensive, and the mean of HDL was lower in hypertensive than normotensive participants. The relation between systolic, diastolic pressure and lipid profile was statistically significant ($P<0.001$). Sarwar et al., (2014) also explore that serum total cholesterol (TC), triglyceride, LDL, VLDL, were significantly higher ($p<0.05$) whereas the level of HDL cholesterol was significantly lower in hypertensive patients as compared to control subjects ($p<0.05$). Pearson's correlation analysis reveals that HDL cholesterol was inversely correlated with systolic and diastolic blood pressure in both patient and control groups. However, serum TC, TG, LDL and HDL cholesterol were directly correlated with systolic and diastolic blood pressure in both groups. Another study revealed that diastolic blood pressure values correlated with all the components of lipid profile ($P<0.001$) (Varbo, et al., 2013).

Table (4.32): Summary of statistically significant variables with lipid profile

Significant Study variables	**Lipid profile**			
	TC	**TG**	**HDL**	**LDL**
Age	P <0.001	P <0.001	P <0.001	P <0.001
Marital status	P <0.001	P <0.001	P <0.001	P <0.001
Place of residency		P = 0.01		
Total income		P = 0.01		
Family history				
Diabetes	P = 0.01	P = 0.01	P = 0.01	
Obesity	P < 0.001	P = 0.01	P = 0.01	P= 0.001
Obesity				
BMI	P < 0.001	P < 0.001	P < 0.001	P < 0.001
WC	P < 0.001	P < 0.001	P < 0.001	P < 0.001
Life style				
Dietary intake				
Sweets	P = 0.01		P = 0.01	P = 0.03
Salty snacks	P = 0.02	P = 0.02	P <0.01	
Fried food	P = 0.02		P = 0.04	
Meat		P = 0.05		
Ice cream			P = 0.04	
Eggs			P = 0.03	
Juice				P = 0.03
Smoking				
Past smoking	P <0.01	P <0.01	P = 0.02	
Physical activity	P <0.01			P = 0.02
Hypertension				
Diastolic BP	P = 0.00	P = 0.00	P = 0.00	P = 0.005

Chapter 5:
Conclusion and Recommendation

5.1 Conclusion

The aim of this study is to identify the prevalence and the most determinants of hyperlipidemia among blood donors in Gaza Governorates; the study was conducted to address this information gap. The researcher extracted data of these determinants from healthy group male adults and highlighted the problem as a public in nature and it needs to put community based interventions programs supported with educational programs. The study might encourage future national efforts to educate the public about the health determinants and it may enhance the generation of future hypotheses. It might increase the awareness of the associated determinants of the elevated cholesterol, triglyceride, low-density lipoprotein, and low levels of high-density lipoprotein before starting any public intervention that is targeted to reduce the high prevalence, motivating the efforts to provide services related to health promotion, risk detection, and risk reduction. It might support the determination of the causes and mechanisms of hyperlipidemia determinants including biologic, social, and epidemiologic and influence effective interventions.

Total of (379) adults were included in the current study, data collected by using an interviewed questionnaire, which included demographic, socioeconomic, medical history, family history, and life style which includes smoking questions, physical activity questions, dietary habits questions, and dietary investigation through food frequency questionnaire. Anthropometric measurements, physical examination (BP), and blood samples were drawn from the participants to measure total cholesterol, triglyceride, high-density lipoprotein, and low-density lipoprotein.

From the study findings it appears that, a number of modifiable factors are responsible for the elevated of hyperlipidemia among the healthy population in the Gaza Governorates. For example obesity and overweight increased the levels of TC, TG, LDL, and decrease the levels of HDL. Also to be past smoker you have risk to have abnormal lipid profile except LDL. Another modifiable factor is physical inactivity; it was related to high levels of cholesterol and low-density lipoprotein. Hyperlipidemia was associated with another modifiable determinant which is dietary intake like taking sweets, salty snakes, fried food, meat, ice cream, eggs, and juice.

The non-modifiable factors were the age, marital status, family history of obesity, and diabetes.

In order to better, characterize Palestinian population it should be possible to reduce the prevalence of non-communicable disease, which are responsible for major morbidity and mortality, changing modifiable determinants through introducing public health policies, programs, and regulations that reduce exposure to such these determinants. It's important to apply a research study on the population in the Gaza Strip to know exactly the major modifiable determinants of hyperlipidemia among all age groups like children, old age, and pregnant women both adult sexes in order to determine the trends of smoking, lifestyle, obesity, and lipid profile tests.

- Findings in the study explained that the means of total cholesterol, triglyceride, high density lipoprotein, and low density lipoprotein were 175.9, 160.2, 44.9, and 99.34 mg/dl respectively.
- The prevalence of lipid profile was 22.7% for TC, 41.2% for TG, 11.9% for HDL, and 17% for LDL.
- The means ± standard deviations (SD) of the anthropometric parameters among the population of the study were (83.3±16.8), (174.8±6.6), (96.1±13.7), and (27.8±14.6) for weight, height, WC, and BMI respectively.
- Body mass index of the population of the study was classified as normalweight+underweight (36.4%), overweight (35.4%), and obese (28.2%).
- There was statistically significant relationship between total cholesterol levels and age groups, the high total cholesterol percentage was increasing among ≥ 30 years group than the younger group.
- Another association was noticed between total cholesterol level and marital status, it was statistically significant, and high TC percentage was higher among the married group.
- There was a statistically significant relationship between triglyceride levels and age group, the percentage of high triglyceride was higher among the older group.
- Triglyceride levels were related to the Gaza Governorates, and the findings of the study showed that there was a statistically significant relationship with place of residency, the percentage of high TG level was higher in the north governorates.

