An-Najah National University

Faculty of Graduate Studies

Dyslipidemia in young patients with type I diabetes mellitus in Nablus city: a cross-sectional study

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Dedication

To my great parents, who never stop supporting, encouraging, and praying forme, and pushing me in the success way...

To my beloved husband, who gives me strength and power in my life...

To my sweethearts, my children, who I see the future in their eyes...

To my dearest brothers and darling sisters who stand by my side always...

To my homeland, Palestine…

And to everybody who touches my heart and gives mehope and strength...

I dedicate this research…

Acknowledgement

First of all, I praise Allah for providing me this opportunity, and giving me the capability to proceed successfully in holding this work.. thanks Allah

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My appreciation to my beloved family and friends for their continuous motivation and support throughout my life..

الاقرار

انا الموقعة أدناه، مقدمة الرسالة التي تحمل عنوان:

Dyslipidemia in young patients with type I diabetes mellitus in Nablus city: a cross-sectional study

أقر بأن ما اشتملت عليه هذه الرسالة هي من نتاج جهدي الخاص، باستثناء ما تمت الاشارة اليه حيثما ورد، وأن هذه الرسالة ككل أو أي جزء منها لم يقدم من قبل لنيل درجة أو لقب علمي أو بحثي لدى أي مؤسسة تعليمية أو بحثية أخرى.

Declaration

The work provided in this thesis unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

Student's name: **اسم الطالبة:**

Signature: **التوقيع:**

Date: **التاريخ:**

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List of abbreviations

TIDM	Type I diabetes mellitus
WHO	World Health Organization
ADA	American Diabetes Association
LDL-C	Low density lipoprotein-cholesterol
HDL-C	High density lipoprotein-cholesterol
TC	Total cholesterol
TG	Triglyceride
CVD	Cardiovascular disease
MOH	Ministry Of Health
NGOs	Non-governmental organizations)
WC	Waist circumference
BMI	Body mass index
SD	Standard deviation
GAD	Glutamic Acid Decarboxylase

Dyslipidemia in young patients with type I diabetes mellitus in Nablus city: a cross-sectional study

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Abstract

Background:

Type I diabetes mellitus is a condition challenging public health worldwide. The prevalence of dyslipidemia in the general population, including children and adolescents, has recently increased. Since dyslipidemia is a preventable risk factor for cardiovascular diseases, proper screening is essential for reducing this harmful result.

Objective:

To estimate the prevalence of dyslipidemia among children and adolescents with type I diabetes mellitus, and to understand the associated factors.

Methods:

116 children and adolescents with type I diabetes mellitus under 18 years of age, attending Nablus diabetic clinics on a regular basis, were enrolled in a cross sectional study, from October 2017 to March 2018. An interviewer-filled questionnaire was used to collect the desired data, which included 3 sections, socio demographic data and disease history, anthropometric measurements, and laboratory results of glycemic and lipid profile. This profile , consists of fasting blood sugar (FBS), Glycated hemoglobin

(HBA1C), total cholesterol, triglycerides, LDL-C, and HDL-C. All analysis was conducted using the Stata software, version 14. Two-sample t test and Chi-square test were used to detect the significant relations between the compared groups. *P*-value of less than 0.05 was considered significant.

Results:

116 patients were recruited from three diabetic centers in Nablus city. Of them, 58.6%were males and 41.4% were females, with mean age = 12.5± 3.8.The mean age at onset of diabetes was 8.2 ± 3.7. The mean BMI was 20.7 ± 4.6, with 10.3% of the patients were obese. The mean of FBS was 221.3 ± 105.5, mean of the HBA1C was 9.5 ± 2.1. The mean of total cholesterol was 165 ± 35.5, for triglyceride was 84.4 ± 49.1, for LDL-C was 92.0 ± 30.7, and for HDL-C it was 55.6 ± 14.1.

Dyslipidemia was found in 51.7% of the samples. The most frequent type was high LDL-C, followed by low HDL-C. Dyslipidemia was significantly more frequent among females than males. A comparison was done between dyslipidemic and normolipidemic groups regarding socio demographic and DM data, anthropometric measurements, degree of glycemic control, and lipid profile.

Conclusion:

Our study was the first report of lipid data for children and adolescents with TIDM in Nablus city. More than half of the children and adolescents with TIDM had dyslipidemia, which is considered a high risk for cardiovascular

diseases. Dyslipidemia was more prevalent in patients having poor glycemic control, which might play a major role in the development of cardiovascular diseases among these patients in the future. Health policy should include routine screening for lipid profile among TIDM patients to prevent further complications and burden on the health system. Raising the awareness at the parents and patients levels about dyslipidemia complications plays a major role in decreasing the health outcome in the future.

Chapter One
Introduction

1.1 Background

Background about type I diabetes mellitus

Type I diabetes mellitus (TIDM) is a condition challenging public health worldwide. It is a form of diabetes mellitus that results from the autoimmune destruction of insulin-producing beta-cells in the pancreas [(1)]. The subsequent lack of insulin leads to increased blood and urine glucose[(1)].The cause of type I diabetes mellitus is unknown. A number of explanatory theories have been put forward, and the cause may be genetic susceptibility, exposure to an antigen, or pancreatic problem [(2)].

The classical symptoms of TIDM include: polyurea, polydipsia, xerostomia (dry mouth), polyphagia, fatigue, and weight loss [(1)].Many TIDM patients are presented with diabetic ketoacidosis (a type of metabolic acidosis caused by high concentrations of ketone bodies, formed by the breakdown of fatty acids and the deamination of amino acids) [(3)].

DM is diagnosed by demonstrating any one of the following, according to WHO:[(4)]

- Fasting plasma glucose level at or above 126 mg/dl.
- Plasma glucose at or above 200 mg/dl two hours after a 75 g oral glucose load as in a glucose tolerance test.

- Symptoms of hyperglycemia and casual plasma glucose at or above 200 mg/dl.

- Glycated hemoglobin (hemoglobin A1C) at or above ≥ 6.5 %. (This criterion was recommended by the American Diabetes Association in 2010, although it has yet to be adopted by the WHO)[5].

Type one diabetes mellitus cannot be treated by diet and exercise alone[6]. Administration of insulin is essential for survival. Insulin therapy must be continued indefinitely and typically does not impair the normal daily activities. It is administered as a subcutaneous injection or by using an insulin pump [6].

Many forms of insulin are used in the treatment. They're grouped by how fast they start to work and how long their effects last[7].

The types of insulin include:[7]

- Rapid-acting (Lispro, Aspart, Glulisine)

- Short-acting (Regular, Velosulin)

- Intermediate-acting (NPH: Neutral Protamine Hagedorn)

- Long-acting (Glargine, Detemir, Degludec)

- Pre-mixed (Humulin 70/30, Humulin 50/50, Humalin mix 75/25)

Basal- bolus regimen (multiple daily injection therapy):

A basal- bolus regimen, also known as multiple daily injection therapy, involves taking a long-acting or intermediate-acting dose and separate injections of short or rapid-acting insulin at each meal [(8)].

A basal- bolus regimen is commonly used in the treatment of TIDM patients. It offers more flexibility over when meals are taken, and also allows doses to be varied in response to different carbohydrates quantities taken in the meals [(8)].

Complications of diabetes are divided into microvascular and macrovascular complications[(9)]. Microvascular complications include diabetic retinopathy, neuropathy, nephropathy, impotence, and diabetic foot disorders. Macrovascular complications include cardiovascular disease (CVD), such as attacks, stroke, and insufficiency in the blood flow to legs[(9)]. Acute complications include diabetic ketoacidosis and non-ketotic hyperosmolar coma [(9)].

The association between chronic hyperglycemia and increased risk of microvascular complications in TIDM patients was demonstrated in the Diabetic Control and Complications Trial (DCCT)[(10)]. So, maintaining normal blood glucose levels reduce the development and the progression of microvascular complications as assessed over 7 years[(10)].

Definition of dyslipidemia

Dyslipidemia was defined by American Diabetes Association (ADA) as having low density lipoprotein-cholesterol (LDL-C) ≥ 100 mg/dl, high density lipoprotein-cholesterol (HDL-C) < 40 mg/dl (males) and < 50 mg/dl (females), total cholesterol (TC) ≥ 200 mg/dl, and triglycerides (TG) ≥ 150 mg/dl, and that dyslipidemia is present if one or more of these lipid levels are abnormal [11, 12].

