# *AWARENESS ,KNOWLEDGE, ATTITUDE, AND PRACTICE ABOUT DIABETIC EYE DISEASE AMONG DIABETIC PATIENTS IN SANA'A CITY 2022.*


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# الوعي, والمعرفة, والمواقف, والسلوك حول أمراض العيون الناتجة عن السكري في مرضى السكري في صنعاء, ٢٠٢٢م


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## Dedication:

With best regards, this work was dedicated to

**our beloved country Yemen,**

**to our beloved parents, and to our brothers and sisters**

who have always been our source of inspiration and encouragement. For our **readers** and **colleagues**, we hope this research will enlighten you.

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## List of Abbreviations

| Meaning | Abbreviation |
|---|---|
| Anterior chamber angle | ACA |
| Angiotensin covering enzyme inhibitor | ACE inhibitor |
| Adenosine Di-phosphate | AD P-ribose |
| Advanced glycation endproduct | AGE |
| Apoptotic indncing factor | AIF |
| Argon laser trabeculoplasty | ALT |
| Blood retinal barrier | BRB |
| Chemotherpy mitomycin C | C [MMC] |
| Computer tomography | CT |
| Chennai urban rural epidemiology | CURES |
| Di acyl gly cerol | DAG |
| Diabetes control and complication trial | DCCT |
| Diabetes mellitus | DM |
| Diabetes mellitus type 1 | DM1 |
| Diabetes mellitus type 2 | DM2 |
| Diabetic retinopathy | DR |
| Diabetic macularedma | DME |
| Erectile dysfunction | ED |
| Fluorescein angio graphy | FAG |
| Fructose 6 phosphate | F6P |
| 5- Fluorouracil | 5FU |
| Glycer aldehyde phosphate | GAPDH |

| | |
|---|---|
| **dehydrogenase** | |
| **High density lipoprotein** | **HDL** |
| **Human leukocyte antigen** | **HLA** |
| **Health maintenance organization** | **HMO** |
| **International diabetes federation** | **IDF** |
| **Interleukin 1** | **IL1** |
| **Interleukin 6** | **IL6** |
| **Interleukin 8** | **IL8** |
| **Intra ocular lens** | **IOL** |
| **Intra- ocular- pressure** | **IOP** |
| **Intra – retinal microvascular abnormalities** | **IRMA** |
| **Knowledge attitude practice** | **KAP** |
| **Laser peripheral iridotomy** | **LPI** |
| **Mitogen activated ptotien kinase** | **MAPK** |
| **Monocyte chemotactic protein -1** | **MCP-1** |
| **Multi – ethnic study of atherosderosis** | **MESA** |
| **Magnetic resonance imaging** | **MRI** |
| **Nicotinamide adenine dinucleotide** | **NAD** |
| **Reduced nicotinamide adenine dinucleotide phophate** | **NADPH** |
| **Neodymium: yttrium aluminum- garnet** | **ND: YAG** |
| **Non proliferative diabetic retinopathy** | **NPDR** |
| **Non penetrating deep sclerectomy** | **NPDS** |
| **Ophthalmic coherence tomograghy** | **OCT** |
| **O- GlcNAc transferase** | **OGT** |

| | |
|---|---|
| **Plasminogen activator inhibitor1** | **PAI-1** |
| **Poly(ADP-ribose) polymerase** | **PARP** |
| **Proliferative diabetic retinopathy** | **PDR** |
| **Protien kinase C** | **PKC** |
| **Primary open angle glaucoma** | **POAG** |
| **Selective laser trabeculplasty** | **SLT** |
| **Sankara nethralaya diabetic retinopathy epidemiology and molecular genetic study** | **SN-DREAMs** |
| **Statisical package of social sciences** | **SPSS 24** |
| **Transforming growth factor B** | **TGFB** |
| **Tomor necrosis factor** | **TNF** |
| **Uridine 5- diphospho-N-acetylgalactosamine** | **UDP.GLcNAc** |
| **United kingdom prospective diabetes study** | **UKPDS** |
| **Vascular endothelial growth factors** | **VEGF** |

# Abstract

## Background

DM is the second most common cause of bilateral blindness preceded by cataract followed by glaucoma .there's limited evidence on knowledge of patients with diabetes mellitus on diabetic complication on the eye's and their eye examination practices and attitude in Sana'a .

## General objective

Assessment of the awareness, knowledge, attitude and practice toward diabetic eye disease among diabetic patients attending Al-Thawra hospital diabetic center, Al-Kuwait Hospital& Al-Jumhouri Hospital in Sana'a.

## Methods

Across-sectional descriptive study targeting the patients diagnoses with type 2 DM for less than 5 years attending Al -thawra hospital diabetic center ,Al-Kuwait hospital and Al-Jumhouri Hospital in Sana'a for period of 1 Month (from 15/11/2022 upto 15/12/2022.) A total of 294 participants were randomly selected based on sample size calculations. The questions focused on the participant (Clinical status of DM, sociodemographic characteristics, awareness of eye complication Secondary to DM, eye screening, eye care seeking behavior ,preventive practices. The collected data was analyzed by "SPSS24".

## Results

Total of the sample was 294 participants Diabetic patients( 43.9%) attending Al-Thawra Hospital ,(23.8%) attending AL-Kuwait Hospital and (32.3%) attending Al-Jumhouri Hospital. (54.1%) were female and (45.9%) were male with mean age was 50.51,(44.9%) were uneducated ,(47,51%) hearing the Information about diabetic complications on the eye from doctors and the percentage of knowledge about diabetic complications on the eyes among the participating individual was (53.8%) For high knowledge and (46.2%) for low knowledge.

## Conclusion

Although The awareness and knowledge about DM complication on the eyes was high in the participating diabetic patients ,frequency of eye screening was not highest ,thus delay Dx and Management . Low income was identified as important

factor for routine eye screening ,more awareness and knowledge need to be imported to every diabetic patients by physicians as soon as they are diagnosed.