- A statistically and significant relationship was obtained between TG levels and total income of the participants families, the high percentage of TG was obtained with the 1000-2000 NIS group.
- There was a statistically significant relationship between high-density lipoprotein level vs. age group, and marital status. High levels of HDL were noticed among the younger group, and the not married group.
- There was a statistically significant relationship between low-density lipoprotein level vs. age group, and marital status. High levels of LDL were noticed among the older group, and the married group.
- A positive family history of diabetes and obesity was in relation with lipid profile levels, the relationships were statistically significant with all lipid profile except between diabetes and LDL levels.
- Highly statistically and significant relationships were noticed between total cholesterol levels triglyceride levels, high-density lipoprotein levels, low-density lipoprotein levels as dependent variables, vs. body mass index, and waist circumferences categories as independent variables.
- The participants were asked about dietary intake, by using food frequency questionnaire, the highest scoring belongs to bread (98.2%) and coffee-tea intake (90.2%). Moderate scoring was noticed among olives oil, vegetables, fruits, and sweet intake, which were 66.6%, 61.0%, and 60.4% respectively. Participants were found to take meat, eggs, juice, fried food, and soda as 59.6%, 59.4%, 57.6%, 56.2% and 54.8% respectively, lower percentages of dietary intake were found in nuts, beans, milk, salty snacks, and fast food.
- Findings explained that percentage of smoking cigarette was 24.3% in this study, exposed to smoking percentage was 90%, past smoking percentage was 28.5%.
- Finding in the study showed that there was a statistically significant relationship between total cholesterol, triglyceride, high-density lipoprotein, and past smoking, but it wasn't significant with current smoking and exposed.
- The population was distributed according to physical activity into low PA (28.8%), moderate PA (61.4%), and high PA (9.8%).
- Cholesterol levels were low among the participants with high physical activity (89.2%), and the low-density lipoprotein levels were lower among the participants

with higher physical activity (91.9%). There were statistically significant relationships between TC and LDL vs. physical activity.

- There were statistically relationship between triglyceride levels and high-density lipoprotein with physical activity. TG levels were lower among the participants with high physical activity (70.3%), and HDL levels were higher among them (91.9%), but the relationships did not reach the significant level.
- This study reveals that high prevalence of hyperlipidemia, hypertriglyceridemia, and hypercholesterolemia were found. Hyperlipidemia is associated with non modifiable risk factors as age marital status, and family history of diabetes, obesity, and group of modifiable variables as obesity, lack of physical activity, smoking. Interventions to control modifiable risk factors can reduce risk for hyperlipidemia and subsequently minimize associated morbidity and mortality.

5.2 Recommendations

The finding of this study give the researcher chance to highlight the problem as a public in nature and help her to provide number of recommendations and suggestions to be as a cornerstone in the prevention and control of hyperlipidemia.

5.2.1 Study recommendations

1- Increase the awareness about the importance of NCDs in Gaza strip and how to manage risk factors associated with NCDs
2- Apply regular programs with experts to give advices about how to decrease of weight, BMI, and WC and to encourage sports and physical activity to all ages
3- Encouragement of Healthy Diet programs in the Palestinian communities.
4- Anti-smoking campaigns and support companies that give advices about the danger of smoking
5- Encourage further research about Risk factors for NCDs in Gaza and support the research in all aspects
6- Apply and support more advanced tests for detecting of hyperlipidemia like genetic tests
7- Family history and lipid profile screening programs should be implemented in schools, universities, and at work places to determine high-risk group.
8- Treatment of potential abnormalities of lipid and lipoprotein supported by community-wide lipid profile awareness and education campaign

5.2.2 Future research recommendations

- Large better-funded research should be carried out to verify the finding of this study should consider the inclusion of weekend sampling.
- Further research should be conducted as community-based study with larger sample to estimate the prevalence of hyperlipidemia and dyslipidemia in the Palestinian society.
- More studies must be conducted to assess the tobacco control and the relation between smoking and the non-communicable diseases in Palestine
- Further studies must be conducted to estimate the familial hyperlipidemia among the Palestinian community.
- Large study must be conducted in the future to assess the effect of stress, on lipid profile.
- More interventional studies must be conducted to reduce the prevalence of hyperlipidemia.
- Large research must be carried out among large sample to assess the awareness of the risk factors of non-communicable disease.
- More research is needed to study the relationship between the consumptions of calorically sweetened beverages and weight gain.
- More research is needed to study the effect of olives oil consumptions on the lipid profile among Palestinian population.
- Further research to estimate the prevalence of hypothyroidism among hyperlipidemic patients.
- Large study must be done to estimate hyperlipidemia among children in the Palestinian schools.

