



**A SURVEY FOR COMPLICATIONS OF DIABETES MELLITUS IN
AL-DIWANYIA TEACHING HOSPITAL**

**A THESIS
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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

يَا أَبَتِ إِنِّي قَدْ جَاءَنِي مِنَ الْعِلْمِ مَا لَمْ يَأْتِكَ فَاتَّبِعْنِي أَهْدِكَ
صِرَاطًا سَوِيًّا

صدق الله العلي العظيم

(مريم ٤٣)

الأهداء

في البداية، اهدي هذا البحث العلمي الى كل من لم يلتحق بقطار العلم لركوبه بقطار الشهادة للدفاع عن ارض العراق ضد الظلم.

و كذلك اهدي هذا البحث الى جميع اساتذتي في الابتدائية و المتوسطة و الإعدادية و في الجامعة وكل من ساهم في حصولي على افضل تعليم. و أيضا اهدي هذا البحث الى عائلتي كافة و خصوصا امي و ابي لتشجيعهم المستمر و دعمهم الي من اجل حصولي على تعليم و حياة أفضل، ولا ننسى اهداء هذا البحث الى اخواني و احبائي الطلاب من سكنة الأقسام الداخلية.

في النهاية، أتمنى ان يأتي هذا البحث بالمنفعة و الاستفادة منه في احداث التغير الجيد في عالم الطب.

شكر و تقدير الى مستشفى الديوانية التعليمي لمساعدتهم في تكون هذا البحث.

شكر و تقدير خاص الى كادر و أعضاء عمادة كلية الصيدلة جامعة القادسية و من ضمنهم عميدها الدكتور

باسم ارحيم الشيباني.

Contents:

INTERFACE	I
الآية	II
الأهداء	III
List of figures	V
List of tables	V
Abstract	VI

Chapter one contents:

Introduction of complications of DM	page 1
--	---------------

- **Classification** page 1
- **Signs and symptoms** page 2
- **Diagnosis** page 3
- **Pathophysiology** page 3
- **Diabetes management** page 4
- **Complications** page 4

Chapter two content:

Method	page 12
---------------	----------------

Chapter three content:

Results	page 14
----------------	----------------

Chapter four content:

Discussion	page 20
-------------------	----------------

Chapter five content:

Conclusions	page 25
--------------------	----------------

Chapter six content:

References	page 27
-------------------	----------------

List of figures

Figure No.	Title of the figure	Page No.
1	Complications of Diabetes Mellitus	15
2	Comparison of D.M complications for both male and female	16
3	Percentage of complication in male and female	17
4	The relationship between each complication and age.	17
5	Numbers of cases that were obtained in each month of the whole four months	18

List of tables

Table No.	Title of the table	Page No.
1	Illustrate the complication and their percentage	15
2	Distribution of complication in male	16
3	Distribution of complication in female	16

Abstract:

This study was carried out to provide further information on the patients with diabetic mellitus and any complications for the prevention of what is a life-threatening disorder.

One hundred and eighty four diabetic mellitus patients from diabetic centre of Al-Diwaniya city were used :- (114) males & (70) females for the period from 1/8/2016 to 1/1/2017. We studied the relationship between genders and complications of diabetic mellitus. The study showed that cardiovascular diseases was most common occur than other complications while nephropathy was the least occur than other complications. Also, we conclude that the males were more than females with the risk of the dangerous of diabetic mellitus complications in Al-Diwaniya city/ IRAQ.

CHAPTER ONE: INTRODUCTION

Introduction

Diabetes mellitus (DM), commonly referred to as diabetes, is a group of metabolic diseases in which there are high blood sugar levels over a prolonged period. Symptoms of high blood sugar include frequent urination, increased thirst, and increased hunger. If left untreated, diabetes can cause many complications. Complications can include diabetic ketoacidosis, nonketotic hyperosmolar coma, or death. Serious long-term complications include heart disease, stroke, chronic kidney failure, foot ulcers, and damage to the eyes.

Diabetes is due to either the pancreas not producing enough insulin or the cells of the body not responding properly to the insulin produced^{[1][2]}.

1. Classification:-

Diabetes mellitus is classified into four broad categories: type 1, type 2, gestational diabetes, and "other specific types". The "other specific types" are a collection of a few dozen individual causes. Diabetes is a more variable disease than once thought and people may have combinations of forms. The term "diabetes", without qualification, usually refers to diabetes mellitus^[3].