## Recommendations

In order to enhance the awareness of health issues of DM complications , the following is recommended :

1- Facilitate districts cities with clinic centers that provide the services needed to DM patients .

2- Engage health service providers in an health campaign to increase health awareness among segments of the population.

3- Notify physicians about the importance of alerting patients about the complications and risks of DM negligence on the eyes.

# Chapter 1:

# INTRODUCTION

# INTRODUCTION

Diabetes Mellitus (DM) is a clinical syndrome which is characterized by hyperglycemia due to an absolute or relative deficiency of insulin [1]. Whereas the primary cause is excessive weight and not enough exercise[2] ,so current projection estimate that 439 million adults will be affected by type 2 diabetes mellitus by 2030 and rate of type 1 diabetes is increasing world-wide[3,4].

Diabetes mellitus (DM) is a growing global epidemic and leading cause of ocular complications, ,and eye diseases, such as cataract, retinopathy, glaucoma, double vision, macular degeneration, and blindness[5]. Diabetic retinopathy is an eye condition that can cause vision loss and blindness in people who have diabetes[6], it is the second most common cause of bilateral blindness preceded by cataract followed by glaucoma[7] . When we talk about glaucoma there are studies report that presence of diabetes and elevated fasting glucose levels are associated with elevated intraocular pressure that is the primary risk for glaucoma which lead to irreversible blindness[8]. and Cataracts are cloudy areas in the lens of the cornea that blur vision, People with diabetes may be twice as likely to develop cataracts as those without diabetes[9].

## Background

### Diabetes mellitus :

Diabetic is a chronic disease that occurs when the body cannot produce or effectively use insulin. Insulin is a hormone that is needed to convert sugar, starches and other food into energy needed for daily life. The hormone is produced by the pancreas, an organ located in the abdomen, There are several types of diabetes, including type 1 diabetes, type 2 diabetes, and gestational diabetes, each with its own causes, symptoms, and treatment options. Diabetes is a chronic medical condition characterized by high levels of sugar (glucose) in the blood. The body relies on a hormone called insulin to regulate blood sugar levels, but people with diabetes either do not produce enough insulin or their bodies do not use it effectively. This can lead to serious health problems over time, including damage to the eyes, kidneys, nerves, and cardiovascular system. The prevalence of diabetes has been steadily increasing worldwide, with an estimated 463 million adults living with diabetes in 2019. There are several types of diabetes, each with its own causes, symptoms, and treatment options. The most common types of diabetes are type 1 diabetes, type 2 diabetes, and gestational diabetes. Diabetes is a major public health issue, and its prevalence is expected to continue to rise in the coming years.

According to the International Diabetes Federation (IDF), diabetes is one of the leading causes of death worldwide, accounting for 4.2 million deaths in 2019 alone. The IDF also estimates that diabetes-related healthcare spending in the world is approximately $760 billion per year. Diabetes can have a significant impact on a person's quality of life, affecting their ability to work, engage in physical activity, and participate in social activities. It is also associated with an increased risk of depression and other mental health disorders. Effective management of diabetes involves a combination of lifestyle modifications, such as diet and exercise, and medical treatment, such as insulin therapy or oral medications. Regular monitoring of blood sugar levels is also important to prevent complications. As the global burden of diabetes continues to increase, it is important for individuals, healthcare providers, and policymakers to work together to improve prevention, diagnosis, and treatment of the disease. This paper aims to provide a comprehensive overview of diabetes and its management, with a focus on the three main types.

Type 1 diabetes is an autoimmune disease in which the immune system attacks and destroys the cells in the pancreas that produce insulin. The exact cause of type 1 diabetes is unknown, but it is thought to be a combination of genetic and environmental factors. Symptoms of type 1 diabetes include increased thirst, frequent urination, weight loss, and fatigue. Treatment involves insulin therapy, regular monitoring of blood sugar levels, and lifestyle modifications.

Type 2 diabetes is the most common type of diabetes and is often associated with obesity and physical inactivity. In type 2 diabetes, the body becomes resistant to insulin, and the pancreas may not be able to produce enough insulin to keep blood sugar levels in check. Symptoms of type 2 diabetes may include increased thirst, frequent urination, blurred vision, and slow healing of wounds. Treatment may involve lifestyle modifications, such as diet and exercise, and medications to help lower blood sugar levels.

Gestational diabetes occurs during pregnancy and can affect the health of both the mother and the baby. It is caused by hormonal changes that make the body less responsive to insulin. Women who have risk factors for diabetes, such as obesity or a family history of diabetes, are more likely to develop gestational diabetes. Treatment may involve lifestyle modifications, such as a healthy diet and regular physical activity, and insulin therapy in some cases.

If left untreated, diabetes can lead to serious complications, such as heart disease, kidney disease, and nerve damage. Effective management of diabetes involves a combination of lifestyle modifications and medical treatment, including regular monitoring of blood sugar levels and medications to help lower blood sugar levels.

In conclusion, diabetes is a major public health issue that requires ongoing attention and management. By understanding the different types of diabetes and their unique characteristics, individuals can take steps to manage their condition and prevent complications.

## There are three main types of diabetes:

- Type 1 diabetes occurs when the body's immune system attacks and destroys the cells in the pancreas that produce insulin. This type of diabetes usually occurs in children and young adults, but it can occur at any age.
- Type 2 diabetes occurs when the body does not produce enough insulin or does not use insulin effectively. This type of diabetes is the most common form of diabetes.
- Gestational diabetes occurs in some women during pregnancy. Most of the time, this type of diabetes goes away after the baby is born. However, women who have had gestational diabetes are at an increased risk of developing type 2 diabetes later in life.