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Annexes

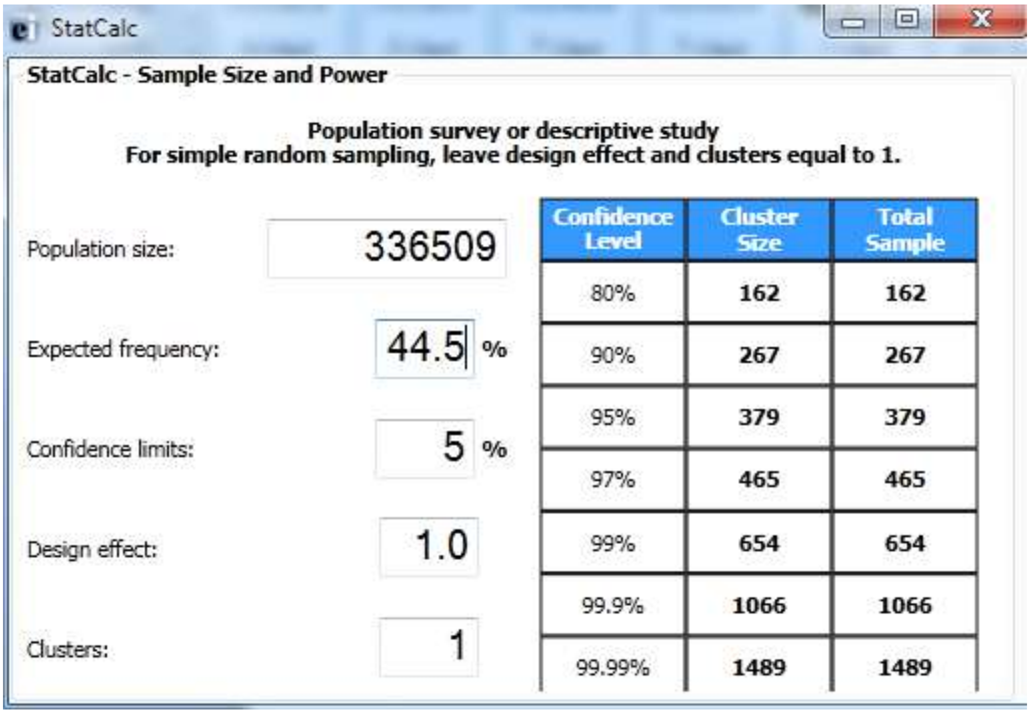
Annex (1): Palestine map

<u>http://www.tahrirnews.com/posts/446833/12/11/2016</u>

Annex (2): Gaza Strip map

http://www.wafainfo.ps/picts/GazaStrip

Annex (3): Sample size calculation



StatCalc

StatCalc - Sample Size and Power

Population survey or descriptive study
For simple random sampling, leave design effect and clusters equal to 1.

Population size: 336509

Expected frequency: 44.5 %

Confidence limits: 5 %

Design effect: 1.0

Clusters: 1

Confidence Level	Cluster Size	Total Sample
80%	162	162
90%	267	267
95%	379	379
97%	465	465
99%	654	654
99.9%	1066	1066
99.99%	1489	1489

Annex (4): Questionnaire

Interview Questionnaire

(English version)

Prevalence and Determinants of Hyperlipidemia Among Blood Donors Gaza Governorates

Hospital Name: ……………………………...…………………………….

Date of Interview: ………………………………...……………………….

Reference No.

Section 1: Socio demographic characteristics
1- Tel. / Mobile No: …………………..(Optional)
2- Place of residence: ☐ North ☐ Gaza ☐ Mid Zone ☐ Khan Younis ☐ Rafah
3- Gender: ☐ Male ☐ Female
4- Age: …………………………...
5- Type of citizenship: ☐ Refugee ☐ Non Refugee
6- Marital status: ☐ Single ☐ Married ☐ Divorced ☐ Widowed ☐ Separated
7- Years of Educational ……………….(Years)
8- Occupation: ……………
9- Family members: ……...
10- Income: ………………..
11- How many persons depend on this income?.......................
Section 2: Medical history: A- Participants medical history
1- Has your doctor ever told you that you had any of the following diseases?
Hypertension ☐ Yes ☐ No If yes, please describe the treatment………….. Since how many years……………...
Heart disease ☐ Yes ☐ No If yes, please describe the treatment………….. Since how many years……………..
brain stroke ☐ Yes ☐ No If yes, please describe the treatment………….. Since how many years……………..
Diabetes Mellitus ☐ Yes ☐ No If yes, please describe the treatment……………. Since how many years……………..
Cancer ☐ Yes ☐ No If yes, please describe the treatment……………Since how many years……………..
GIT problems(gastritis, IBS, Stomach ulcers, food allergies or intolerance, colitis, crohns disease,…etc) ☐ Yes ☐ No If yes, specify……………describe the treatment………………… Since how many years……………
Liver disease ☐ Yes ☐ No If yes, please describe the treatment…………………………........Since how many years……………..
Renal disease ☐ Yes ☐ No If yes, please describe the treatment……………………………… Since how many years……………..
Hypothyroidism ☐ Yes ☐ No If yes, please describe the treatment……………………………… Since how many years……………..
Psychiatric diseases ☐ Yes ☐ No

If yes, please describe the treatment……………………………… Since how many years……………..
High Triglyceride ☐ Yes ☐ No If yes, please describe the treatment……………………………… Since how many years……………..
High Cholesterol ☐ Yes ☐ No If yes, please describe the treatment……………………………… Since how many years……………..
Cerebrovascular disease ☐ Yes ☐ No If yes, please describe the treatment………………………………Since how many years……………..
Others diseases mention ………….. Treatment……………

B- Family medical history:			
1- Did your parents have high cholesterol?	☐ Yes	☐ No	☐ Don'know
2- Did any of your siblings have high cholesterol?	☐ Yes	☐ No	☐ Don'know
3- Did your parents have high triglyceride?	☐ Yes	☐ No	☐ Don'tknow
4- Did any of your siblings have high triglyceride?	☐ Yes	☐ No	☐ Don'tknow
5- Did your parents have over weight or obesity?	☐ Yes	☐ No	☐ Don't know
6- Did any of your siblings have over weight or obesity?	☐Yes	☐ No	☐ Don't know
7- Did your parents diagnosed for diabetes?	☐ Yes	☐ No	☐ Don't know
8- Did any of your siblings diagnosed for diabetes?	☐ Yes	☐ No	☐ Don't know
9- Did your parents diagnosed for hypertension?	☐ Yes	☐ No	☐ Don't know
10- Did any of your siblings diagnosed for hypertension?	☐ Yes	☐ No	☐ Don't know
11- Did your parents died from heart disease, heart attack, or stroke before age 60? ☐ Yes ☐ No ☐ Don't know (DK)			
6- Did any of your siblings died from heart disease, heart attack, or stroke before age 60? ☐ Yes ☐ No ☐ Dk			
7- Is there any other significant disease not mentioned? …………………			