The term hyperlipidemia is used interchangeably with dyslipidemia. But that is not entirely accurate [13]. Hyperlipidemia refers to high levels of LDL-C or triglycerides. Dyslipidemia can refer to levels that are either higher or lower than the normal range for the lipids [13].

Diabetes and dyslipidemia

Diabetes is associated with a high risk of cardiovascular disease (CVD), which is the primary cause of death among patients with type I and 2 diabetes mellitus [14]. So, aggressive management of all CVD risk factors, including dyslipidemia, is necessary in individuals with diabetes [15]. The most common lipid pattern in diabetic patients consists of high low density lipoprotein-cholesterol (LDL-C), low high density lipoprotein-cholesterol (HDL-C), and hypertriglyceridemia [16].

Several factors are likely to be responsible for diabetic dyslipidemia: Insulin effects on liver apoprotein production, regulation of lipoprotein lipase, actions of cholesteryl ester transfer protein, and peripheral actions of

insulin on adipose and muscle [17]. Furthermore, it has been proposed that the composition of lipid particles in diabetic dyslipidemia is more atherogenic than other types of dyslipidemia [17].

Most children and adolescents with TIDM should be considered at low risk for vascular disease associated with dyslipidemia, except those with longer duration of disease, microvascular complications or other CVD risk factors, including smoking, hypertension, obesity, or family history of premature CVD [18].

Screening for dyslipidemia

Children and adolescents with TIDM should be routinely screened for dyslipidemia at age of 10 years, as recommended by ADA guidelines, 2018 [19]. If lipids are abnormal, annual monitoring is reasonable. If LDL-C values are within the accepted level (<100 mg/dl), a lipid profile must be repeated every 5 years [19]. Patients who are less than 10 years of age should be screened if they have other risk factors, such as obesity (body mass index > 95th percentile for age and gender), early CVD, or if the family history is unknown [20]. In these situations, screening should start at age of 2 years. If normal results are obtained, screening should be repeated every 5 years [20].

Tests that should be done are: fasting total cholesterol, high-density lipoprotein-cholesterol, triglycerides, calculated low-density lipoprotein-cholesterol.

Initial therapy of diabetic dyslipidemia should consist of optimizing glucose control, and medical nutrition therapy to decrease the amount of cholesterol and saturated fats in the diet [19]. Achievement of ideal body weight and activity level, adoption of a well-balanced diet, and smoking cessation all are fundamental considerations to improve glycemic control, lipid profile, and to reduce CVD risk [19].

ADA guidelines recommend addition of statins after the age of 10 years in patients who continue to have LDL-V values > 160 mg/dl, despite the life style changes, or LDL-C > 130 mg/dl with one or more CVD risk factors [19].

Epidemiology of Diabetes

Type I diabetes mellitus accounts between 5% and 10% of all diabetic cases [21]. Globally, the number of patients with TIDM is unknown, although it is estimated that about 80,000 children develop the disease each year [21]. Annual incidence rates for childhood TIDM show the highest incidence in Scandinavia, and the lowest in China and Japan [17]. TIDM is more common in males than in females [22].

No documented data was found about the prevalence of dyslipidemia among TIDM patients worldwide.

1.2 Rationale (significance of study)

The prevalence of dyslipidemia in the general population, including children, has recently increased. Changes in lifestyle that contribute to overweight and obesity, and high carbohydrate and fat diets, may have led to this increased dyslipidemia prevalence [15]. In patients with TIDM, the presence of dyslipidemia significantly increases the cardiovascular risk, with 2 to 4 times greater risk of developing atherosclerosis compared to individuals without diabetes mellitus [16]. In fact, CVD is the primary cause of death among patients with type I and type 2 diabetes, it accounts for up to 44% of total mortality in these patients [16].

Dyslipidemia is a preventable major risk factor for CVD [23]. There are several studies that have evaluated dyslipidemia in patients with type 2 diabetes, but dyslipidemia in patients with type I diabetes and especially children and adolescents remains largely undiagnosed, and few studies are concerned with this relation [24].

To the best of our knowledge, there is little or no studies were conducted about dyslipidemia in young patients with type I DM in the West bank or in Nablus. The current study sheds light on the presence of dyslipidemia in young T1DM patients who are attending Nablus diabetic centers.

1.3 Aim and Objectives

The aim of this study was to understand the prevalence of dyslipidemia among type I DM' children and adolescents in Nablus diabetic centers.

Specific objectives

- To estimate the pattern of dyslipidemia in children and adolescents with type I diabetes mellitus in Nablus diabetic centers.
- To assess the relationship between dyslipidemia and age, gender, duration of diabetes, degree of glycemic control, anthropometric measurements, and other related factors.

Chapter Two
Literature review

2.1 International studies

A cross-sectional study was conducted in Brazil in 2015, concluded that there is a high prevalence of dyslipidemia in young patients with T1DM, particularly in puberty females [25].

A case-control study was conducted in Pakistan revealed that type I diabetic children have elevated levels of lipids despite short duration of disease and normal BMI as compared to healthy age and sex matched control children, and T1DM male children had more dyslipidemia as compared to female T1DM patients [23].

Another case-control study was done in Spain, resulted that the most prevalent dyslipidemic disorder in TIDM poorly controlled diabetes is low HDL-C, and that most patients have undesirable LDL-C levels. In addition, the study proved the beneficial effect of glycemic optimization on diabetic dyslipidemia, and confirmed that females with type I diabetes have less favorable lipid profiles than males [26].

A cross-sectional study was conducted in Brazil in 2006. In this study, the most prevalent lipid profile was high TC and LDL, low HDL, and normal TG levels. In addition, patients with well-controlled diabetes had a better lipid profile, including LDL values below the target level for the prevention of cardiovascular disease. These results may highlight the importance of glycemic control and its effect on lipid profile results [27].

A prospective cross sectional study was done in Pakistan in 2015, aimed to determine the prevalence and pattern of dyslipidemia in patients with hyperglycemia, regardless of the type of diabetes they have. The majority of patients were dyslipidemic, with prevalence in males was 97.18% while in females 87.15%. The most prevalent pattern among males was combined dyslipidemia with high TG and low HDL, and in females it was high LDL and low HDL. The most prevalent lipid abnormality in that study was low HDL followed by high TG. They also concluded that dyslipidemia is more prevalent in patients having poor glycemic control, which might play a major role in the development of CVD among diabetic patients [(28)].

During the period 2015 to 2016, a case-control study was conducted in Iran, to examine the variables associated with dyslipidemia in TIDM patients who were under 15 years old. The results showed that there was no significant difference between serum lipid levels and patient's age and sex, but there was a significant relationship between HbA1C and high lipid profile levels. There was no significant relation between disease duration and HbA1C. The highest amount of dyslipidemia was related to hypercholesterolemia [(29)].

Another case-control Turkish study was published in 2016, reported that dyslipidemia prevalence among TIDM patients aged below 18 years was found to be 26.2%. Hypercholesterolemia was the most common finding. Age, BMI, and poor glycemic control were significantly higher in cases with dyslipidemia. Dyslipidemia frequency was not different between genders [(30)].

An American study was published in 2017, involved T1DM patients aged 6 to 18 years. The study showed that every 1 percent increase in HBA1C was associated with approximately a 2 to 6 mg/dl increase in harmful LDL. Additionally, one standard deviation in BMI was associated with an LDL increase of about 2 mg/dl when study participants were 10 years old, and increased to about 8 mg/dl when study participants were 19 years old [(31)].

2.2 Regional studies

A study was conducted in Egypt in 2015, revealed that the most frequent type of dyslipidemia was high LDL-C alone or in combination with other parameters in 50% of children and adolescents with T1DM and dyslipidemia. There was a positive correlation between dyslipidemia and BMI and waist circumference (WC) [(32)].

In 2006, a case-control study was conducted in Iraq, resulted in that Mean total cholesterol, triglycerides, LDL-C, were significantly higher in diabetic children compared to the control. However, there was no significant difference in the levels of HDL-C in both groups .In addition to that, diabetic patients with poor control have a significantly higher levels of blood glucose, total cholesterol, triglycerides, and LDL-C as compared to those with good control [(33)].