## Symptoms of DM:

The symptoms of diabetes can vary depending on the type of diabetes and how well it is controlled. Some of the common symptoms of diabetes include:

1. Frequent urination
2. Excessive thirst
3. Extreme hunger
4. Unexplained weight loss
5. Fatigue
6. Blurred vision
7. Irritability
8. Slow-healing sores

If you have any of these symptoms, it is important to see a doctor to get tested for diabetes.

## Treatment of diabetes:

There is no cure for diabetes, but it can be managed with diet, exercise, and medication. If you have diabetes,

1. Diet and exercise:

Diet and exercise are important parts of managing all types of diabetes. Eating a healthy diet and getting regular exercise can help you control your blood sugar levels, lose weight if you need to, and reduce your risk of developing other health problems.

If you have type 1 diabetes, you will need to take insulin injections or use an insulin pump to control your blood sugar levels. You will also need to monitor your blood sugar levels regularly and make changes to your diet and exercise routine as needed.

If you have type 2 diabetes, you may be able to control your blood sugar levels with diet and exercise alone. However, many people with type 2 diabetes also need to take oral medications or insulin injections.

2. Medications:

There are many different types of medications that can be used to treat diabetes. Some of the most common medications for type 2 diabetes include metformin, sulfonylureas, thiazolidinedione, and meglitinides. Insulin is also a common medication for diabetes.

3. Insulin:

Insulin is a hormone that is needed to convert sugar, starches and other food into energy needed for daily life. People with type 1 diabetes must inject insulin several times a day or use an insulin pump to deliver the insulin. People with type 2 diabetes may also need to take insulin, especially if their blood sugar levels are not well-controlled with diet and exercise alone.

4. Insulin pumps:

An insulin pump is a small device that delivers insulin through a thin tube inserted under the skin. Insulin pumps can be helpful for people with type 1 diabetes or type 2 diabetes who have difficulty controlling their blood sugar levels with diet and exercise alone.

## Complications of diabetes:

The complications of diabetes can be serious and life-threatening. Some of the potential complications of diabetes include:

- Heart disease. Diabetes is a major risk factor for heart disease, the leading cause of death for both men and women. People with diabetes are two to four times more likely to develop heart disease than people without diabetes.
- Stroke. Diabetes is also a major risk factor for stroke, the third leading cause of death in the United States. People with diabetes are two to four times more likely to have a stroke than people without diabetes.
- Kidney disease. Diabetes is the leading cause of kidney failure in the United States. People with diabetes are 20 to 40 times more likely to develop kidney disease than people without diabetes.
- Nerve damage. Diabetes can damage nerves throughout the body, leading to problems such as numbness, tingling, pain, and loss of sensation. Nerve damage can also affect the digestive system, urinary system, and sexual function.
- Eye disease. Diabetes can damage the blood vessels in the eyes, leading to blindness. People with diabetes are 20 to 30 times more likely to develop blindness than people without diabetes.
- Foot problems. Diabetes can damage the nerves and blood vessels in the feet, leading to problems such as ulcers, infections, and amputations. People with diabetes are 15 to 20 times more likely to have a foot ulcer than people without diabetes.
- Skin problems; Diabetes can make people more susceptible to skin problems such as infections, rashes, and slow-healing sores.
- Dental problems. Diabetes can make people more susceptible to gum disease and tooth loss. People with diabetes are twice as likely to have gum disease as people without diabetes.
- Hearing loss. Diabetes can increase the risk of hearing loss. People with diabetes are two to three times more likely to have hearing loss than people without diabetes.
- Erectile dysfunction. Diabetes can cause erectile dysfunction (ED), the inability to get or keep an erection. Men with diabetes are two to five times more likely to have ED than men without diabetes.

Diabetes can also increase your risk of developing other health problems, such as Alzheimer's disease and cancer.

There is no cure for diabetes, but it can be managed with diet, exercise, and medication. If you have diabetes, it is important to work with your doctor to create a treatment plan that is right for you.

## Type 1 diabetes:

Type 1 diabetes is an autoimmune disease in which the immune system attacks and destroys the cells in the pancreas that produce insulin. Without insulin, the body cannot use glucose for energy, and it builds up in the blood, leading to high blood sugar levels. Type 1 diabetes usually develops in childhood or adolescence, although it can also occur in adults. It is sometimes referred to as juvenile diabetes or insulin-dependent diabetes. This type of diabetes usually occurs in children and young adults, but it can occur at any age.

The exact cause of type 1 diabetes is unknown, but it is thought to be a combination of genetic and environmental factors. People who have a family history of type 1 diabetes are at an increased risk of developing the disease. Other risk factors for type 1 diabetes include being overweight or obese, having a high blood pressure, and having a history of certain infections.

There is no cure for type 1 diabetes, but it can be managed with insulin injections. Insulin is a hormone that is needed to convert sugar, starches and other food into energy needed for daily life. People with type 1 diabetes must inject insulin several times a day or use an insulin pump to deliver the insulin.

In addition to insulin injections, people with type 1 diabetes must also monitor their blood sugar levels and make changes to their diet and exercise routine as needed.

- **Causes:**

The exact cause of type 1 diabetes is not fully understood, but it is believed to be a combination of genetic and environmental factors. Researchers have identified several genes that may increase the risk of developing type 1 diabetes, but not everyone with these genes develops the condition. Some environmental triggers, such as viruses and toxins, may also play a role in the development of type 1 diabetes. As mentioned earlier, the exact causes of type 1 diabetes are not fully understood. However, it is believed to be a combination of genetic and environmental factors that trigger an autoimmune response in which the body's immune system mistakenly attacks and destroys the insulin-producing cells in the pancreas.