Section 3: Life style Information:

A- **Physical activity:**

(Part I) Activity at work	**Response**	**Code**
1- Does your work involve vigorous-intensity activity thatcauses large increases in breathing orheart rate like for at least 10 minutes continuously? Ex:[carrying heavyloads, digging or construction work]	**Yes** **No**(If No skip to P4)	P1
2- In a typical week, on how many days do you do vigorous intensity activities as part of your work?	No. of days:..........	P2
3- How much time do you spend doing vigorous-intensity activities at work on a typical day?	Hrs : Min ....:.........	P3

4- Does your work involve moderate-intensity activity that causes small increases in breathing or heart rate such as brisk walking [or carrying light loads] for at least 10 minutes continuously?	**Yes** **No** (If No skip to P7)	P4
5- In a typical week, on how many days do you do moderate intensity activities as part of your work?	No. of days:..........	P5
6- How much time do you spend doing moderate-intensity activities at work on a typical day?	Hrs : Min ....:.........	P6
(Part II) Travel to and from places	**Response**	**Code**
1- Do you walk or use a bicycle for at least 10 minutes continuously to get to and from places?	**YesNo**(If No skip to P10)	P7
2- In a typical week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places?	No. of days:..........	P8
3- How much time do you spend walking or bicycling for travel on atypical day?	Hrs : Min........:.........	P9
(Part III) Recreational activities	**Response**	**Code**
1- Do you do any vigorous intensity sports, fitness, or recreational (leisure) activities that cause large increases in breathing or heart rate like [running or football,] for at least 10 minutes continuously?	**Yes** **No**(If No skip to P13)	P10
2- In a typical week, on how many days do you do vigorous intensity sports, fitness or recreational (leisure) activities?	No. of days:	P11
3- How much time do you spend doing vigorous-intensity sports fitness or recreational activities on a typical day?	Hrs : Min ....:.........	P12
4- Do you do any moderate intensity sports, fitness or recreational (leisure) activities that cause a small increase in breathing or heart rate such as brisk walking, (cycling, swimming, and volleyball) for at least 10 minutes continuously?	**Yes** **No** (If No Stop questions)	P13
5- In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational (leisure) activities?	No. of days:	P14

B- Smoking:

1- At the present time, are you smoker? ☐Yes ☐ No
If yes how many cigarette?..................

2- Have you ever smoked? ☐ Yes ☐ No

3 - How long have you been quit smoking? (..................years)

4- How much did you smoke before stop smoking? (.......... Cigarettes)

5- Currently, are you exposed to smoke? (passive) ☐ Yes ☐ No

6- Other types of smoking………………………

C-**Nutritional information**

(Part I)Dietary Intake

Food Frequency Questionnaire for Adolescents					
How often do you eat the following foods? (Put an "X" on the line.)					
	More than once/day	Once/day	2-3 times/week	Seldom	Never
Milk					
Cheese, yogurt					
Ice cream					
Meat, fish, poultry					
Eggs					
Peanut butter, nuts					
Dry beans, peas, tofu, soy					
Citrus fruits, juice (i.e., orange, grapefruit, tomato)					
Dark green leafy or deep orange vegetables collards, broccoli, carrots, sweet potatoes					
Other fruits, vegetables, potatoes					
Bread, cereals, rice, pasta					
Sweets (cakes, donuts, pies, cookies, candy)					
Salty snacks: potato chips, corn chips, tortilla chips, pretzels, etc.					
Soda pop, Kool-Aid					
Olives oil					
Coffee, tea					
Vitamins, herbs, other supplements					
Fast food					
Fried food					

(Part II)Dietary Habits

1- Do you follow any special diet regimen? ☐ Yes ☐ No

If the answer yes, specify. ☐ Low fat ☐ Low salt ☐ Special diet for DM. ☐ Special diet for weight loss ☐others, specify

………………………………………………………………………………..

2- Do you get breakfast daily? ☐ Always ☐ Sometimes ☐ Never

3- Do you take three regular meals daily? ☐ Yes ☐ No

4- I take my daily dietary meals outside home. ☐ Always ☐ Sometimes ☐ Never

5- Do you eat during watching TV? ☐ Always ☐ Sometimes ☐ Never

6- Do you eat during using internet? ☐ Always ☐ Sometimes ☐ Never

7- Do you consider your weight as? ☐ Normal weight ☐ Underweight ☐ Overweight ☐ Obese

8- Did you take a multivitamin and/or mineral supplement? ☐ Yes ☐ No

9- How many hours do you sleep daily……………………………………………………………………..