Another Egyptian study conducted in 2015, showed that dyslipidemia was found in a significantly higher percentage of children and adolescents with TIDM compared to that of the non-diabetic control group. Dyslipidemia

was significantly more frequent among females with higher mean waist circumference and physically inactive[34].

A Cross-sectional and retrospective study, from 2010 to 2016, was conducted in Kuwait and published in 2017. The result of this study is that there is a significant positive correlation between HbA1c and dyslipidemia in TIDM patients [35].

A case–control study in 2017 included 50 Egyptian patients with T1DM, aged 9-18 years. There was a statistically high significant increase in the frequency of dyslipidemia in diabetic patients (64%). The most common type of dyslipidemia was high LDL-C (50%) and low HDL-C (25%) of patients. There was no statistically significant difference between the dyslipidemic group and the normolipidemic group regarding BMI (P=0.070), but waist circumference showed statistically significant increase in the dyslipidemic group compared with the normolipidemic group (P=0.045). By conclusion, this study supported the hypothesis that LDL-C is the cornerstone for assessment of lipoprotein-related cardiovascular risk[36].

2.3 Local studies

In Palestine, very few studies were found about TIDM in Palestine or West Bank. Only one study concerning about dyslipidemia in TIDM patients was found, it was conducted in Gaza Strip.

A case-control study was done in Gaza Strip in 2016, and published in the same year. The aim was to evaluate the lipid profile of patients with TIDM in comparison with controls. They concluded that there was no relationship between the lipid profiles in diabetic patients and the gender, level of education, family history, duration of DM, and BMI. The only finding was the elevation of triglyceride level was significantly higher in diabetic males as compared to diabetic females (*P*-value=0.011) [37].

Chapter Three
Methodology

3.1 Study design

A cross-sectional design was carried out from October 2017 till March 2018.

3.2 Study population and settings

All type I DM children and adolescents, under age of 18 years, with duration of diabetes of more than one year, who are having a periodic follow-up in Nablus diabetic centers.

Centers that were involved are Nablus Diabetic center in PHC, which is situated in Almakhfeyya, and Palestinian Diabetes Institute , which is considered as the largest NGOs (non governmental organizations) clinic in Nablus.

UNRWA was planned to be involved in the study, but at the end, it did not participate due to reasons related to the UNRWA last crisis of budget cut. So, instead, we involved the patients who are attending Huwwara Diabetic center, a part of Nablus PHC, which covers the southern and eastern areas and villages that are part of Nablus city.

3.3 Sample size

A representative sample of T1DM young patients, who met the criteria listed below, was selected to participate in the study. The total number of

T1DM who are under 18 years old is around 300 patients: in MOH Nablus Diabetic center 100 patients, in UNRWA 120 patients, and in Palestinian Diabetes Institute 80 patients.

The sample size (ss) was calculated by using this equation:

$$ss = \frac{Z^2 * (p) * (1-p)}{c^2}$$

Where:

Z = Z value (e.g. 1.96 for 95% confidence level)

p = percentage picking a choice, expressed as decimal (.5 used for sample size needed)

c = confidence interval, expressed as decimal By applying this equation, the sample size is 355.

As a result of the small population number, we used this equation:

(Correction for Finite Population)

$$\text{new ss} = \frac{Ss}{1 + \frac{ss-1}{pop}}$$

Where ss is the sample size, pop is the population

The sample size of the study by using this equation is 168 patients. By using stratified sampling, the sample size from MOH- Nablus Diabetic center will be 55, from UNRWA will be 67, and from Palestinian Diabetes institute will be 46.

After UNRWA withdrawal from the participation and after inclusion of Huwwara Diabetic center, all the patients who are having a periodic follow up there were taken. The number of patients was 15. So, the total number of patients who were participated in the study was 116.

Patients from Nablus Diabetic center and Huwwara Diabetic center who were coming to a routine checkup examination were selected to participate in the study, after their parents' agreement. Data collection was every Monday in these centers, since this day is specified for TIDM patients there. Patients from Palestinian Diabetes Institute were called to come to the institute, to participate in the study, and were arranged to come there on two consecutive Saturdays.

3.4 Inclusion criteria

Registered type I diabetic patients, under 18 years of age, who are attending these clinics on a regular basis for more than one year and no signs of acute or other chronic illness.

3.5 Exclusion criteria

- Patients aged above 18 years.
- Patients with other types of diabetes (maturity onset diabetes of the young (MODY), type 2 diabetes mellitus)
- Patients with irregular follow-up visits or inadequate information and laboratory data.
- The use of lipid lowering medications.
- The presence of associated hypothyroidism and thyroxin therapy, because it may affect the results. That's because patients with subclinical hypothyroidism (defined as elevated TSH concentrations with normal circulating levels of triiodothyronine (T_3) and thyroxine (T_4)), had significantly higher levels of total cholesterol and LDL-cholesterol compared with euthyroid patients[38].

3.6 Ethical and administrative consideration

An approval from the Public Health department as well as the faculty of graduate studies at An-Najah National University was obtained.

A written approval from the Institutional review board (IRB) was delivered. (Appendix 2)

A permission from the MOH and Palestinian Diabetes Institute was obtained to conduct the study in the diabetic clinics there.(Appendix 3 and 4).

An explanatory letter for all participants was attached to each questionnaire which explained the aim, importance, confidentiality and anonymity of the information with optional participation. A written informed consent was obtained from each participant's parent.

3.7 Data collection and tool

Interviewer-filled questionnaire based on a study conducted in Egypt in 2015 [34] was used to collect required information. The original questionnaire was modified and back-to- back translate then piloted on 20 TIDM patients to check for validity and reliability, and the feasibility of the study protocol.

The questionnaire started with a short introduction about the study and its aim. It included 3 sections: detailed medical history, anthropometric measurements, and laboratory results. (Appendix 1)

The first section: this section included the detailed medical history and socio demographic information of the patient, consisted of age, sex, place of residence, duration and age of diabetes, type and dose of insulin therapy, and family history of diabetes, hypertension, coronary heart disease and stroke, and history suggestive of diabetic complications.

The second section: the anthropometric and blood pressure measurements were taken and recorded by the researcher or a trained nurse.

The height was measured by using the stadiometer, a horizontal height rod which is adjusted to rest on the top of the patients' head. The patients were

standing upright and without shoes. The measurements were in centimeters (cm), and were recorded to the nearest 0.5 cm.

The weight was measured by using the manual SECA weight scale (the height rod is fixed with it). The patients were standing without coats and shoes. The measurements were in kilograms (kg), and were recorded to the nearest 0.5 kg.

BMI was defined as body weight (kilograms) divided by the square of body height (meters). BMI was calculated to each patient individually, using the CDC calculator for child and teen/ metric version, which is available online[39].This calculator provides BMI and the corresponding BMI-for-age percentile on a CDC BMI-for-age growth chart. This calculator is used for children and teens, aged 2 through 19 years old. After calculating the BMI, the same website categorize the patient's BMI into one of these categories: underweight, normal weight, overweight, or obese. (Normal weight if BMI z-score was under the 85th percentile, overweight if BMI z-score was 85th to less than 95th percentile, and obese if BMI z-score was 95th percentile or greater).

Waist circumference was measured by using a tape measure, which was put in the horizontal plane at the top of iliac crest, at the umbilical level. The number was recorded after the patient exhale, and was recorded to the nearest 0.5 cm.

Blood pressure was recorded to the nearest 2 mmHg by a mercury sphygmomanometer, with age-appropriate sleeves, with the patient's arm

supported at heart level after sitting quietly for 10 min. Trained nurses took the readings.

The third section: The laboratory assessment for lipid profile was done after minimum 8-10 hours overnight fasting.

Venous blood samples were withdrawn from the antecubital fossa. Before withdrawal, tight clothes that might constrict the upper arm were removed. During blood collection, the arm was rested on a pillow or other supportive object. The laboratory technician put the tourniquet around the upper arm, then the needle was pushed smoothly and quickly into the vein after palpating it. Immediately after insertion, the tourniquet was released to minimize the effect of hemoconcentration.