Some of the known genetic factors that increase the risk of developing type 1 diabetes include certain variants of the HLA (human leukocyte antigen) genes, which are involved in regulating the immune system. However, not everyone with these genetic variants develops type 1 diabetes. In addition to genetics, environmental factors may also play a role in triggering the autoimmune response that leads to type 1 diabetes. Some of these environmental factors include:

1. Viral infections: Certain viruses, such as enter viruses, have been linked to an increased risk of developing type 1 diabetes. It is believed that these viruses may trigger the autoimmune response by mimicking the beta cells in the pancreas, leading the immune system to attack them.

2. Toxins: Exposure to certain toxins, such as nitrosamines and bisphenol A, has also been linked to an increased risk of developing type 1 diabetes.

3. Geography: Type 1 diabetes is more common in certain geographic areas, such as Finland and Sweden. Researchers believe that this may be due to a combination of genetic and environmental factors.

4. Age: Type 1 diabetes is most commonly diagnosed in children and young adults, although it can occur at any age.

The causes of type 1 diabetes are complex and multifactorial. While genetic factors play a role, environmental factors such as viral infections and toxins may also trigger the autoimmune response that leads to the development of type 1 diabetes.

- **Symptoms of type 1 diabetes include:**

1. Frequent urination
2. Increased thirst and hunger
3. Fatigue
4. Unexplained weight loss
5. Blurred vision
6. Slow-healing wounds
7. Numbness or tingling in the hands or feet
8. Complications of type 1 diabetes include:
9. Diabetic ketoacidosis (DKA)
10. Hypoglycemia (low blood sugar)
11. Eye complications
12. Nerve damage
13. Kidney damage
14. Cardiovascular disease.

- **Treatment of type 1 diabetes includes:**

1. Insulin therapy
2. Carbohydrate counting
3. Monitoring blood sugar levels
4. Regular physical activity**.**

## Type 2 diabetes

Type 2 diabetes is the most common type of diabetes, accounting for around 90% of all cases. It occurs when the body becomes resistant to insulin or does not produce enough insulin to keep blood sugar levels in check. Type 2 diabetes is often associated with obesity and physical inactivity, although other factors such as genetics and age also play a role. It is sometimes referred to as adult-onset diabetes .Type 2 diabetes is a metabolic disorder that occurs when the body does not produce enough insulin or does not use insulin effectively. This type of diabetes is the most common form of diabetes .The exact cause of type 2 diabetes is unknown, but it is thought to be a combination of genetic and environmental factors. People who are overweight or obese, have a family history of type 2 diabetes, or are of certain ethnic groups are at an increased risk of developing the disease .Type 2 diabetes can be managed with diet, exercise, and medication. If you have type 2 diabetes, it is important to work with your doctor to create a treatment plan that is right for you.

- **Symptoms:**

The symptoms of type 2 diabetes can develop slowly over time and may include:

1. Frequent urination.
2. Excessive thirst.
3. Blurry vision.
4. Fatigue.
5. Slow-healing wounds.
6. Tingling or numbness in the hands or feet.

- **Causes:**

The exact cause of type 2 diabetes is not fully understood, but it is believed to be a combination of genetic and environmental factors. Some of the known risk factors for type 2 diabetes include:

1. Age: Type 2 diabetes is more common in people over the age of 45.

2. Family history: Having a family history of diabetes increases the risk of developing type 2 diabetes.

3. Obesity: Being overweight or obese is a significant risk factor for type 2 diabetes, as excess body fat can make the body more resistant to insulin.

4. Inactivity: Physical inactivity and a sedentary lifestyle increase the risk of developing type 2 diabetes.

5. Race and ethnicity: Type 2 diabetes is more common in certain racial and ethnic groups, including African Americans, Hispanic/Latino Americans, and Native Americans.

- **Complications:**

If left untreated, type 2 diabetes can lead to a range of complications, including nerve damage, kidney damage, eye damage, cardiovascular disease, and foot problems.

- **Treatment:**

The treatment for type 2 diabetes typically involves a combination of lifestyle modifications and medications. Lifestyle modifications may include weight loss,

regular physical activity, and a healthy diet that is low in carbohydrates and sugars. Medications may include oral medications that help the body use insulin more effectively, insulin therapy, or other injectable medications that help regulate blood sugar levels .Type 2 diabetes is a common medical condition that requires lifelong management. With proper treatment and management, people with type 2 diabetes can lead healthy, active lives and reduce their risk of complications.

## Gestational Diabetes

Gestational diabetes occurs during pregnancy and affects around 3-8% of pregnant women. It is caused by hormonal changes that make the body less responsive to insulin. Gestational diabetes usually resolves after the baby is born, although women who develop gestational diabetes are at increased risk of developing type 2 diabetes later in life .The cause of gestational diabetes is not fully understood, but it is thought to be related to hormonal changes that occur during pregnancy .Gestational diabetes can be managed with diet, exercise, and medication. If you have gestational diabetes, it is important to work with your doctor to create a treatment plan that is right for you.

- **Symptoms:**

Gestational diabetes often does not cause any noticeable symptoms. However, some women may experience increased thirst, frequent urination, and fatigue.

- **Causes:**

The exact cause of gestational diabetes is not fully understood, but it is believed to be related to the hormonal changes that occur during pregnancy. During pregnancy, the placenta produces hormones that can make the body more resistant to insulin. In some women, the pancreas is unable to produce enough insulin to overcome this resistance, leading to high blood sugar levels and gestational diabetes.

- **Risk factors:**

Some of the known risk factors for gestational diabetes include:

1. Age: Women over the age of 25 are at a higher risk for gestational diabetes.

2. Family history: Having a family history of diabetes increases the risk of gestational diabetes.

3. Obesity: Being overweight or obese increases the risk of gestational diabetes.

4. Previous history of gestational diabetes: Women who have had gestational diabetes in a previous pregnancy are at a higher risk of developing it again.