- **Type 1 DM** is results from the pancreas's failure to produce enough insulin. This form was previously referred to as "insulin-dependent diabetes mellitus" (IDDM) or "juvenile diabetes". The cause is unknown. The majority of type 1 diabetes is of the immune-mediated nature, in which a T-cell-mediated autoimmune attack leads to the loss of beta cells and thus insulin. Type 1 diabetes can affect children or adults, but was traditionally termed "juvenile diabetes" because a majority of these diabetes cases were in children^[4].
- **Type 2 DM** is characterized by insulin resistance, which may be combined with relatively reduced insulin secretion. The defective responsiveness of body tissues to insulin is believed to involve the insulin receptor. However, the specific defects are not known. Diabetes mellitus cases due to a known defect are classified separately. Type 2 DM is the most common type of diabetes mellitus^[5].

- **Gestational diabetes mellitus (GDM)** resembles type 2 DM in several respects, involving a combination of relatively inadequate insulin secretion and responsiveness. It occurs in about 2–10% of all pregnancies and may improve or disappear after delivery. However, after pregnancy approximately 5–10% of women with gestational diabetes are found to have diabetes mellitus, most commonly type 2. Gestational diabetes is fully treatable, but requires careful medical supervision throughout the pregnancy. Management may include dietary changes, blood glucose monitoring, and in some cases, insulin may be required^[6].
- **Other types:**
 - A. Prediabetes indicates a condition that occurs when a person's blood glucose levels are higher than normal but not high enough for a diagnosis of type 2 DM. Many people destined to develop type 2 DM spend many years in a state of prediabetes^[7].
 - B. Latent autoimmune diabetes of adults (LADA) is a condition in which type 1 DM develops in adults. Adults with LADA are frequently initially misdiagnosed as having type 2 DM, based on age rather than etiology^[7].

2. Sign and Symptoms:-

The classic symptoms of untreated diabetes are weight loss, polyuria (increased urination), polydipsia (increased thirst), and polyphagia (increased hunger). Symptoms may develop rapidly (weeks or months) in type 1 DM, while they usually develop much more slowly and may be subtle or absent in type 2 DM^[8].

Several other signs and symptoms can mark the onset of diabetes although they are not specific to the disease. In addition to the known ones above, they include blurry vision, headache, fatigue, slow healing of cuts, and itchy skin. Prolonged high blood glucose can cause glucose absorption in the lens of the eye, which leads to changes in its shape, resulting in vision changes. A number of skin

rashes that can occur in diabetes are collectively known as diabetic dermadromes ^[8].

3. Diagnosis:-

Diabetes mellitus is characterized by recurrent or persistent high blood sugar, and is diagnosed by demonstrating any one of the following ^{[9],[10]}:

- Fasting plasma glucose level ≥ 7.0 mmol/l (126 mg/dl)
- Plasma glucose ≥ 11.1 mmol/l (200 mg/dl) two hours after a 75 g oral glucose load as in a glucose tolerance test
- Symptoms of high blood sugar and casual plasma glucose ≥ 11.1 mmol/l (200 mg/dl)
- Glycated hemoglobin (HbA1C) ≥ 48 mmol/mol (≥ 6.5 DCCT %).

A positive result, in the absence of unequivocal high blood sugar, should be confirmed by a repeat of any of the above methods on a different day. It is preferable to measure a fasting glucose level because of the ease of measurement and the considerable time commitment of formal glucose tolerance testing, which takes two hours to complete and offers no prognostic advantage over the fasting test. According to the current definition, two fasting glucose measurements above 126 mg/dl (7.0 mmol/l) is considered diagnostic for diabetes mellitus ^[11].

4. Pathophysiology:-

Insulin is released into the blood by beta cells in response to rising levels of blood glucose, typically after eating. If the amount of insulin available is insufficient, if cells respond poorly to the effects of insulin (insulin insensitivity or insulin resistance), or if the insulin itself is defective, then glucose will not be absorbed properly by the body cells that require it, and it will not be stored appropriately in the liver and muscles. The net effect is persistently high levels of blood glucose, poor protein synthesis, and other

metabolic derangements, such as acidosis, alkalosis, polydipsia, polyuria, glycosuria^[12].

5. Diabetes Management:-

- **Lifestyle changes:** People with diabetes can benefit from education about the disease and treatment, good nutrition to achieve a normal body weight, and exercise, with the goal of keeping both short-term and long-term blood glucose levels within acceptable bounds. In addition, given the associated higher risks of cardiovascular disease, lifestyle modifications are recommended to control blood pressure^[13].
- **Medications:** Medications used to treat diabetes do so by lowering blood sugar levels. There are a number of different classes of anti-diabetic medications. Some are available by mouth, such as metformin, while others are only available by injection such as GLP-1 agonists. Type 1 diabetes can only be treated with insulin, typically with a combination of regular and NPH insulin, or synthetic insulin analogs^[14].