Five milliliters of venous blood samples were collected from fasting diabetic patients into two tubes, plain and EDTA tubes (plain for lipid profile and FBS, while EDTA for HBA1C).

In Nablus and Huwwara Diabetic Centers, the specimens in the plain tubes were centrifuged. Serum was separated by centrifuging the blood samples at 3000 rpm for 5 to 10 minutes, for FBS and lipid profile analysis. Blood samples were analyzed by ChemWell Wine Autoanalyzer, using standard methods. Total cholesterol, Triglyceride and HDL-C levels were measured. LDL-C levels were calculated by the Friedewald formula using the available lipid data. HBA1C measurement (which was in the EDTA tubes) was performed using the Tri-stat Analyzer device. The results were expressed as percentages.

Specimens from Palestinian Diabetes Institute were collected in two tubes, plain and EDTA tubes (plain for lipid profile and FBS, while EDTA for HBA1C). The blood samples in the plain tubes were centrifuged for 10 minutes and put in a sterile 5 ml centrifuge eppendorfs. Both of EDTA tubes and eppendorfs were shipped by the researcher within half an hour (in the two consecutive Saturdays) to An-Najah National Hospital laboratory for analysis. Measurements of FBS, HBA1C, total cholesterol, HDL-C, and triglyceride were performed enzymatically on COBAS C 501 (Roche-Hitachi) using standard methods. LDL-C levels were calculated by the Friedewald equation for individuals with triglyceride levels less than 400 mg/dl (all of them were below 400 mg/dl).

3.8 Statistical analysis

Data were entered, cleaned, managed and analyzed using Excel and the statistical software Stata, version 14. Categories data was reported as percentages and frequencies, continues data was reported as means with standard deviations.

For analytic purposes, Two-sample t test and Chi-square test were used to detect the significant relations between the compared groups. *P*-value of less than 0.05 was considered significant.

Chapter Four
Results

This chapter summarizes the findings of the current study. The findings were divided into three parts: descriptive data, analytic data regarding dyslipidemia, and comparison between the dyslipidemic and normolipidemic groups regarding their demographic, anthropometric and laboratory data.

4.1 Part one: descriptive data

The study sample consists of 116 TIDM patients who were less than 18 years old. The age of the participants ranged from 3-17 years (mean age = 12.5± 3.8).58.6% (n=68) of the participants were males, and 41.4% (n=48) were females. Of them, 8.6% were not educated yet (less than age of 6), 68.1% in the primary and preparatory levels, and 23.3% in the secondary level in the school. 32% of the patients' lives in an urban, while 63% of them live in a rural areas, and 5% in a refugee camp. Socio demographic data is listed in Table 1.

Table 1: Socio demographic characteristics of the patients

Characteristic		
Sex (%)	Male	58.6 (n=68)
	Female	41.4 (n=48)
Age	Mean ± SD*	12.5 ± 3.8
Level of education (%)	Not educated yet	8.6 (n= 10)
	Grade 1 to 10	68.1 (n=79)
	Grade 11 to 12	23.3 (n=27)
Education of parents (%)	Till 10^{th} grade	19.0 (n= 22)
	Till 12^{th} grade	49.1 (n= 57)
	More than 12^{th} grade	31.9 (n= 37)
Residence (%)	Urban	32.0 (n= 37)
	Rural	63.0 (n= 73)
	Refugee camp	5.0 (n= 6)

*****SD: standard deviation.

The mean age at onset of diabetes in the studied group was 8.2 ± 3.7 (range from 1-16) years.

Regarding the insulin types that has been used in the treatment, 63 patients were using the combination of intermediate-acting (NPH) and short-acting insulin, and 53 were using the combination of long-acting and rapid-acting insulin.

Regarding family history, 51.7% of the patients had DM in their families, either type 1 or type 2 DM. Of them, 19% had DM complications. 33.6% and 19% of the patients had HTN, and CVD in their families, respectively. DM related data is listed in Table 2.

Table 2: Data related to DM

Age at onset (years)	Mean± SD*	8.2 ± 3.7
Insulin type (%)	Intermediate and short-acting	54.3 (n= 63)
	Long acting and rapid-acting	45.7 (n= 53)
No. of Insulin units per day	Mean ± SD	42.0 ± 24.0
DM in family (%)	There is DM	51.7 (n= 60)
	No DM	48.3 (n= 56)
HTN in family (%)	There is HTN	33.6 (n=39)
	No HTN	66.4 (n=77)
CVD in family (%)	There is CVD	19.0 (n=22)
	No CVD	81.0 (n= 94)
Presence of DM complications (%)	There is complications	19.0 (n= 22)
	No complications	81.0 (n= 94)

*SD: standard deviation

The mean Body Mass Index BMI of study population was 20.7 ± 4.6. 10.3% of the patients were found obese (n=12), while most of the patients were having a healthy weight 69% (n=80). The mean of the height of the participants was 147.5 ± 20.2 According to the waist circumference (WC), it was 71.7 ± 13.0.The anthropometric measurements are listed in Table 3.

Table 3: Anthropometric measurements

Height (cm)	Mean ± SD*	147.5 ± 20.2
Weight (kg)	Mean ± SD	47.0 ± 18.1
BMI	Underweight (less than the 5^{th} percentile)	3.4% (n= 4)
	Healthy weight (5^{th} to less than 85^{th} percentile)	69.0% (n= 80)
	Overweight (85^{th} to less than 95^{th}percentile)	17.2% (n= 20)
	Obese (equal to or greater than 95^{th} percentile)	10.3% (n= 12)
Waist circumference (cm)	Mean ± SD	71.7 ± 13.0

*SD: standard deviation

Regarding the glycemic results, the mean of FBS was 221.3 ± 105.5, which is considered a high value. The mean of the HBA1C was also very high, which was 9.5% ± 2.1.

The mean of total cholesterol for all participants (regardless they have dyslipidemia or not) was 165 ± 35.5, for triglyceride was 84.4 ± 49.1, for LDL-C was 92.0 ± 30.7, and for HDL-C it was 55.6 ± 14.1. The related measured laboratory data are listed in Table 4.

Table 4: Laboratory results

FBS (mg/dl)	Mean ± SD*	221.3 ± 105.5
HBA1C %	Mean ± SD	9.5 ± 2.1
Total cholesterol (mg/dl)	Mean ± SD	165.0 ± 35.5
Triglyceride (mg/dl)	Mean ± SD	84.4 ± 49.1
LDL-C (mg/dl)	Mean ± SD	92.0 ± 30.7
HDL-C (mg/dl)	Mean ± SD	55.6 ± 14.1

*SD: standard deviation

4.2 Part two: analytic data regarding dyslipidemia

This part consists of data about the prevalence of dyslipidemia, prevalence of each type of dyslipidemia, pattern of dyslipidemia, and lipid profile in the dyslipidemic group according to gender.

According to the definition of dyslipidemia by the ADA, it's having low density lipoprotein-cholesterol (LDL-C) ≥ 100 mg/dl, high density lipoprotein-cholesterol (HDL-C) < 40 mg/dl (males) and < 50 mg/dl (females), total cholesterol (TC) ≥ 200 mg/dl, and triglycerides (TG) ≥ 150

mg/dl, and dyslipidemia is present if one or more of these lipid levels are abnormal [11, 12].

So, after using these criteria, we found that 51.7% (n=60) of the patients were having dyslipidemia, regardless the lipid type that was abnormal. The prevalence of dyslipidemia is listed in Table 5.

Table 5: Prevalence of dyslipidemia

Presence of dyslipidemia	Percentage	No. of patients
Having dyslipidemia	51.7%	60

17.2% (n=20) of the patients were having high total cholesterol, either isolated or in association with other lipid abnormalities. 10.3% (n=12) were having high triglycerides, 38.8% (n=45) were having high LDL-C, and 20.7% (n=24) of the patients were having high HDL-C, 19 of them were females, and 5 were males. All were either isolated or associated with other lipid abnormalities.

The most prevalent lipid abnormality in the current study was high LDL-C, followed by low HDL-C. Many patients were sharing more than one type of dyslipidemia. The prevalence of each type of dyslipidemia is listed in Table 6.