- **Complications:**

If left untreated, gestational diabetes can lead to complications for both the mother and the baby. These complications may include high blood pressure, pre-eclampsia, premature birth, and increased risk of cesarean delivery. Babies born to mothers with gestational diabetes may be at risk for jaundice, breathing problems, and low blood sugar.

- **Treatment:**

The treatment for gestational diabetes typically involves a combination of lifestyle modifications and monitoring blood sugar levels. Lifestyle modifications may include a healthy diet that is low in carbohydrates and sugars and regular physical activity. Women with gestational diabetes may also need to monitor their blood sugar levels several times a day and may require insulin therapy or other medications to help regulate blood sugar levels.

Gestational diabetes is a type of diabetes that occurs during pregnancy and requires careful management to ensure the health of both the mother and the baby. With proper treatment and management, most women with gestational diabetes are able to deliver healthy babies and recover fully after childbirth.

If you have diabetes, it is important to work with your doctor to manage your blood sugar levels and prevent complications. Controlling your blood sugar levels can help reduce your risk of developing or worsening these complications.

- **Prevention of diabetes:**

There is no sure way to prevent diabetes, but there are things you can do to reduce your risk of developing the disease. These include:

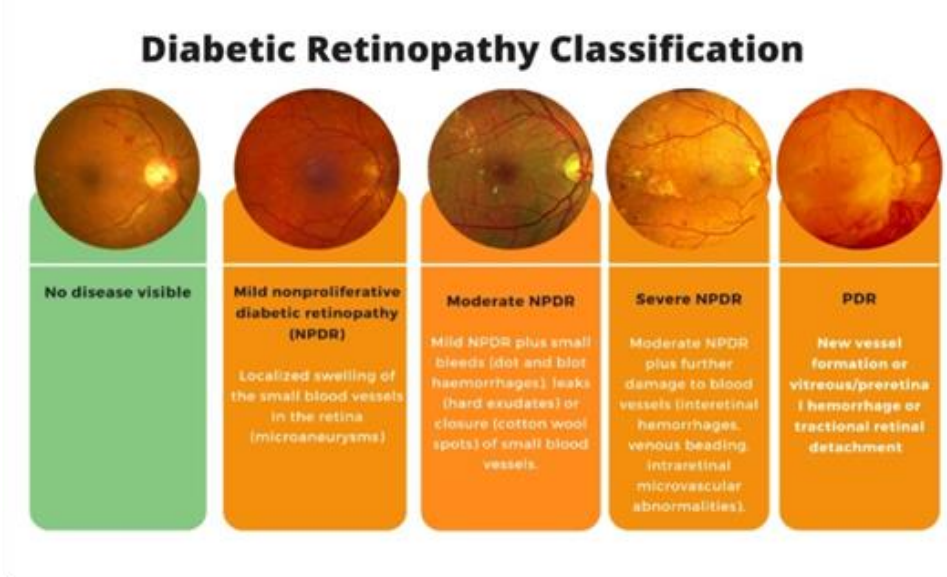
- Maintaining a healthy weight
- Eating a healthy diet
- Getting regular exercise
- Not smoking
- If you have a family history of diabetes, talk to your doctor about getting tested.

## Diabetic retinopathy

DR is the most common microvascular complication in diabetic patients and the leading global cause of vision loss in working middle-aged adults.[21], [22] The propensity of developing DR is directly proportional to the age of the patient and duration of diabetes as well as with poor glycemic control and hypertension.

DR can be classified clinically into non-proliferative (NPDR) and proliferative (PDR) forms, according to the presence or absence of retinal neovascularization, and it can present with or without macular edema (DME).[20]

figure (1 ) classification of diabetic retinopathy.



**Mechanisms of Diabetic Retinopathy Subtypes:**

NPDR represents the early stage of DR, with increased vascular permeability and capillary occlusion being the two main observations in retinal vasculature. Based on the severity of retinal vascular lesions, NPDR is categorized into mild, moderate, and severe forms. Lesions vary from microaneurysms , dot and blot hemorrhages, hard exudates, and cotton wool spots to venous beading and intra-retinal microvascular abnormalities (IRMAs).[21],[22] PDR represents a more advanced stage of DR characterized by the presence of neovascularization. The new abnormal vessels may bleed into the vitreous or cause a tractional retinal detachment, severely impairing vision.[23] DME is characterized by thickening of the macula due to the accumulation of fluid within 500 µm of the center of the macula and it can occur at any stage of DR. [24] In patients with type I diabetes, PDR is the most prevalent vision-threatening condition. However, the most common cause of vision loss in type II diabetes patients is DME.[25]

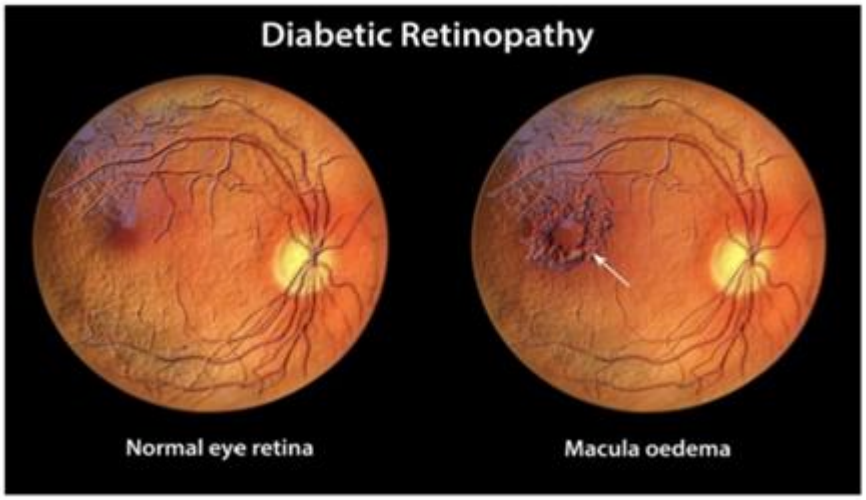
**NPDR**

Hyperglycemia results in damage to retinal capillaries through the formation of advanced glycation endproducts (AGEs). The resulting endothelial damage compromises capillary walls and results in microaneurysms. Microaneurysms consequently rupture to form hemorrhages deep in the retina, appearing as "dots" on retinal examination, more commonly known as dot and blot hemorrhages.[21] The fundamental pathologic process involved in capillary occlusion is believed to be the result of an activated leukocyte adhering to and damaging the retinal capillary wall, which results in eventual capillary occlusion.[26] This obstruction can cause infarction of the nerve fiber layer, resulting in cotton-wool spots.