6. Complications:-

The complications of diabetes mellitus are far less common and less severe in people who have well-controlled blood sugar levels. Conversely, some genes appear to provide protection against diabetic complications, as evidenced by the absence of complications in a subset of long-term diabetes survivors.

Long-term complications of diabetes develop gradually. The longer you have diabetes — and the less controlled your blood sugar — the higher the risk of complications. Eventually, diabetes complications may be disabling or even life-threatening.

Possible complications include: :

A. Acute :-

1. Diabetic ketoacidosis

Diabetic ketoacidosis (DKA) is an acute and dangerous complication that is always a medical emergency and requires prompt medical attention. Low insulin levels cause the liver to turn fatty acid to ketone for fuel (i.e., ketosis); ketone bodies are intermediate substrates in that metabolic sequence. This is normal when periodic, but can become a serious problem if sustained. Elevated levels of ketone bodies in the blood decrease the blood's pH, leading to DKA. On presentation at hospital, the patient in DKA is typically dehydrated, and breathing rapidly and deeply. Abdominal pain is common and may be severe. The level of consciousness is typically normal until late in the process, when lethargy may progress to coma. Ketoacidosis can easily become severe enough to cause hypotension, shock, and death. Urine analysis will reveal significant levels of ketone bodies (which have exceeded their renal threshold blood levels to appear in the urine, often before other overt symptoms). Prompt, proper treatment usually results in full recovery, though death can result from inadequate or delayed treatment, or from complications (e.g., brain edema). Ketoacidosis is much more common in type 1 diabetes than type 2^[15].

2. Hyperglycemia hyperosmolar state

(HNS) is an acute complication sharing many symptoms with DKA, but an entirely different origin and different treatment. A person with very high (usually considered to be above 300 mg/dl (16 mmol/L)) blood glucose levels, water is osmotically drawn out of cells into the blood and the kidneys eventually begin to dump glucose into the urine. This results in loss of water and an increase in blood osmolarity. If fluid is not replaced (by mouth or intravenously), the osmotic effect of high glucose levels, combined with the loss of water, will eventually lead to dehydration. The body's cells become progressively dehydrated as water is taken from them and excreted .

Electrolyte imbalances are also common and are always dangerous. As with DKA, urgent medical treatment is necessary, commonly beginning with fluid volume replacement. Lethargy may ultimately progress to a coma, though this is more common in type 2 diabetes than type 1 ^[15].

3. Diabetic coma

Diabetic coma is a medical emergency in which a person with diabetes mellitus is comatose (unconscious) because of one of the acute complications of diabetes:

- Severe diabetic hypoglycemia
- Diabetic ketoacidosis advanced enough to result in unconsciousness from a combination of severe hyperglycemia, dehydration and shock, and exhaustion
- Hyperosmolar nonketotic coma in which extreme hyperglycemia and dehydration alone are sufficient to cause unconsciousness.

In most medical contexts, the term diabetic coma refers to the diagnostic dilemma posed when a physician is confronted with an unconscious patient about whom nothing is known except that he has diabetes. An example might be a physician working in an emergency department who receives an unconscious patient wearing a medical identification tag saying DIABETIC. Paramedics may be called to rescue an unconscious person by friends who identify him as diabetic. Brief descriptions of the three major conditions are followed by a discussion of the diagnostic process used to distinguish among them, as well as a few other conditions which must be considered ^[16].

4. Erectile Dysfunction

Estimates of the prevalence of erectile dysfunction in men with diabetes range from 20 to 85 percent. Erectile dysfunction is a consistent inability to have an erection firm enough for sexual intercourse. Among men with erectile dysfunction, those with diabetes are likely to have experienced the problem as much as 10 to 15 years earlier than men without diabetes ^[17].

5. Respiratory infections

The immune response is impaired in individuals with diabetes mellitus. Cellular studies have shown that hyperglycemia both reduces the function of immune cells and increases inflammation. The vascular effects of diabetes also tend to alter lung function, all of which leads to an increase

in susceptibility to respiratory infections such as pneumonia and influenza among individuals with diabetes. Several studies also show diabetes associated with a worse disease course and slower recovery from respiratory infections ^[18].