Section 4: Biochemical tests

Test	**Result**
Total Cholesterol	
Triglyceride	
HDL	
LDL	

Section 5: Anthropometric and physical measurements

Parameter	First measure	Second measure	Mean
Weight (kg)			
Height (M)			
Waist circumferences (cm)			
Blood pressure (mmHg)			

Thank you

Annex (5): List of Experts

No.	Name	Position
1.	Dr Bassam Abu Hamad	Al - Quds University
2.	Dr Khitam Abu Hamad	Al - Quds University
3.	Dr Mohammed Abu Hasheesh	Al - Quds University
4.	Dr Ali Belbeesy	MoH-European Gaza Hospital
5.	Dr Reema El Qishawi	MoH-Al Rimal central lab.
6.	Dr Amaal Abu Jamea	MoH-Al Shefa Hospital
7.	Dr Hatem Dabbakkeh	Al - Quds University
8.	Dr Akram Abu Salah	MoH
9.	MPH Yamin Geshta	MoH
10.	Dr Salah El shami	MoH-European Gaza Hospital

Annex (6): Hilsinki approval

المجلــس الفلسطيــني للبحـــث الصحـــــي

Palestinian Health Research Council

تعزيز النظام الصحي الفلسطيني من خلال مأسسة استخدام المعلومات البحثية في صنع القرار

"Developing the Palestinian health system through institutionalizing the use of information in decision making"

Helsinki Committee

For Ethical Approval

Date: 04/04/2016 **Number:** PHRC/HC/103/16

Name: Awatif Abd El Qader

الاسم: عواطف عبد القادر

We would like to inform you that the committee had discussed the proposal of your study about:

نفيدكم علماً بأن اللجنة قد ناقشت مقترح دراستكم حول:

Prevalence and Determinants of Hyperlipidemia among Blood Donors, Gaza Governorates

The committee has decided to approve the above mentioned research. Approval number PHRC/HC/103/16 in its meeting on 04/04/2016

و قد قررت الموافقة على البحث المذكور عاليه بالرقم والتاريخ المذكوران عاليه

Signature

Member **Chairman** **Member**

Genral Conditions:-

1. Valid for 2 years from the date of approval.
2. It is necessary to notify the committee of any change in the approved study protocol.
3. The committee appreciates receiving a copy of your final research when completed

Specific Conditions:-

E-Mail:pal.phrc@gmail.com

Gaza - Palestine غزة - فلسطين

Annex (7): Ministry of Health Approval

Ministry of health		وزارة الصحة

التاريخ:24/02/2016

السيد : ناصرالدين رافت مصطفى ابوشعبان   حفظه الله
مدير عام بالوزارة/الإدارة العامة لتنمية القوى البشرية - /وزارة الصحة
السلام عليكم ورحمة الله وبركاته ,,,

الموضوع/ تسهيل مهمة باحث// عواطف فايز عبد القادر

التفاصيل //

بخصوص الموضوع أعلاه، يرجي تسهيل مهمة الباحثة/ عواطف فايز عبد القادر
الملتحقة ببرنامج ماجستير الصحة العامة جامعة القدس ابوديس بغزة في إجراء بحث بعنوان :-

Prevalence and Determinants of Hyperlipidemia among Blood Donors Gaza " Governorates"

حيث الباحثة بحاجة لتعبئة استبانه وأخذ قياسات الطول والوزن ومحيط الخصر وضغط الدم وجزء من عينة دم من عدد من المتبرعين بالدم في بنوك الدم في مستشفيات قطاع غزة.

نأمل توجيهاتكم لذوي الاختصاص بضرورة الحصول على الموافقة المستبصرة ممن هم على استعداد للمشاركة في البحث ومن ثم تمكين الباحثة من تطبيق أدوات الدراسة عليهم، ووفق الأسس التي يتم بها التعامل مع هذا النوع من البحوث وعلى مسئولية الباحثة، بما لا يتعارض مع مصلحة العمل وضمن أخلاقيات البحث العلمي، و دون تحمل الوزارة أي أعباء أو مسئولية.

وتفضلوا بقبول التحية والتقدير،،،

محمد ابراهيم محمد السرساوي
- مدير دائرة/الإدارة العامة لتنمية القوى البشرية

Based on: Email between Human Resources Department and MoH Hospitals

Date: 24/02/2016

Annex (8): Participation approval letter

نموذج موافقة

عزيزي المتبرع

أنا الطالبة /عواطف فايز عبد القادر ملتحقة ببرنامج الصحة العامة- تخصص علم أوبئة بجامعة القدس- أبو ديس.

لقد تم اختيارك بشكل عشوائي للمشاركة في هذه الدراسة والتي تهدف إلى معرفة نسبة انتشار ومحددات ارتفاع الدهون والكولسترول بين المتبرعين بوحدات الدم في مستشفيات محافظات قطاع غزة والتي ستسهم في تحديد أسباب مشكلة ارتفاع الدهون وتساعد في وضع الحلول المناسبة لها.

- أخي المتبرع: إن اشتراكك في هذا البحث طوعي ويحق لك القبول والرفض او الانسحاب في أي وقت.
- سيتم عينة دم حوالي 5 سم وسوف يتم إجراء فحوصات مثل معدل الكولسترول و الدهون الثلاثية وفحوصات HDL, LDL التي تبين الكولسترول الجيد وغير الجيد ويلزم في هذه الحالة الصيام لمدة 12- 16 ساعة حتى تكون النتائج دقيقة.
- سيتم أخذ قياس الطول والوزن ومحيط الخصر وضغط الدم .
- سوف يتم تعبئة الاستبانة لمدة 15 دقيقة تقريبا بواسطة الباحثة تضم أسئلة تتعلق بالبيانات الشخصية ونظام الأكل والرياضة والتدخين... للمشاركين في الدراسة.
- كل بياناتك ستكون سرية وبإمكانك اخذ نتائج فحوصاتك في أي وقت تشاء.