**DME**

Inflammatory cytokines are significantly up-regulated in diabetes, and as a result, chronic inflammation and endothelial damage lead to increased vascular permeability of blood vessels.[27] The pathologic process involved in DME is the resultant fluid leaking into the retina and depositing under the macula. Sediment left behind from this edema leads to waxy, yellow lipid byproducts referred to as hard exudates.[21] Macular edema can occur in NPDR, but it is more common in more severe cases of DR where the increased vascular permeability is more advanced.[28]

Figure (2 ) Normal eye retina VS macular edema

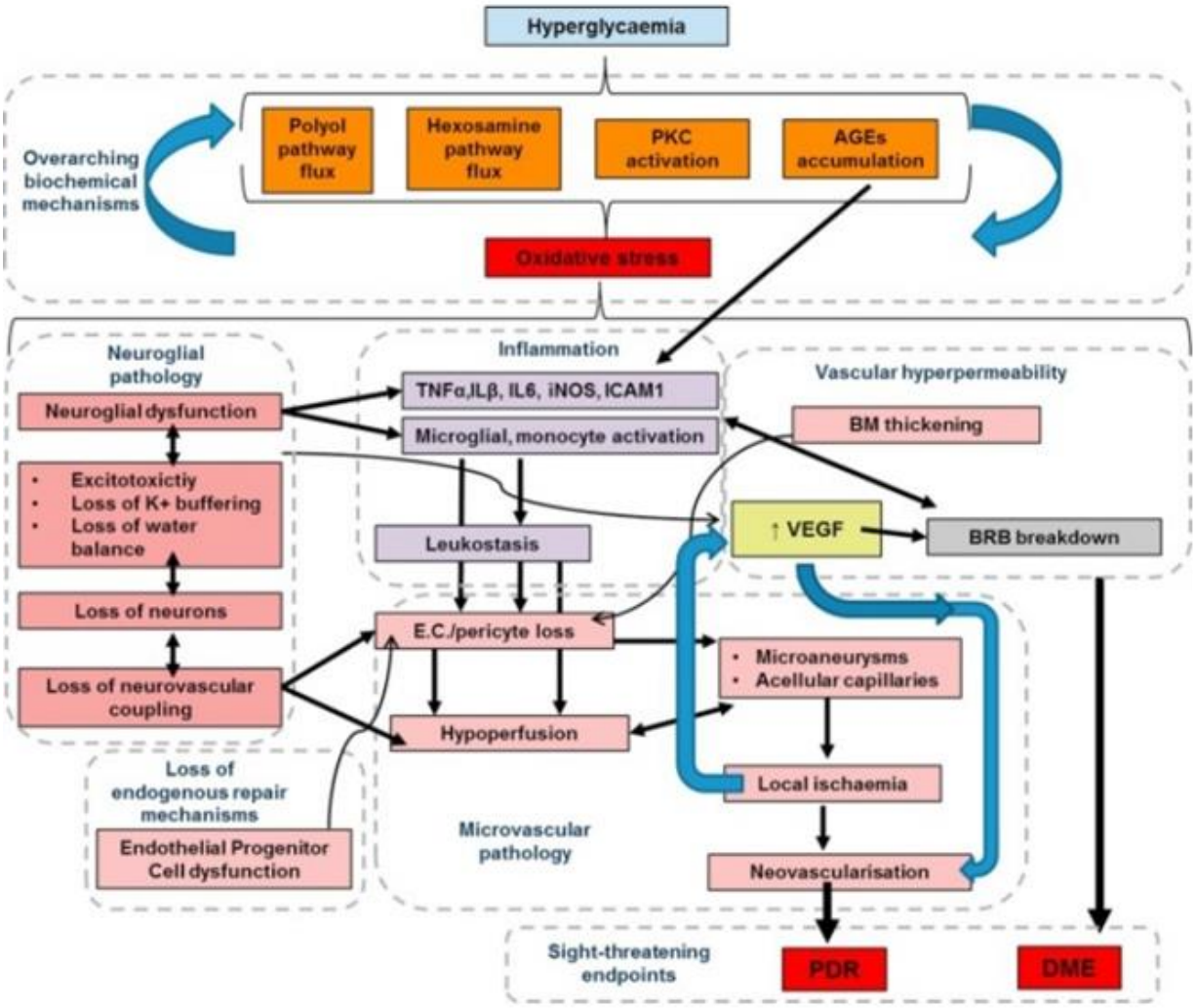



**PDR**

Continued ischemia stimulates retinal cells to release pro-angiogenic factors such as VEGF. Such factors stimulate neovascularization to bypass damaged retinal blood vessels. The formation of new blood vessels occurs from existing capillaries as a result of angiogenesis. These blood vessels usually arise in the interface between perfused and non-perfused areas of the retina in retinal neovascularization.[29] They can also originate from the optic disk or iris (neovascularization of the disk/iris). These new vessels are extremely immature, fragile, permeable and bleed very easily, originating severe complications such as vitreous hemorrhage or tractional retinal detachment.[23]

## Pathological Processes

Figure (3 ) pathology of diabetic retinopathy.