A. Chronic

Chronic elevation of blood glucose level leads to damage of blood vessels (angiopathy). The endothelial cells lining the blood vessels take in more glucose than normal, since they do not depend on insulin. They then form more surface glycoproteins than normal, and cause the basement membrane to grow thicker and weaker. In diabetes, the resulting problems are grouped under "microvascular disease" (due to damage to small blood vessels) and "macrovascular disease" (due to damage to the arteries) ^[19].

2. Microangiopathy, which causes one or more of the following:

- **Cardiovascular disease.** Diabetes dramatically increases the risk of various cardiovascular problems, including coronary artery disease with chest pain (angina), heart attack, stroke and narrowing of arteries (atherosclerosis). If you have diabetes, you are more likely to have heart disease or stroke. Diabetic patients exhibit an increased risk for development of atherosclerotic CAD for many reasons, including metabolic factors, like hyperglycemia, dyslipidemia and insulin resistance, which lead to endothelial cell, vascular smooth muscle dysfunction, impaired platelet function and abnormal coagulation. Diabetic patients tend to exhibit other risk factors for CAD, like hypertension and obesity. Patients with diabetes have lipid-rich atherosclerotic plaques, which are more vulnerable to rupture than the plaques seen in non-diabetic patients. Described an overall increase in atherosclerotic burden and a 3.5-fold higher risk of coronary stenosis that was independent of other cardiovascular risk factors in diabetic patients ^[20].

Inflammation plays an important role in atherosclerosis. Inflammation activation in type 2 DM results from obesity and insulin resistance, in which an acute phase reaction occur, and a large number of inflammatory and pro-inflammatory cytokines are released from adipose tissue. Endothelial dysfunction is generally present in diabetic patients with CAD, as evidenced by high levels of endothelin 1 and low levels of nitric oxide. Vascular endothelial (VE)-cadherin was identified recently as an updated marker of endothelial function that is well-correlated with endothelin 1 in diabetic patients with CAD.

Enhanced thrombus formation occurs in type 2 DM because of increased platelet activity and blood coagulability. Pathological alterations in fibrinogen and plasminogen activation inhibitors are primarily relevant for the short-term incidence of cardiovascular events in patients with type 2 DM^[21].

- **Diabetic nephropathy:** damage to the kidney which can lead to chronic renal failure. The kidneys contain millions of tiny blood vessel clusters (glomeruli) that filter waste from your blood. Diabetes can damage this delicate filtering system. Severe damage can lead to kidney failure or irreversible end-stage kidney disease, which may require dialysis or a kidney transplant. Many studies have revealed that genetic factors contribute in the development of diabetic nephropathy^[1].
- **Diabetic neuropathy:** Excess sugar can injure the walls of the tiny blood vessels (capillaries) that nourish your nerves, especially in your legs. This can cause tingling, numbness, burning or pain that usually begins at the tips of the toes or fingers and gradually spreads upward. Left untreated, you could lose all sense of feeling in the affected limbs. When combined with damaged blood vessels this can lead to diabetic foot. Damage to the nerves related to digestion can cause problems with nausea, vomiting, diarrhea or constipation. For men, it may lead to erectile dysfunction). Other forms of diabetic neuropathy may present as mononeuritis or autonomic neuropathy. Diabetic amyotrophy is muscle weakness due to neuropathy^{[22],[23]}. Also DM can damage the nerves that are

responsible for blood pressure control and may cause fainting attack ^[24]

- **Eye damage (retinopathy):** Diabetes can damage the blood vessels of the retina (diabetic retinopathy), potentially leading to blindness. Diabetes also increases the risk of other serious vision conditions, such as cataracts and glaucoma ^{[25],[26]}.
- **Diabetic encephalopathy:** is the increased cognitive decline and risk of dementia, including (but not limited to) the Alzheimer's type, observed in diabetes. Various mechanisms are proposed, including alterations to the vascular supply of the brain and the interaction of insulin with the brain itself ^[11,12].

3. Macrovascular disease leads to cardiovascular disease, to which accelerated atherosclerosis is a contributor :

- Coronary artery disease, leading to angina or myocardial infarction ("heart attack")
- Diabetic myonecrosis ('muscle wasting')
- Peripheral vascular disease, which contributes to intermittent claudication (exertion-related leg and foot pain) as well as diabetic foot.
- Stroke (mainly the ischemic type) (27).

CHAPTER ONE: INTRODUCTION

The aim of this study to determine the most common complications and the relation between the gender, the age and the complications in patients with diabetes mellitus during the period of the study.