Table 6: Prevalence of each type of dyslipidemia

Type of dyslipidemia	Percentage	Number
Total cholesterol ≥ 200 mg/dl	17.2%	20
Triglyceride ≥ 150 mg/dl	10.3%	12
LDL-C ≥ 100 mg/dl	38.8%	45
HDL-C <40 mg/dl (males) **and <50 mg/dl** (females)	20.7%	24
Note: many patients were sharing more than one type of dyslipidemia, that is why the total number exceeds the number of dyslipidemia prevalence that was mentioned previously.		

Isolated single parameter dyslipidemia means that one pattern was abnormal regarding the definition of dyslipidemia by the ADA. In the current study, it was 27.6%. Combination of two parameters of dyslipidemia means that any two patterns were abnormal. It was 16.4%. Abnormality in all parameters of lipid profile was found in only one patient. Patterns of dyslipidemia among the sample are listed in Table 7.

Table 7: Patterns of dyslipidemia

Patterns of dyslipidemia	Percentage	Number
Isolated single parameter	27.6%	32
Combination of two parameters	16.4%	19
Three parameters	6.9%	8
All parameters	0.8%	1
Total	51.7%	60

Using Chi-square test, females had higher LDL-C values and lower HDL-C values compared to males (*P*-value =0.014, 0.000 respectively). The total cholesterol and triglyceride were not significantly associated with gender (*P*-value=0.174, 0.208 respectively). Lipid profile according to gender is listed in Table 8.

Table 8: Lipid profile according to gender

Lipid profile	Male %	Female %	*P*-value
High Total cholesterol	13.2 (9)	22.9 (11)	0.174
High Triglyceride	7.3 (5)	14.6 (7)	0.208
High LDL-C	29.4 (20)	52.1 (25)	0.014
Low HDL-C	7.4 (5)	39.6 (19)	0.000

4.3 Part three: comparison between dyslipidemic and normolipidemic groups

This part contains a comparison between dyslipidemic and normolipidemic groups with TIDM regarding their demographic and patients' information, anthropometric measurements, and laboratory data.

Chi-square test was used to assess the relation between the dyslipidemia and multiple demographic factors, follow up clinic, and insulin type used in the treatment.

The education of the participants, education of the parents, and the place of residence were not significantly associated with the presence of dyslipidemia, since the *P*-value was higher than 0.05 for these three categories (0.735, 0.380. and 0.759 respectively).

According to the clinic where the patients were followed up, the *P*-value was 0.009, which means that there is a statistically significant association between the follow up clinic and dyslipidemia. The presence of dyslipidemia was higher in patients who were visiting the clinics that are part of MOH (Nablus and Huwwara) than who were visiting the Palestinian Diabetes Institute. 36 patients out of 55 who were visiting Nablus clinic

were having dyslipidemia, 8 patients out of 15 who were visiting Huwwara clinic were having dyslipidemia, compared to 16 out of 46 who were visiting the Palestinian Diabetes Institute.

Regarding the insulin types that were used in the treatment, the patients who were using the combination of intermediate-acting and short-acting insulin were more dyslipidemic than the patients who were using the combination of long-acting and rapid-acting insulin. 60.3% (n= 38, out of 63) of patients taking intermediate and short-acting insulin were having dyslipidemia, compared to 41.5% (n= 22, out of 53) of patients taking long and rapid-acting insulin were having dyslipidemia. The *P*-value was 0.035, which means a statistically significant association. Demographic characteristics follow up clinic, and insulin type of dyslipidemic and normolipidemic groups are listed in Table 9.

Table 9: Demographic characteristics, follow up clinic, and insulin type of dyslipidemic and normolipidemic groups

Characteristic	**Dyslipidemic group (n=60)**	**Normolipidemic group (n=56)**	***P*-value**
	Percentage% (n)	**Percentage% (n)**	
Gender			<0.001
Male	33.8% (23)	66.2% (45)	
Female	77.0% (37)	23.0% (11)	
Education			0.735
Not educated yet	40% (4)	60% (6)	
Grade 1-10	53.2% (42)	46.8% (37)	
Grade 11-12	51.8% (14)	48.2% (13)	
Education of parents			0.380
Grade 1-10	40.9% (9)	59.1% (13)	
Grade 11-12	50.8% (29)	49.2% (28)	
More than 12th grade	59.5% (22)	40.5% (15)	
Residency			0.759
Urban	56.8% (21)	43.2% (16)	
Rural	49.3% (36)	50.7% (37)	

Refugee camp	50% (3)	50% (3)	
Follow up clinic Nablus clinic Palestinian Diabetes Institute Huwwara clinic	 65.5% (36) 34.8% (16) 53.3% (8)	 34.5% (19) 65.2% (30) 46.7% (7)	0.009
Insulin type Intermediate and short-acting Long and rapid-acting	 60.3% (38) 41.5% (22)	 39.7% (25) 58.5% (31)	0.035

Two-sample t test was used to recognize the relation between the presence of dyslipidemia with age, age at onset, duration of diabetes, and insulin dose.

According to the age of the patient, age at onset of DM, and DM duration, there was no significant association with the presence of dyslipidemia since the *P*-value was higher than 0.05 (0.169, 0.785, and 0.051 respectively).

Regarding the number of insulin units that was taken daily, the *P*-value was 0.035, which means that there is statistically significant association between taking higher number of insulin units per day and the presence of dyslipidemia.

Number of insulin units taken daily increases the risk of dyslipidemia which is statistically significant when compared between the two groups, as shown in Table 10.

Mean age, age at onset, duration of diabetes, and insulin dose of dyslipidemic and normolipidemic groups are listed in Table 10.

Table 10: Mean age, age at onset, duration of diabetes, and insulin dose of dyslipidemic and normolipidemic groups

Characteristic	Dyslipidemic group (n=60)	Normolipidemic group (n=56)	*P*-value
	Mean ± SD*	Mean ± SD	
Age (year)	12.9 ± 3.5	12.0 ± 3.9	0.169
Age at onset of DM (year)	8.2 ± 3.7	8.3 ± 3.8	0.785
Duration of DM (year)	4.7 ± 2.9	3.6 ± 2.9	0.051
Insulin units/day	46.5 ± 26.5	37.2 ± 20.2	0.035

*****SD: standard deviation

Chi-square test was used to assess the relation between the presence of DM, HTN, CVD, and DM complications existence in the family, with the dyslipidemia occurrence in the patients. The *P*-value in the four categories were higher than 0.05. this means that there is no significant association. Family history of dyslipidemic and normolipidemic groups is listed in Table 11.

Table 11: family history of dyslipidemic and normolipidemic groups

Family history	Dyslipidemic group (n=60)	Normolipidemic group (n=56)	*P*-value
	Percentage% (n)	Percentage% (n)	
DM in family			0.700
No	53.6% (30)	46.4% (26)	
Yes	50.0% (30)	50.0% (30)	
HTN in family			0.472
No	49.3% (38)	50.7% (39)	
Yes	56.4% (22)	43.6% (17)	
CVD in family			0.442
No	50.0% (47)	50.0% (47)	
Yes	59.0% (13)	41.0% (9)	
DM complications in family			0.769
No	51.0% (48)	49.0% (46)	
Yes	54.5% (12)	45.5% (10)	

Two-sample t test was used to know the relation between the BMI and WC values, and the presence of dyslipidemia among the participants. Regarding the BMI, the *P*-value was 0.005, which means that there is a strong statistically significant association between the high BMI value and the presence of dyslipidemia. Regarding WC, the *P*-value was 0.196, which means no significant association.

Mean values of anthropometric measures of dyslipidemic and normolipidemic groups are listed in Table 12.

Table 12: Mean values of anthropometric measures of dyslipidemic and normolipidemic groups

Anthropometry	**Dyslipidemic group (n=60)**	**Normolipidemic group (n=56)**	***P*-value**
	Mean ± SD*	**Mean ± SD**	
BMI	21.8 ± 5.2	19.4 ± 3.5	0.005
WC (cm)	73.2 ± 13.8	70.1 ± 11.8	0.196

*SD: standard deviation

Using Chi-square test, BMI category was significantly related to dyslipidemia, with *P*-value= 0.031. Patients in the dyslipidemic group were more obese and overweight than in the normolipidemic group. BMI profile of dyslipidemic and normolipidemic groups are listed in Table 13.