وشكراً لتعاونكم

الباحثة/ عواطف عبد القادر

Annex (9): Relation between Cholesterol groups and dietary intake

	Cholesterol Groups	N	Mean	SD	P value
Milk	< 200	293	2.1775	.91556	0.46
	≥ 200	86	2.0930	.95336	
Cheese, yogurt	< 200	293	2.9829	.76506	0.37
	≥ 200	86	3.0698	.83723	
Ice cream	< 200	293	2.0887	.50237	0.06
	≥ 200	86	1.9767	.48451	
Meat, fish, poultry	< 200	293	2.9863	.43771	0.81
	≥ 200	86	3.0000	.55307	
Eggs	< 200	293	2.9898	.80871	0.46
	≥ 200	86	2.9186	.70653	
Nuts	< 200	293	2.6143	.76171	0.26
	≥ 200	86	2.5116	.71528	
Beans	< 200	293	2.5461	.67395	0.12
	≥ 200	86	2.4186	.62243	
Juice	< 200	293	2.9147	.81692	0.12
	≥ 200	86	2.7791	.67565	
Vegetables	< 200	293	3.2901	.73172	0.29
	≥ 200	86	3.3837	.67158	
Fruits, vegetables	< 200	293	3.0410	.78406	0.43
	≥ 200	86	3.1163	.74231	
Bread	< 200	293	4.9249	.31158	0.13
	≥ 200	86	4.8605	.43825	
Sweets	< 200	293	3.0853	.92319	0.01
	≥ 200	86	2.8023	.89205	
Salty snacks	< 200	293	2.3754	.85348	0.02
	≥ 200	86	2.1279	.79404	
Soda pop, Kool-Aid	< 200	293	2.7611	1.06191	0.56
	≥ 200	86	2.6860	1.05453	
Olives oil	< 200	293	3.3276	.88082	0.68
	≥ 200	86	3.3721	.85470	
Coffee, tea	< 200	293	4.5085	.88988	0.65
	≥ 200	86	4.5581	.91529	
Vitamins, herbs	< 200	293	1.1570	.65892	0.53
	≥ 200	86	1.2093	.75329	
Fast food	< 200	293	2.1672	.70421	0.55
	≥ 200	86	2.1163	.65832	
Fried food	< 200	293	2.8532	.78664	0.02
	≥ 200	86	2.6279	.85470	

Annex (10): Relation between Triglyceride groups and dietary intake

	TG by groups	N	Mean	Std. Deviation	P value
Milk	< 150	223	2.1839	.89910	0.52
	≥ 150	156	2.1218	.95946	
Cheese, yogurt	< 150	223	2.9910	.77687	0.73
	≥ 150	156	3.0192	.79084	
Ice cream	< 150	223	2.0762	.50092	0.55
	≥ 150	156	2.0449	.49959	
Meat, fish, poultry	< 150	223	2.9507	.45746	0.05
	≥ 150	156	3.0449	.47305	
Eggs	< 150	223	2.9776	.81342	0.91
	≥ 150	156	2.9679	.74850	
Nuts	< 150	223	2.6143	.80212	0.46
	≥ 150	156	2.5577	.67433	
Beans	< 150	223	2.5471	.69508	0.29
	≥ 150	156	2.4744	.61643	
Juice	< 150	223	2.8565	.82584	0.41
	≥ 150	156	2.9231	.73211	
Vegetables	< 150	223	3.2780	.74363	0.28
	≥ 150	156	3.3590	.68107	
Fruits, vegetables	< 150	223	3.0135	.77390	0.28
	≥ 150	156	3.1218	.77329	
Bread	< 150	223	4.9148	.32453	0.76
	≥ 150	156	4.9038	.37294	
Sweets	< 150	223	2.9955	.90294	0.52
	≥ 150	156	3.0577	.95201	
Salty snacks	< 150	223	2.4036	.88449	0.02
	≥ 150	156	2.1987	.77393	
Soda pop, Kool-Aid	< 150	223	2.7040	1.05366	0.38
	≥ 150	156	2.8013	1.06813	
Olives oil	< 150	223	3.3139	.90052	0.53
	≥ 150	156	3.3718	.83641	
Coffee, tea	< 150	223	4.4753	.90945	0.25
	≥ 150	156	4.5833	.87221	
Vitamins, herbs	< 150	223	1.1435	.63462	0.39
	≥ 150	156	1.2051	.74243	
Fast food	< 150	223	2.1435	.62026	0.69
	≥ 150	156	2.1731	.78833	
Fried food	< 150	223	2.8386	.79466	0.29
	≥ 150	156	2.7500	.82403	