**CHAPTER TWO:
PATIENTS AND METHODS**

CHAPER TWO: PATIENTS AND METHODS

It is a descriptive statistical study. Data collected from Diabetic Mellitus Centre in Diwaniyah city /IRAQ. We started filling out the data from 1/8/2016 to 1/1/2017. Data collection was obtained through filling the researcher's questionnaire considering the followings: - Gender, age and heart diseases, Neuropathy, Nephropathy, Retinopathy & Foot complications. Also General physical examination and systemic evaluation were carried out; patients were also examining for other diabetic systemic complications. We were able to obtain the required data of 184 cases for this research, (114) males & (70) females diabetic mellitus patients.

CHAPTER THREE: RESULTS

The results showed as shown in figure (1) that the occurrence of cardiovascular diseases is the most common in comparison with other complications that we found in Diabetic Mellitus Centre in Diwaniyah city during the period of study. While the occurrence of nephropathy is the least complication in comparison with other complications that we found in Diabetic Mellitus Centre in Diwaniyah city during the period of study.

Also our results showed as shown in figure (2) that the percentage of diabetes complications in male (61%) more than the percentage of diabetes complications in female (39%) during the study period.

Also our results showed as shown in figure (3) that the occurrence of cardiovascular diseases is the most common in male while the occurrence of neuropathy is the most common in female. Also our results showed that the occurrence of nephropathy is the least common in both male and female.

Also our results in the figure (3) show that for neuropathy complication of diabetes mellitus as shown in figure 3 neuropathy complication most common occur in the age group (61-70) while it's occurrence in the age group (31-40) is the least .

For cardiovascular diseases complication also most common occur in the age group (61-70) while it's occurrence in the age group (15-30) is the least.

For retinopathy complication most common occur in both age groups (61-70 and 51-60) while their occurrence in the age groups (15-30 and 31-40) are the least.

For foot damage complication we found that this complication most common occur in the age group (41-50) while their occurrence in the age groups (15-30 and 31-40) are the least.

For nephropathy complication in general there is no difference between it's occurrence in all age groups.

figure (1) complications of diabetes mellitus

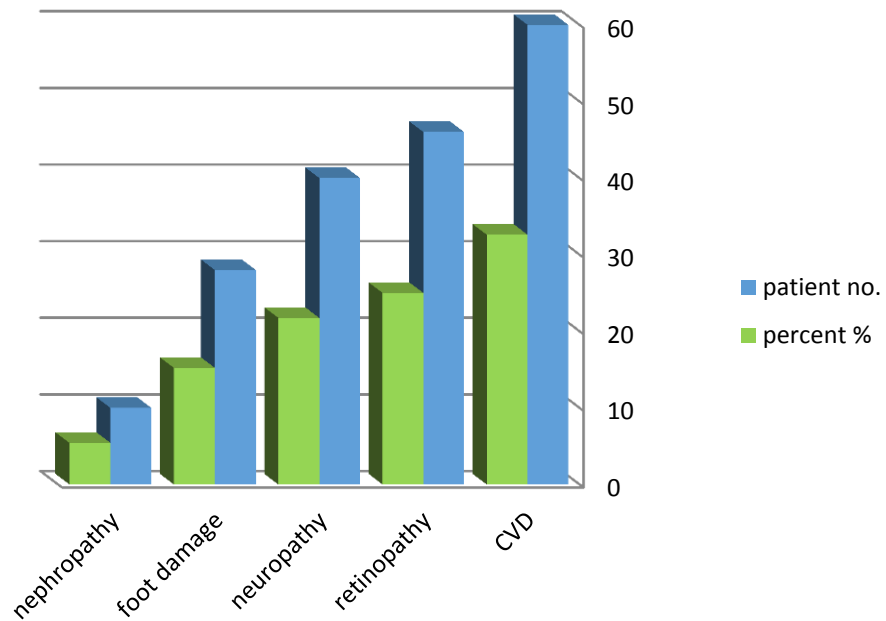


Table (1) illustrate the complication and their percentage

complications	No of patients	Percentage= compls/sum *100%
nephropathy	10	35
Foot damage	28	70
neuropathy	40	86
retinopathy	46	76
CVD	60	32
	184	