Table 13: BMI categories of dyslipidemic and normolipidemic groups

BMI category	Dyslipidemic group (n=60)	Normolipidemic group (n=56)	*P*-value
	Percentage% (n)	Percentage% (n)	
Underweight	75.0% (3)	25.0% (1)	0.031
Healthy weight	42.5% (34)	57.5% (46)	
Overweight	70.0% (14)	30.0% (6)	
Obese	75.0% (9)	25.0% (3)	

Two-sample t test was used to estimate the relation between the glycemic control tests and dyslipidemic and normolipidemic groups.

Regarding FBS, the mean in the dyslipidemic group was 227.8 ± 114.6, while it was 214.3 ± 95.3 in the normolipidemic group. The *P*-value was 0.492, which means that no statistically significant association between the presence of dyslipidemia and the mean FBS.

The mean HBA1C was higher in the dyslipidemic group compared with the normolipidemic one, 9.9% ± 2.2 vs. 9.1% ± 1.8, respectively. There was no significant difference when comparing the patients according to their HBA1C values, between three groups, as having good, fair, or poor glycemic control, (the *P*-value = 0.435).

60.0% of the dyslipidemic group patients were having poor glycemic control. 26.7% , and 13.3% of them were having fair, and good glycemic control, respectively. This means that more than half of the dyslipidemic patients were having poor glycemic control, which is considered a high percentage. HBA1C groups of the dyslipidemic and normolipidemic groups are listed in Table 15.

Table 14: HBA1C groups of the dyslipidemic and normolipidemic groups

HBA1C group	Dyslipidemic group (n=60)	Normolipidemic group (n=56)	*P*-value
	Percentage% (n)	Percentage% (n)	
Good <7.5 %	13.3 (8)	21.4 (12)	0.435
Fair 7.5-9 %	26.7 (16)	28.6 (16)	
Poor > 9%	60.0 (36)	50.0 (28)	

Two-sample t test was used to see the difference between the dyslipidemic and normolipidemic groups regarding lipid profile values. In the four lipid categories the *P*-value was ≤ 0.05. Lipid profile of dyslipidemic and normolipidemic groups is listed in Table 15.

Table 15: Lipid profile of dyslipidemic and normolipidemic groups

Lipids	Dyslipidemic group (n=60)	Normolipidemic group (n=56)	*P*-value
	Mean ± SD*	Mean ± SD	
Total cholesterol (mg/dl)	182.4 ± 37.8	146 ± 20.2	0.000
Triglyceride (mg/dl)	103.2 ± 56.2	64.2 ± 29.0	0.000
LDL-C (mg/dl)	108.9 ± 32.1	73.9 ± 14.9	0.000
HDL-C (mg/dl)	51.6 ± 13.6	59.7 ± 13.5	0.001

*SD: standard deviation

Chapter Five
Discussion

5.1 Main study findings

The aim of this study was to estimate the prevalence of dyslipidemia among type I DM among children and adolescents in Nablus. 51.7 % of patients with TIDM were having dyslipidemia according to the definition of dyslipidemia by ADA. This alarming prevalence should be monitored carefully with further clinical interventions and further researches.

Having a high dyslipidemia frequency in this study (51.7%) is similar to other published results. El Bakry et al, found that 64% of TIDM children were dyslipidemic [(36)], and Hassan et al, also found that dyslipidemia frequency was (65%) among the TIDM patients[(34)].

In the current study, the most frequent type of dyslipidemia was high LDL-C (38.8%) of the patients, either isolated or in association with other lipid abnormalities. It is followed by low HDL-C (20.7%). This correlates with the findings of El Bakry et al, who concluded that the most common type of dyslipidemia was high LDL-C (50%) and low HDL-C (25%) of patients[(36)].

Another study published in 2018, showed that the overall frequency of dyslipidemia was 65%, and LDL-C was the most common lipid abnormality[(40)].This result agrees with the result of the current study. While Perez et al, found that the low HDL-C was the most prevalent dyslipidemic disorder in TIDM[(26)].

In this study, the female gender was significantly associated with dyslipidemia, 77% of the females were dyslipidemic, compared to 33.8% of the males. The most lipid abnormality in the female group was high LDL-C, followed by low HDL-C (52.1% of females have high LDL-C compared to 29.4% of males, *P*-value = 0.014, and 39.6% of females have low HDL-C compared to 7.4% of males, *P*-value = 0.000). These findings agree with the results of other studies[25, 34].

This finding is in contrast to other studies that reported that the males were having dyslipidemia more than females[23, 28].Others found that there was no relation between dyslipidemia in children with TIDM and gender[30, 41].

In the present study, isolated single parameter dyslipidemia was the most common pattern of dyslipidemia, with 27.6 %(n= 32) out of 51.7% (n= 60) of total percent of dyslipidemia. Only one patient had an abnormality in the four lipids.

Education of the patient, education of the parents, and place of residence were not associated with the presence of dyslipidemia. The age of patient and the age at onset of DM were also not significantly associated with the dyslipidemia. This finding result is similar to the result that was conducted by Arash, R., and Arian, H.[29]On the contrary, Bulut et al, found that the patient's age was significantly higher in patients with dyslipidemia[30]. Further studies should be conducted in Palestine on larger population to rule out the age role in dyslipidemia among TIDM patients.

In the current study, the duration of DM showed no significant difference between the dyslipidemic and normolipidemic groups, this finding agrees with the finding of other studies[23, 34, 40]. In contrast to the result that was reported in other study, in which the dyslipidemia was found to be related to long duration of diabetes[42], suggesting other area of further research on larger population.

Regarding the treatment, the current study results showed that the patient who were taking the combination of intermediate-acting and short-acting insulin were having higher rates of dyslipidemia than patients who were taking the combination of long-acting and rapid-acting insulin (60.3% vs. 41.5%, *P*- value = 0.035). The intermediate-acting and short-acting insulin are human insulin, available in a suspension form, while the long-acting and rapid-acting insulin are new insulin analogs, and available in a pen fill form, which is called the modern insulin. So in this study we can estimate that patients using modern insulin were having dyslipidemia less frequently than those using the older insulin.

In MOH diabetic centers, Nablus and Huwwara, the insulin types that are available there are the human insulin, so most of the patients there get their insulin from the MOH's pharmacy.

As a result, we can estimate that the patients visiting MOH centers were more prone to have dyslipidemia than patients who were visiting Palestinian Diabetes Institute, who were using the new analogues from pharmacies outside. This agrees with the current study's result, that reveals

the significant relationship between the follow up clinic and dyslipidemia, where the *P*-value was 0.009. The result was that 36 patients out of 55 who were visiting Nablus clinic were having dyslipidemia, 8 patients out of 15 who were visiting Huwwara clinic were having dyslipidemia, compared to 16 out of 46 who were visiting the Palestinian Diabetes Institute. But no published studies in the literature regarding this relation were found.

Regarding the relation between the total number of insulin was taken in the day with dyslipidemia, results showed that there is a significant relation between them (*P*- value = 0.035), which means that patients, in this study, who were taking higher insulin units daily were at more risk to have dyslipidemia than those who were taking lower units. But no published studies in the literature concerning this topic were found.

In the present study, the waist circumference was not significantly associated with the dyslipidemia presence, since the P- value was 0.196. This finding is in concord with a study done in Bangladesh[40]. This result is in contrast with other studies[32, 34].

Regarding the BMI, the current study showed the BMI was significantly higher in the dyslipidemic group compared with the normolipidemic group. The majority of patients who were classified as overweight and obese in this study were among the dyslipidemic group. This agrees with the results of other studies conducted by Bulut et al, and Hassan et al [30, 32].

In the current work, the mean HBA1C was higher in the dyslipidemic group compared with the normolipidemic one, 9.9 ± 2.2 vs.9.1 ± 1.8, respectively. 60.0% of patients having dyslipidemia were having poor glycemic control, as HBA1C value was higher than 9%, while 50.0% of the normolipidemic groups were having poor glycemic control. Although both groups were containing a high number of poorly glycemic patients, but it is still higher in the dyslipidemic one. This result agrees with many studies' results[27, 28, 30].