Annex (11): Relation between High-density lipoprotein groups and dietary intake

	HDL by Groups	N	Mean	Std. Deviation	P value
Milk	< 40	45	1.9778	.96505	0.16
	≥ 40	334	2.1826	.91674	
Cheese, yogurt	< 40	45	2.9778	.83907	0.82
	≥ 40	334	3.0060	.77496	
Ice cream	< 40	45	1.9333	.44721	0.04
	≥ 40	334	2.0808	.50468	
Meat, fish, poultry	< 40	45	2.9778	.54309	0.86
	≥ 40	334	2.9910	.45511	
Eggs	< 40	45	2.7333	.65366	0.03
	≥ 40	334	3.0060	.79787	
Nuts	< 40	45	2.4000	.68755	0.07
	≥ 40	334	2.6168	.75724	
Beans	< 40	45	2.4222	.65674	0.31
	≥ 40	334	2.5299	.66486	
Juice	< 40	45	2.7333	.65366	0.17
	≥ 40	334	2.9042	.80340	
Vegetables	< 40	45	3.4667	.62523	0.12
	≥ 40	334	3.2904	.72871	
Fruits, vegetables	< 40	45	3.1111	.85870	0.63
	≥ 40	334	3.0509	.76354	
Bread	< 40	45	4.9111	.28780	0.98
	≥ 40	334	4.9102	.35219	
Sweets	< 40	45	2.6667	.92932	0.01
	≥ 40	334	3.0689	.91273	
Salty snacks	< 40	45	1.9333	.61791	<0.01
	≥ 40	334	2.3713	.85944	
Soda pop, Kool-Aid	< 40	45	2.7556	1.06931	0.94
	≥ 40	334	2.7425	1.05957	
Olives oil	< 40	45	3.3111	.99595	0.85
	≥ 40	334	3.3413	.85791	
Coffee, tea	< 40	45	4.4222	1.05505	0.44
	≥ 40	334	4.5329	.87188	
Vitamins, herbs	< 40	45	1.2444	.82999	0.43
	≥ 40	334	1.1587	.65894	
Fast food	< 40	45	2.0667	.65366	0.36
	≥ 40	334	2.1677	.69880	
Fried food	< 40	45	2.5778	.83907	0.04
	≥ 40	334	2.8323	.79904	

Annex (12): Relation between Low-density lipoprotein groups and dietary intake

	LDL by Groups	N	Mean	Std. Deviation	P value
Milk	<130	313	2.1693	.92339	0.64
	≥130	64	2.1094	.94478	
Cheese, yogurt	<130	313	2.9872	.77614	0.48
	≥130	64	3.0625	.81406	
Ice cream	<130	313	2.0799	.50321	0.17
	≥130	64	1.9844	.48770	
Meat, fish, poultry	<130	313	3.0000	.44578	0.40
	≥130	64	2.9375	.55990	
Eggs	<130	313	2.9936	.79660	0.34
	≥130	64	2.8906	.73716	
Nuts	<130	313	2.5911	.75459	0.98
	≥130	64	2.5938	.75000	
Beans	<130	313	2.5431	.67384	0.09
	≥130	64	2.3906	.60729	
Juice	<130	313	2.9233	.80892	0.03
	≥130	64	2.6875	.66368	
Vegetables	<130	313	3.2971	.72361	0.27
	≥130	64	3.4063	.68357	
Fruits, vegetables	<130	313	3.0479	.77683	0.57
	≥130	64	3.1094	.77903	
Bread	<130	313	4.9201	.31523	0.32
	≥130	64	4.8594	.46691	
Sweets	<130	313	3.0639	.92460	0.03
	≥130	64	2.7969	.89407	
Salty snacks	<130	313	2.3227	.85186	0.83
	≥130	64	2.2969	.82960	
Soda pop, Kool-Aid	<130	313	2.7604	1.06070	0.48
	≥130	64	2.6563	1.07229	
Olives oil	<130	313	3.3355	.88030	0.95
	≥130	64	3.3438	.85855	
Coffee, tea	<130	313	4.5016	.90626	0.45
	≥130	64	4.5938	.84925	
Vitamins, herbs	<130	313	1.1789	.70252	0.57
	≥130	64	1.1250	.57735	
Fast food	<130	313	2.1534	.70402	0.72
	≥130	64	2.1875	.63932	
Fried food	<130	313	2.8339	.80734	0.11
	≥130	64	2.6563	.80116	

نسبة ومحددات ارتفاع الدهون لدى المتبرعين بالدم في محافظات قطاع غزة

إعداد: عواطف فايز عبد القادر

إشراف: د. يحيى عابد

ملخص:

مقدمة:

يعتبر ارتفاع الدهون حالة طبية تتميز بارتفاع أحد أو جميع أنواع الدهنيات مثل الكولسترول اوالدهون الثلاثية /أو البروتين الدهني في الدم LDL و HDL، والتعرض للدهون في جميع الأعمار يعرض صحة الإنسان لخطر الإصابة بأمراض القلب والأوعية الدموية والسرطان والسكري، وارتفاع ضغط الدم والأمراض الأخرى، حيث تعتبر من الأسباب الرئيسية للإصابة بالأمراض والوفيات في العالم.

الهدف من الدراسة:

- تحديد نسبة ومعدل ارتفاع الدهون بين المتبرعين بالدم في محافظات قطاع غزة
- معرفة العلاقة بين ارتفاع الدهون و العوامل الاجتماعية والديموغرافية
- دراسة العلاقة بين ارتفاع الدهون و مؤشرات السمنة
- قياس علاقة ارتفاع الدهون مع التاريخ الطبي للعائلة
- تحديد علاقة ارتفاع الدهون بالأمراض
- دراسة العلاقة بين ارتفاع الدهون ونمط الحياة الذي يضم التدخين ، النشاط البدني، و التغذية

نوع الدراسة:

دراسة مقطعية أجريت بين المتبرعين بالدم الذكور وكان عددهم 379 من عمر 20 إلى 30 سنة.

جمع البيانات:

قام الباحث بجمع البيانات من خلال تعبئة استبانه من إعداد الباحثة بنفسها لكل مشارك، تتعلق الاستبانة بالمعلومات الاجتماعية والديموغرافية مثل العمر ومكان الإقامة والحالة الاجتماعية ومستوى الدخل والتعليم وعدد أفراد الأسرة. وتضمنت الاستبانة أسئلة عن التاريخ الطبي للمشترك و تاريخ الأسرة الصحي من حيث وجود أمراض لدى الآباء والإخوة و الأخوات.وقد تم سؤال المشترك عن نمط الحياة والذي يضم أسئلة عن النشاط البدني، والتدخين والمتناول الغذائي، وعادات النظام الغذائي.