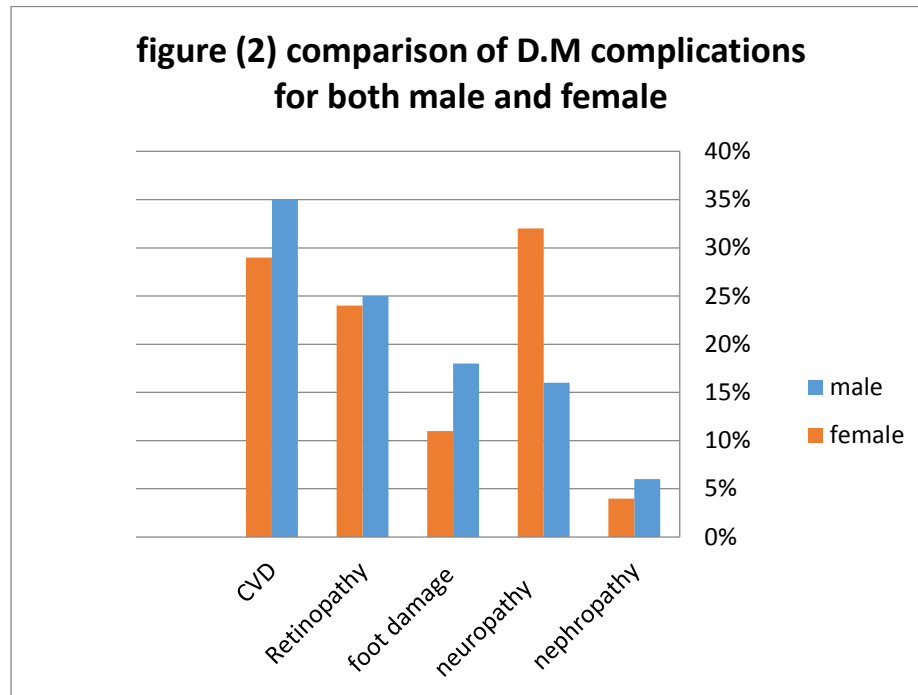


Table 2: (distribution of complication in male)

complications	No of compls	Percentage= compls/sum *100%
CVD	40	35
Retinopathy	29	25
Foot damage	20	18
Neuropathy	18	16
Nephropathy	7	6
	114	

Table 3: (distribution of complication in female)

complications	No of compls	Percentage= compls/sum *100%
CVD	20	29
Retinopathy	17	24
Foot damage	8	11
Neuropathy	22	31
Nephropathy	3	4
	70	