The American Diabetes Association suggests that the target of HBA1C for patients with diabetes is less than 7.5%, and FBS is between 90–130 mg/dl[43]. But in the current study, the mean of HBA1C and FBS were very high. So further glycemic control and restrictions must be done to reach this target.

5.2 Limitations of the study

- UNRWA refusal in participation in the study, although we tried many times, since October 2017, to take the permission to conduct the study there, but without agreement.
- Cross-sectional design of the study, so no association can be established.
- The blood samples were analyzed in two places, MOH centers and An-Najah National University laboratories. Which may result in minimal variations in laboratory results. Both of the laboratories however have

the same normal ranges and in both have external quality and accreditation.

- Family history of dyslipidemia was not included, because we cannot rely on the reported data from patients or their parents, and the lack of medical history of the presence of dyslipidemia in the family.

- Glutamic Acid Decarboxylase Autoantibodies (GAD) antibodies test was not done to the most of type 1 DM patients due to its high cost.

GAD test is a blood test which measures whether the body is producing a type of antibody which destroys its own GAD cells. In type 1 diabetes, a number of autoantibodies are thought to circulate including those which target glutamic acid decarboxylase. Presence of these autoantibodies suggests type 1 diabetes [(44)].

Despite these limitations, we believe that this study provides a baseline data to assess the prevalence of dyslipidemia among TIDM patients, visiting MOH centers, and Palestinian Diabetes Institute, which is considered the largest NGO's, in Nablus city. We believe that this study enables us to develop interventional programs to control and minimize the dyslipidemia occurrence in young diabetic patients.

5.3 Conclusion

- Our study was the first report of lipid data of children and adolescents with TIDM in Nablus city and West Bank.
- More than half of the children and adolescents with TIDM had dyslipidemia (51.7%), which is considered a high risk for cardiovascular diseases.
- Dyslipidemia was significantly more frequent among females than males.
- The most frequent type of dyslipidemia in this study was high LDL-C, followed by HDL-C.
- Although not statistically significant, results suggest that dyslipidemia is more prevalent in patients having poor glycemic control, which might play a major role in the development of cardiovascular diseases among these patients.
- Results of the current study confirmed that dyslipidemia was related to the obese patients.

5.4 Recommendations

Due to the high prevalence of dyslipidemia among TIDM patients and its harmful effects in the occurrence of atherosclerosis and cardiovascular disease, the recognition of elevating lipid profile in young age is important in defining those children with dyslipidemia, and to consider the suitable lifestyle interventions, as physical activity, proper healthy diet, and lipid-lowering medications to minimize the occurrence of cardiovascular diseases later in life.

Screening of the lipid profile should be done in TIDM children and adolescents. ADA recommends screening at 10 years old, although in this study many patients were younger than 10 years old and had dyslipidemia. So further studies should be done in this direction to establish guidelines for dyslipidemia screening among TIDM that is specific for the Palestinian settings.

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Appendix 1

Data collection form

جامعة النجاح الوطنية – كلية الدراسات العليا

استبيان حول مدى وجود اضطراب مستويات الدهون في الدم لدى مرضى السكري من النوع الأول في مدينة نابلس

عزيزي ولي أمرالمريض،

أنا طالبة ماجستير صحة عامة في جامعة النجاح الوطنية، بيان سمير أبو عيشة، و أقوم بعمل دراسة ميدانيه تهدف إلى معرفة مدى وجود اضطراب مستويات الدهون في الدم لدى مرضى السكري من النوع الأول، من هم اقل من 18 عاما. وقد تم اختياركم لتكونوا جزءا من عينة الدراسة. يرجى الإجابة عن الأسئلة المرفقة ومراعاة الدقة في الإجابة، حيث سوف تستخدم لغرض البحث العلمي فقط، مع الحفاظ على سرية وخصوصية المشاركين بأقصى درجة. ولكم الحرية الكاملة بعدم الإجابة عن أي سؤال، مع إمكانية الانسحاب من المشاركة في الدراسة دون أن يؤثر ذلك على العناية الطبية المقدمة.

- تعبئة هذه الاستمارة تعني قبول المشاركة في هذا البحث

موافقة ولي الأمرو توقيعه:

شاكرين لكم مشاركتكم في هذه الدراسة

الاستبيان المتعلق بمدى وجود اضطراب مستويات الدهون في الدم لدى مرض السكري من النوع الأول

الرقم التسلسلي:

أولا: معلومات يتم تعبئتها من قبل المشترك أو الباحث: (وضع دائرة حول الجواب)

بيانات المشترك :

- الجنس: * ذكر *أنثى
- العمر: .....
- المستوى التعليمي للمشترك:

*غير متعلم * أساسي * ثانوي

- المستوى التعليمي لولي الأمر(المتابع للعلاج والفحوصات الدورية):

*غير متعلم * أساسي * ثانوي * جامعي

- رقم الهاتف: .....رقم الجوال: .....
- العنوان(مكان السكن):

*مدينة*قرية * مخيم

التاريخ الطبي: (خاص بالمرضى المصابين بالسكري من النوع الأول)

- مدة تشخيص الإصابة بمرض السكري بالسنوات:.....
- العمر عند تشخيص مرض السكري:.....
- نوع الأنسولين المستخدم في العلاج:.....
- عدد وحدات الأنسولين اللي يتم أخذها خلال اليوم: .....
- تاريخ العائلة المرضي: هل يوجد في العائلة أمراض:

*ارتفاع ضغط الدم *سكري *أمراض في القلب *جلطات دماغية

- إذا كان مرض السكري موجود بالعائلة، هل يوجد مضاعفات على:

*اعتلال شبكية العين: *نعم *لا *لا أعلم

*اعتلال الكلية: *نعم *لا *لا أعلم

*اعتلال عصبي في الأطراف: * نعم *لا *لا أعلم

*أمراض في الأوعية الدمويةوالقلب: *نعم *لا *لا أعلم

ثانيا: معلومات يتم تعبئتها من قبل الباحث:

الفحص الطبي:

- الطول :.....
- الوزن:.....
- مؤشر كتلة الجسم:.....
- محيط الخصر:.....
- قياس ضغط الدم:.....

الفحوصات المخبرية:

- FBS:…….
- HBA1C:…….
- Total Cholesterol level:……..
- Triglycerides:…….
- LDL-C:…….
- HDL-C:…….

Appendix 2

Institutional review board (IRB) approval of the study

An-Najah
National University
Faculty of medicine
&Health Sciences
Department of Graduate
Studies

جامعة النجاح
الوطنية
كلية الطب وعلوم الصحة
دائرة الدراسات العليا

IRB Approval Letter

Study Title:

Dyslipidemia in young patients with type one diabetes mellitus in Nablus city: a cross sectional study

Submitted by:

Bayan Sameer Abu-Eisheh , Dr Abdulsalam Alkhayyat

Date Reviewed:
10th October ,2017

Date Approved:
11th October, 2017

Your Study titled "**Dyslipidemia in young patients with type one diabetes mellitus in Nablus city: a cross sectional study'** with achieved number (24) October 2017 was reviewed by An-Najah National University IRB committee and was approved on 11th October, 2017.

Hasan Fitian, MD

IRB

IRB Committee Chairman
An-Najah National University

نابلس - ص.ب 7 أو 707 || هاتف 2342902/4/7/8/14 (970) (09) || فاكسميل 2342910 (970) (09)

Nablus - P.O Box :7 or 707 | Tel (970) (09) 2342902/4/7/8/14 | Faximile (970) (09) 2342910 | E-mail : hgs@najah.edu

Appendix 3

An-Najah national university letter to MOH to facilitate the student's mission

An-Najah
National University
Faculty of Graduate Studies

جامعة
النجـــاح الوطنية
كلية الدراسات العليا

التاريخ: 2017/11/8

حضرة الدكتورة امل ابو عوض المحترمة
مدير عام التعليم الصحي
وزارة الصحة الفلسطينية

تحية طيبة وبعد ،

الموضوع : تسهيل مهمة الطالبة/ بيان سمير عبد الله ابو عيشه، رقم تسجيل (11457564)، تخصص الصحة العامة

يرجى من حضرتكم تسهيل مهمة الطالبة / بيان سمير عبد الله ابو عيشه، رقم تسجيل 11457564، تخصص ماجستير الصحة العامة، في كلية الدراسات العليا، وهي بصدد اعداد الاطروحة الخاصة بها والتي عنوانها:

(اضطراب مستويات الدهون في الدم لدى مرضى السكري من النوع الأول من هم اقل من 18 عاما في مدينة نابلس: دراسة مقطعية)

يرجى من حضرتكم تسهيل مهمتها في تطبيق دراستها، في زيارة عيادات السكري وجمع عينات حول مرض السكري في محافظة نابلس.