تم أخذ قياسات الوزن والطول و محيط الخصر وضغط الدم. وعلاوة على ذلك تم جمع عينات دم من المشتركين في الدراسة بعد صيام 12 – 16 ساعة لقياس فحوصات الكولسترول والدهون الثلاثية و الكولسترول الجيد وغير الجيد.

وقد تم فحص صدق وثبات الأداة من قبل محكمين بالإضافة إلي تطبيق الاستبانة على عينة استطلاعية قبل البدء بالبحث. كما التزمت الباحثة بالمعايير الأخلاقية البحثية كالحصول على موافقة لجنة هلسنكي والمشاركة الطوعية.

تحليل البيانات:

تم استخدام البرنامج الإحصائي SPSS لمعالجة البيانات إحصائيا وتم استخدام فحوصات لاختبار العلاقة بين المتغيرات وهي:

"P-value,Chi-square, independent t-test and correlation"

النتائج:

- أظهرت النتائج أن نسبة ارتفاع الكولسترول في الدم بين المشتركين في الدراسة كانت (22.7%)، و كذلك نسبة ارتفاع الدهون الثلاثية (41.2%). وأظهرت النتائج أن نسبة انخفاض الكولسترول الجيد (11.9%) بينما كانت نسبة الكولسترول الغير جيد LDL (17%).

- كان ارتفاع الكولسترول والدهون الثلاثية و LDL وانخفاض HDL متناسبا مع زيادة العمر والحالة الاجتماعية ، حيث ان معدل TC, TG, and LDL ازداد عند كبار السن والمتزوجين مقارنة بمعدلات HDL التي انخفضت لدى الفئة العمرية الأكبر و لدى المتزوجين .

- أظهرت نتائج الدراسة أن هناك علاقة قوية جدا بين Hyperlipidemia والتاريخ المرضي لعائلات المشتركين في الدراسة حيث أن معدلات ارتفاع الدهون كانت مرتبطة بالسمنة ومرض ارتفاع السكر وضغط الدم لدى عائلات المشتركين.

- أظهرت نتائج الدراسة أن معدلات مستوى قياس السمنة بين المشتركين في الدراسة كانت 36.4% ، 35.4% و 28.2% لدى الوزن الطبيعي ، الوزن الزائد و السمنة على التوالي ، كما انه تبين وجود علاقة قوية جدا بين مستويات فحوصات TC, TG, HDL, LDL و معدل قياس السمنة BMI.

- ايضا كان هناك ارتباطا قويا بين ارتفاع الدهون Hyperlipidemia و مستوى محيط الخصر WC حيث ازدادت نسبة الدهون لدي المشتركين الذين يتبعون مستوى WC المرتفع ($\geq$ 94cm).

- اظهرت نتائج الدراسة ان نسبة المدخنين بين المشتركين كانت 24.3% بينما كانت نسبة الذين يتعرضون للتدخين 90% وتبين ان نسبة المقلعين عن التدخين 28.5%. كان هناك علاقة ذو دلالة إحصائية بين معدلات TC, TG, HDL و بين المشتركين المدخنين سابقا ولكنها لم تكن كذلك مع المدخنين الحاليين.

- كانت نتائج تصنيف المشتركين في الدراسة حسب النشاط البدني منخفض بنسبة 28.8% ومتوسط بنسبة 61.4% ومرتفع بنسبة 9.8%.ولقد أظهرت الدراسة أن نسبة ارتفاع الكولسترول وLDL كانت منخفضة لدى المشتركين ذو النشاط البدني المرتفع.

- اظهرت نتائج الدراسة انخفاض الكولسترول الجيد عند المشتركين الذين يستهلكون الحلوى والوجبات الخفيفة المالحة، والطعام المقلي ، في حين أن مستوى الدهون الثلاثية ارتفع بين الأشخاص الذين يتناولوا الوجبات الخفيفة المالحة واللحوم. وانخفض مستوى الكولسترول لدى المشركين الذين تناولوا العصير.

الاستنتاج: كشفت هذه الدراسة أن الانتشار المرتفع للدهون و الكولسترول.كان مرتبطا بعوامل الخطر الغير قابلة للتعديل وهي العمر والحالة الزوجية، وتاريخ الأسرة ومجموعة أخرى من المتغيرات القابلة للتعديل كالسمنة وقلة النشاط البدني، والتدخين ، مما يشجع على ضرورة التدخل للسيطرة على عوامل الخطر القابلة للتعديل و التي تقلل من خطر الدهون بالتالي تقليل معدلات الوفيات والأمراض المرتبطة بها.

التوصيات:

- زيادة الوعي بالأمراض الغير معدية والعوامل المرتبطة بها

- تطبيق البرامج المنتظمة والاستعانة بالخبراء لإعطاء النصائح حول كيفية إنقاص الوزن، مؤشر كتلة الجسم، محيط الخصر وتشجيع الرياضة والنشاط البدني لجميع الأعمار

- التشجيع على "اتباع نظام غذائي صحي" من خلال برامج تنظم في المجتمعات الفلسطينية

- مكافحة التدخين من خلال الحملات الخاصة ودعم المؤسسات التي تعطي نصائح حول خطر التدخين

- تشجيع إجراء المزيد من البحوث حول التي تتسبب في حدوث الأمراض الغير معدية في قطاع غزة، ودعم البحوث في جميع جوانب

- توفير وتطبيق فحوصات أكثر تطورا للكشف عن الدهون مثل الفحوصات الجينية