Figure 3: percentage of complication in male and female

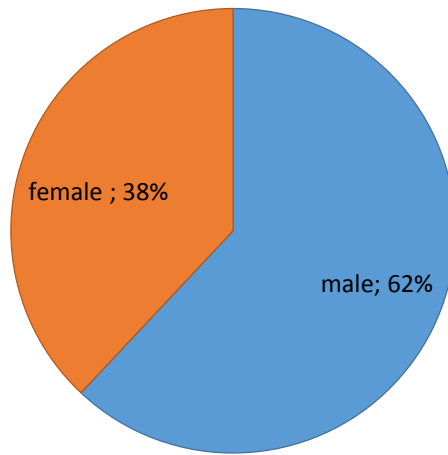
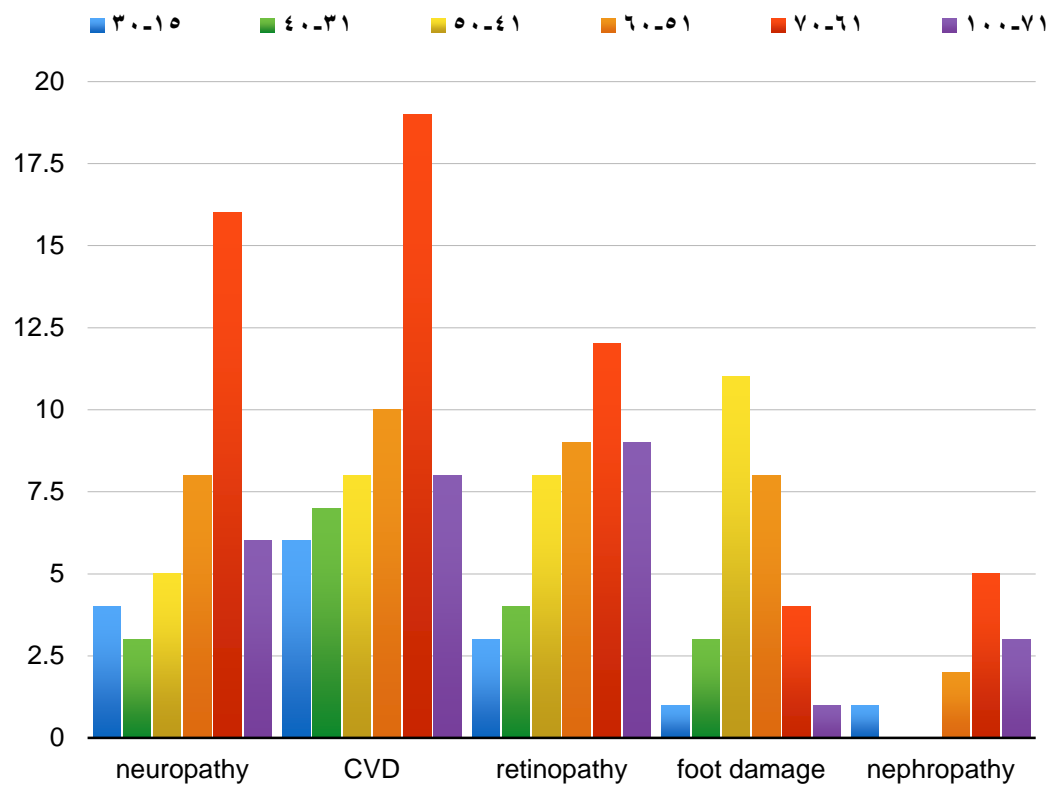
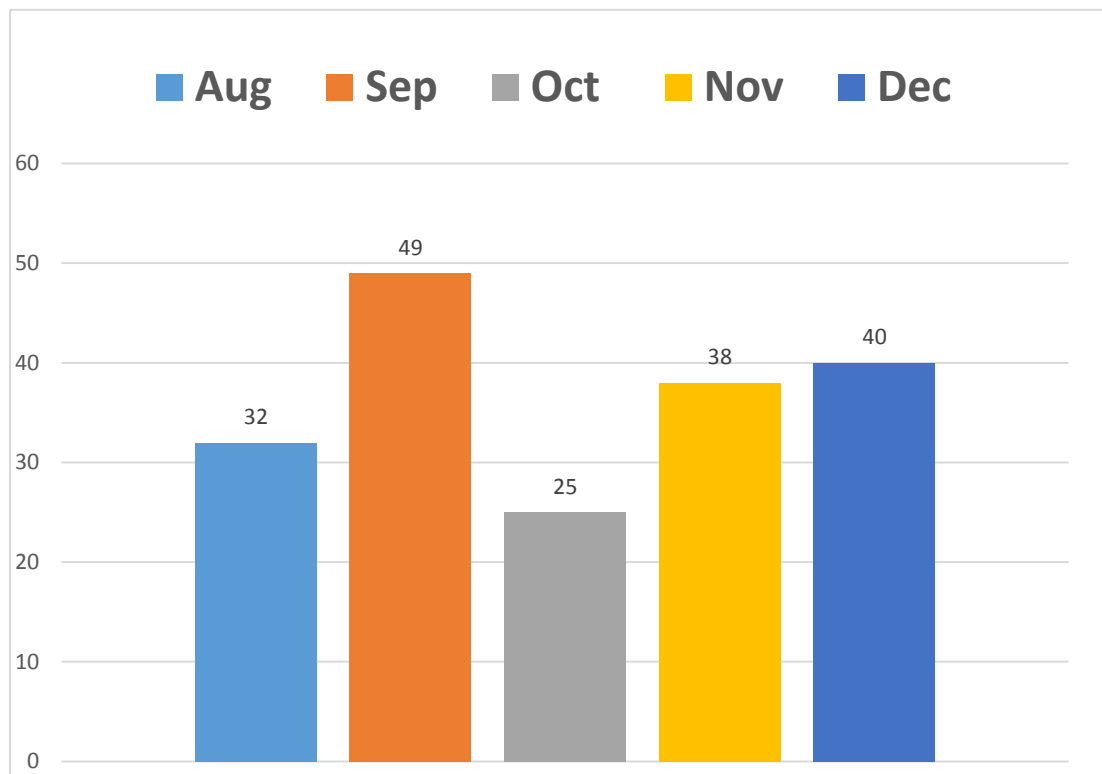


Figure 4: the relationship between each complication and age.



CHAPTER THREE: RESULTS

Figure 5: numbers of cases (or complications) that were obtained in each month of the whole five months.



CHAPTER FOUR: DISCUSSION

Over the last few decades the prevalence of diabetes has reached epidemic proportions in western societies and is even higher in developing countries, (28). The World Health Organization (WHO) has estimated that the global prevalence of diabetes will increase from 2.8% in 2000 to 4.4% by 2030, (29). The present study indicates that the event of diabetic mellitus in people of Diwaniya is with risk of complications especially for male.