شاكرين لكم حسن تعاونكم.

جامعة النجاح الوطنية
كلية الدراسات العليا
نابلس / فلسطين

د. محمد سليمان
عميد كلية الدراسات العليا

فلسطين، نابلس، ص.ب 707، هاتف: 2345115، 2345114، 2345113 (09)(972)* فاكسميل: 2342907(09)(972)
Nablus, P. O. Box (7) *Tel. 972 9 2345113, 2345114, 2345115
هاتف داخلي (5) 3200 *www.najah.edu - email fgs@najah.edu
* Facsimile 972 92342907

Appendix 4

An-Najah national university letter to Palestinian Diabetes Institute to facilitate the student's mission

An-Najah
National University
Faculty of Graduate Studies

جامعة
النجـــاح الوطنية
كلية الدراسات العليا

التاريخ : 2017/11/16م

حضرة الدكتور مدير المعهد الفلسطيني لامراض السكري المحترم
مجمع دار المال التجاري / نابلس

تحية طيبة و بعد ,,,

الموضوع : تسهيل مهمة الطالبة/ بيان سمير عبد الله ابو عيشه، رقم تسجيل (11457564)، تخصص الصحة العامة

يرجى من حضرتكم تسهيل مهمة الطالبة / بيان سمير عبد الله ابو عيشه، رقم تسجيل 11457564، تخصص ماجستير الصحة العامة، في كلية الدراسات العليا، وهي بصدد اعداد الاطروحة الخاصة بها والتي عنوانها:

(اضطراب مستويات الدهون في الدم لدى مرضى السكري من النوع الأول من هم اقل من 18 عاما في مدينة نابلس: دراسة مقطعية)

يرجى من حضرتكم تسهيل مهمتها في تطبيق دراستها، في زيارة عيادات السكري وجمع عينات حول مرض السكري في محافظة نابلس.

شاكرين لكم حسن تعاونكم.

جامعة النجاح الوطنية
كلية الدراسات العليا
نابلس / فلسطين

مع وافر الاحترام ,,,

د. محمد سليمان
عميد كلية الدراسات العليا

فلسطين، نابلس، ص.ب 707 هاتف/ 2345115، 2345114، 2345113 (09)(972)* فاكسميل 2342907(09)(972)
Nablus, P. O. Box (7) *Tel. 972 9 2345113, 2345114, 2345115 هاتف داخلي (5) 3200
* Facsimile 972 92342907 *www.najah.edu - email fgs@najah.edu

جامعة النجاح الوطنية

كلية الدراسات العليا

اضطراب مستويات الدهون في الدم لدى مرضى السكري من النوع الأول من هم أقل من 18 عاما في مدينة نابلس: دراسة مقطعية

إعداد

بيان سمير أبوعيشة

إشراف

د. عبد االسلام الخياط

قدمت هذه الأطروحة استكمالاً لمتطلبات الحصول على درجة الماجستير في الصحة العامة، بكلية الدراسات العليا، في جامعة النجاح الوطنية، نابلس–فلسطين.

2018

اضطراب مستويات الدهون في الدم لدى مرضى السكري من النوع الأول من هم أقل من 18 عاما في مدينة نابلس: دراسة مقطعية

إعداد

بيان سمير أبوعيشة

إشراف

د. عبد االسلام الخياط

الملخص

خلفية الدراسة:

النوع الأول من مرض السكري هو حالة تتحدى الصحة العامة في جمع أنحاء العالم. زاد معدل انتشار اضطراب مستويات الدهون في الدم في عموم السكان، بما في ذلك الأطفال و المراهقين، في الآونة الأخيرة. بما أن هذا الاضطراب يعتبر عامل خطورة لأمراض القلب و الأوعية الدموية، فإن الفحص الصحيح ضروري للحد من هذه النتيجة الضارة.

الهدف:

دراسة انتشار اضطراب مستويات الدهون في الدم عند الأطفال والمراهقين المصابين بالنوع الأول من مرض السكري، وتقييم علاقته بعوامل مختلفة.

المنهجية:

تم اجراء الدراسة على 116مريض من الأطفال والمراهقين الذين يعانون من داء السكري من النوع الأول، والذين تقل أعمارهم عن 18 عاماً، والذين كانوا يحضرون عيادات مرضى السكري في نابلس بشكل منتظم، في دراسة مقطعية مستعرضة، من تشرين الأول 2017 إلى آذار 2018. تم استخدام استبيان لجمع البيانات، والتي شملت 3 أقسام، البيانات السكانية والاجتماعية وتاريخ المرض، والقياسات البشرية، والنتائج المختبرية لفحوصات الكوليسترول الكلي والدهون الثلاثية

والكوليسترول منخفض الكثافة والكوليسترول عالي الكثافة، بالإضافة الى فحص صيام السكر في الدم والفحص التراكمي للسكر.

وقد أجريت عملية تحليل الاستبيانات باستخدام برنامج Stata، وتم استخدام اختبارات Chi-square, two-sample t test للكشف عن العلاقات الهامة بين المجموعات المقارنة. وتم اعتبار درجة الندرة أقل من 0.05 ذات دلالة إحصائية.

النتائج:

تم تطبيق الدراسة على 116 مريض من ثلاثة مراكز لمرضى السكري في مدينة نابلس. وكان منهم 58.6% من الذكور و41.4% من الإناث، مع متوسط العمر = 12.5 ± 3.8. وكان متوسط العمر عند بداية الإصابة بالسكري 8.2 ± 3.7 .

كان متوسط مؤشر كتلة الجسم 20.7 ± 4.6، بينهم 10.3% كانوا يعانون من السمنة. كان متوسط فحص صيام السكر في الدم 221.3 ± 105.5، ومتوسط فحص السكر التراكمي 9.5± 2.1، ومتوسط فحص الكوليسترول الكلي 165 ± 35.5، ومتوسط فحص الدهون الثلاثية 84.4 ± 49.1، ومتوسط فحص الكوليسترول منخفض الكثافة 92.0 ± 30.7، والكوليسترول عالي الكثافة 55.6 ± 14.1.

كانت نسبة اضطراب مستويات الدهون في الدم 51.7% من عينة الدراسة، وكانت أكثر تكرارا بين الإناث. النوع الأكثر شيوعاً كان ارتفاع الكوليسترول منخفض الكثافة، يليه انخفاض الكوليسترول عالي الكثافة.

تم إجراء مقارنة بين مجموعة المرضى الذين لديهم اضطراب في مستويات الدهون وبين مجموعة المرضى الخاليين من هذا الاضطراب فيما يتعلق بالبيانات السكانية والاجتماعية، و قياسات الجسم البشري، ودرجة السيطرة على نسبة السكر في الدم، ومستوى الدهون.

الاستنتاج:

كانت دراستنا أول تقرير لبيانات الدهون للأطفال والمراهقين الذين يعانون من النوع الأول من مرض السكري في مدينة نابلس. أكثر من نصف المرضى لديهم اضطراب في مستويات الدهون في الدم، وهذه تعتبر نسبة عالية المخاطر لأمراض القلب والأوعية الدموية. اضطراب مستويات الدهون في الدم كان أكثر انتشارا بين المرضى الذين يعانون من ضعف السيطرة على نسبة السكر في الدم، وهذا يلعب دوراً رئيسياً في تطوير أمراض القلب والأوعية الدموية بين هؤلاء المرضى في المستقبل. يجب أن تتضمن السياسة الصحية الفحص الروتيني لبيانات الدهون بين مرضى السكري من النوع الأول لمنع المزيد من المضاعفات والعبء على النظام الصحي. رفع مستوى الوعي لدى أولياء الأمور والمرضى حول مضاعفات اضطراب مستويات الدهون في الدم يلعب دورا رئيسيا في خفض النتائج على الصحة في المستقبل.