From the result, Diabetes mellitus and its complications is widespread between people, including those who lived in Al-Diwaniya city. This spreading may be due to several factors which include low physical activity, taken high diet that contains sugar and may be due to uncontrolled DM.

Through the [figure 1], we can see that the most widespread complication is cardiovascular disease according to the data that was obtained from statistics center in Al-Diwaniya teaching hospital and from examination diabetic center. The second more common complication according to this research is retinopathy, the third common complication is neuropathy and finally the less two common complications are foot damage and nephropathy and there is no other complications such as myonecrosis, skin necrosis and others.

In the [figure 2], we can see that the complications of DM presented with people of Al-Diwaniya city is more widespread in male than in female.

In figure (3) , This study showed that heart disease in males were more than females, this disagree with 30 who found that heart disease and diabetes patient were in female higher than male ,but agree with,(31) heart disease were higher in men than female. (32) Explain that

CHAPTER FOUR: DISCUSSION

hypertension is one major risk factor for atherosclerosis. The atherosclerotic vessel is more prone to thrombosis and rupture. Also (33) explain that vascular problems that occur as a result of diabetes are made worse when blood pressure is elevated from other sources such as poor diet or lack of exercise. The current study results showed that occurrence of neuropathy in females were more than males, this agree with (34) while disagree with (35) they found that male are higher neuropathy than female. (36) Explain that researchers are studying how prolonged exposure to high blood glucose causes nerve damage. Nerve damage is likely due to a combination of factors: metabolic factors, such as high blood glucose, long duration of diabetes, abnormal blood fat levels, and possibly low levels of insulin .neurovascular factors, leading to damage to the blood vessels that carry oxygen and nutrients to nerves .autoimmune factors that cause inflammation in nerves.

results in this study found, but males were more than males with foot problem,

This disagrees with (41) explain that it is because of the common diabetic foot complications include neuropathy, infections, vascular disease and ulcerations. (42) explains that high blood glucose in diabetes patients can causes two problems that can hurt feet: nerve damage in legs also called diabetic neuropathy so the patient might not feel pain, heat, or cold in legs and feet, that can lead to a sore or an infection, the second problem happens when not enough blood flows to legs and feet. Because it's makes it hard for a sore or infection to heal.

The present study showed that nephropathy have no signification with gender, males were more than females , this agree with (35) showed that male were higher nephropathy than female. (37) They have found that high blood pressure and high levels of blood glucose increase the risk that a person with diabetes will progress to kidney failure. This results showed no significant relationship between retinopathy and gender, females were more than males, this agree with (35) were found that male are higher retinopathy than female, (38) found that adult diabetic patient with retinopathy had more other associated disease ,in the form of hypertension, heart disease ,diabetic nephropathy and diabetic foot ulcer, which agree with our study results. (39) Concluded from their study that retina damage happens slowly in diabetic patients because retinas have tiny blood vessels that are easy to damage. (40) Having high blood glucose and high blood pressure for a long time can damage these tiny blood vessels. Significant results in this study found, but males were more than males with foot problem,

This disagrees with (41) explain that it is because of the common diabetic foot complications include neuropathy, infections, vascular disease and

CHAPTER FOUR: DISCUSSION

ulcerations. (42) explains that high blood glucose in diabetes patients can causes two problems that can hurt feet: nerve damage in legs also called diabetic neuropathy so the patient might not feel pain, heat, or cold in legs and feet, that can lead to a sore or an infection, the second problem happens when not enough blood flows to legs and feet. Because it's makes it hard for a sore or infection to heal.

About [figure 4], we can see that age has a role in developing and appearing of complication in diabetes patients. Although it may not definite study, but it may give a look or a help that aged people are more exposed to complications of DM than younger people who also have DM.

[Figure 5]: reviews the period of time and the number of complications that were collected in each month, which shows that September contains the large number of complications than other month of the whole months.

CHAPTER FIVE: CONCLUSIONS

We conclude from my survey that:

- The Gender of the patient who has diabetes mellitus may play a major role in the manifestation and development of the complications. The results of this study concluded that male with diabetic mellitus who suffering from the complications are at more risk than female.
- During the period of survey or study we conclude that cardiovascular disease the most occurrences in patients with diabetes mellitus while nephropathy the least occurrence among them.
- The age of the patient who has diabetes mellitus also has an effect on the manifestation and occurrence of the complication.

CHAPTER SIX: REFERENCES

CHAPTER SIX: REFERENCES

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CHAPTER SIX: REFERENCES