1_Hyperglycemia and the regulation of metabolic pathways:

Chronic hyperglycemia is the key promotor for the development and progression of DR due to its tissue-damaging effects, as described in the UKPDS[30] and DCCT[31] trials. However, genetic factors may play a role in individual susceptibility to those effects and other clinical factors like hypertension, dyslipidemia and pregnancy have also been implicated.[21] [22][32]

Hyperglycemia leads to the activation of alternative pathways of glucose metabolism[20] such as the polyol pathway, advanced glycation endproducts (AGEs) formation, protein kinase C (PKC) activation, hexosamine pathway flux and Poly(ADP-ribose) polymerase activation.[34] The end result of these pathways is the activation of cytokines and growth factors, leading to vascular endothelial dysfunction, increased vascular permeability, and eventual microvascular occlusion.[20] Microvascular occlusion then leads to retinal ischemia, which promotes neovascularization and the formation of IRMAs.[20]

2_The Polyol Pathway:

Excess glucose is metabolized via the polyol pathway to sorbitol.[34] Sorbitol is impermeable to cellular membranes, accumulating inside the cell and inducing osmotic damage.[35], [36] It can also be metabolized to fructose and subsequently to fructose-3-phosphate and deoxyglucosone, both of which are strong glycolyzing agents and lead to the deposition of AGEs.[34] In addition, upregulation of the polyol pathway results in a reduced availability of NADPH, thereby enhancing the sensitivity of affected cells to oxidative stress.[37]

3_AGEs Formation:

Due to the high availability of glucose, AGEs formation is markedly increased in diabetic patients.[38] AGEs have the capacity to cross-link proteins which alters their structure and function, affecting basement membranes, cellular receptors, and blood vessel wall components. Moreover, AGEs receptors activation induces prooxidant and pro-inflammatory cascades, thus exacerbating oxidative stress and leukocyte adhesion.[39] The accumulation of AGEs has also been correlated to pericyte loss.[40]

4_PKC Activation:

An increase in glycolysis activity also occurs during hyperglycemic episodes, elevating the synthesis of diacylglycerol (DAG) which in turn activates the PKC pathway.[41] PKC activates the mitogen-activated protein kinase (MAPK) factors, leading to enhanced expression of stress-related proteins and mediators of vascular function such as c-Jun kinases and heat shock proteins.[42] In particular, the PKC-β isoform increases VEGF expression.[43] PKC activation also drives over-expression of NADPH oxidase and NFκB in vascular cells, exacerbating oxidative stress and inflammation.[44]

5_Hexosamine Pathway Flux:

In the hexosamine pathway, fructose-6-phosphate (F6P) is converted into uridine-5-diphospho-N-acetylgalactosamine (UDP-GlcNAc).[45] O-GlcNAc transferase (OGT) catalyzes the addition of GlcNAc to serine and threonine residues at phosphorylation sites on SP1, upregulating its transcriptional activity and consequently the expression of transforming growth factor beta (TGFβ) and plasminogen activator inhibitor-1 (PAI-1) in vascular cells.[46] The glycosylation of RNA polymerase-II transcription factors by OGT and UDP-GlcNAc affects the expression of multiple factors involved in DR pathophysiology, representing a key regulatory mechanism of glucose-responsive gene transcription.[47]

6_Poly(ADP-Ribose) Polymerase Activation:

Hyperglycemia-induced oxidative stress correlates to increased poly(ADP-ribose) polymerase (PARP) activation. The formation of ROS leads to NAD+ depletion and inhibition of glyceraldehyde phosphate dehydrogenase (GAPDH) through the depletion of the enzyme's catalytic cofactor and PARP-mediated ribosylation. In conjunction, these molecular mechanisms contribute to DNA damage and endothelial cell dysfunction in diabetic blood vessels.[48][49]

8_Inflammation:

Increasing evidence points to inflammation as a key factor in the pathogenesis of DR, although the exact molecular mechanisms are not well understood. The simultaneous course of multiple metabolic pathways, such as oxidative stress, AGEs, and increased VEGF expression all likely contribute to the inflammatory response.[51] Chronic low-grade inflammation is a key driver of capillary occlusion and hypoxia that reinforces VEGF expression and concomitant hallmark vascular abnormalities of DR.

Inflammatory cytokines such as tumor necrosis factor alpha (TNF-α), interleukin 6 (IL-6), IL-8 and IL-1 were significantly up-regulated in diabetic patients, and their expression level is correlated with the severity of DR.[52] [53] Leukostasis has been associated with occlusion of retinal microvasculature and is correlated with endothelium damage and BRB impairment in diabetic rats, contributing to endothelial cell loss and breakdown of BRB.[54] [55]

Retinal glial cell dysfunction is also presumed to be involved in inflammation in DR. Under hyperglycemic stress, microglia activation increases secretion of TNF-α, IL-6, MCP-1 and VEGF.[56] Numerous studies show that inflammation inhibition by using anti-inflammatory drugs such as intravitreal triamcinolone acetonide and NSAIDs like nepafenac reduces VEGF expression and vascular permeability, inhibits retinal cell death, diminishes leukostasis, and ultimately improves visual acuity.[57] [58] [59]

9_Vascular abnormalities and angiogenesis pathways:

Hyperglycemia causes pericyte loss, apoptosis of endothelial cells and thickening of the basement membrane, which collectively contribute to the impairment of the BRB.[60] Since pericytes are responsible for providing structural support for capillaries, their loss leads to microaneurysm formation.[61] Furthermore, pronounced loss of pericytes and endothelial cells results in capillary occlusion and ischemia. Retinal ischemia/hypoxia leads to upregulation of VEGF through activation of hypoxia-inducible factor 1 (HIF-1).[62]

10_Retinal neurodegeneration:

Neural retina cells are also affected in DR pathophysiology. In fact, retinal neurodegeneration is an early event during the progression of DR that may even precede vascular apoptosis. Upregulation of pro-apoptotic molecules has been detected in retinal neurons in diabetic animals and humans.[63] [64] [65] Oxidative stress seems to be involved in the activation of these pathways.[66] Pro-apoptotic mitochondrial proteins such as cytochrome c and apoptosis-inducing factor (AIF) were also found to be significantly increased, implicating mitochondrial dysfunction in retinal degeneration [65]In diabetic patients, inner retinal thinning was detected with no DR or minimal DR.[67][68] This highlights the sensitivity of neuronal cell types to apoptotic stimuli such as oxidative stress and mitochondrial dysfunction. Therefore, neuroprotective agents may play a role in preventing retinal neurodegeneration in early stages of DR.[69] Neuronal and vascular cells interact with each other to regulate blood flow in the retina via an autonomic independent mechanism. New evidence shows that this interaction is uncoupled in DR .[70]

## Risk factor of diabetic retinopathy:

**Non-modifiable risk factors:**

1-Duration of diabetes

Cohort studies found that almost all patients with T1DM develop some degree of retinopathy in long duration of the disease.

2-puberty & pregnancy

Puberty is a well-known risk factor for DR in T1DM, but it is disease exposure during puberty due to rapid development and maturation of body, that has greater impact on the risk of DR, the onset of diabetes during puberty or post-pubertal age increases risk of sever retinopathy that requires laser treatment by 30 %. During

pregnancy DR can progress rapidly especially in mothers with T1DM by almost 3 times than that in mothers with T2DM (31.3 % vs. 11.7 %, P = 0, 001). Possible theories behind the rapid progression of DR during pregnancy include both hormonal and immune theories. During postpartum period 29 % would have DR regression, while during pregnancy 47% are at much higher risk of DR progression and 50% of those require laser treatment.

**Modifiable risk factors :**

Figure(4 ) modifiable Risk factors of DR


1-Hyperglycemia:

It is one of the most important risk factors for DR. The United kingdom Prospective Diabetes study ( UKPDS ) and the Diabetes Control and Complications Trial ( DCCT ) provided strong evidence that tight control of glycemia (HbA1c < 7 %) will reduce the risk of development and progression of DR in both T1DM and T2DM . Intensive glycemic control is associated with 76 % reduction in incidence of DR and 54 % reduction in progression of the disease, thus strict glycemic control is effective in delaying the onset of DR and limiting the severity of DR after it has occurred.

A decreased in every 1% HbA1c will cause reduction in 40 % of retinopathy, 25 % in need for retinal laser and 15 % of blindness.

2 – Hypertension:

Tight BP control ( BP < 150/ 85mmHg ) in patient with T2DM reduced the risk by 37 % & the rate of progression by 34 % and the rate of vision deterioration by 47 %. A decrease in every 10 mmHg will cause reduction in 35 % of retinopathy, 35 % need for retinal laser and 50 % of blindness.

3 – Hyperlipidemia:

Various studies have reported inconsistent results on the effect of lipid on the development and progression of DR and DME. DCCT showed that the severity of DR correlated positively with increasing triglycerides and inversely with high-density lipoprotein (HDL) in T1DM. However, there was no association between total cholesterol and DR shown in the Multi-Ethnic Study of Atherosclerosis (MESA) and the Chennai Urban Rural Epidemiology Study (CURES) Eye Study. Of the subset in the lipid panel, triglycerides were shown to be related to the presence of DR and the low-density lipoprotein was related to DME. In Sankara Nethralaya-Diabetic Retinopathy Epidemiology and Molecular Genetic Study (SN-DREAMS), high serum low-density lipoprotein (OR: 2.72), high non-high density lipoprotein cholesterol (OR: 1.99) and high cholesterol ratio (OR: 3.08) were related to DME.

3-Obesity:

There is a strong link between obesity and diabetes. Those with class 3 obesity (body mass index >40) have a 5 times higher chance of developing diabetes than normal weight individuals. [71]. Increased body mass index has been linked to an increased risk of diabetic retinopathy. [72]However, not all studies have confirmed an increased risk of diabetic retinopathy in obese diabetics or those with a higher body mass index. Some studies have even found the reverse to be true, that body mass index and obesity have a protective effect .There has been suggestion that the link between body mass index and diabetic retinopathy may be clouded by inclusion of those with DM type 1 or juvenile diabetes, who likely have a different metabolic risk profile . The waist-to-hip ratio has been identified as a marker for abdominal obesity and has been linked to significantly higher rates of diabetic retinopathy. In one study, those in the highest tertile of waist-to-hip ratio had 40 times the risk of developing diabetic retinopathy. Interestingly, even increased neck and waist circumference have been linked to both increased risk of and higher severity of diabetic retinopathy. [73]

4-Nephropathy:

In multi-centric studies the coincidence of nephropathy and diabetic retinopathy in both type 1 and type 2 diabetes was observed. Diabetic retinopathy may be the most common microvascular complication of diabetes, preceding nephropathy [74].

5-Sleep apnea syndrome:

In diabetic patients suffering from this syndrome, diabetic retinopathy and macular edema can get worse. [75].

## Investigation of diabetic retinopathy:

## Diagnosis:

After pupil dilation, the fundus can be seen with direct and indirect ophthalmoscopy, but retinal detail is best visualized with triple-mirror contact lens slit-lamp biomicroscopy and also allows the anatomical relationship between the posterior hyaloid and the retinal surface to be assessed.

Areas of retinal ischemia are difficult to distinguish with biomicroscopy alone; they are usually pale in color, intersected by white vessels and located in the middle of the periphery. FAG highlights the area of hypofluorescence of capillary and neovascular bundles, showing early perfusion and leaks in subsequent frames.The new vessel wall, which is composed of basement membrane tubes lined with endothelial cells without tight junctions, easily fluorescein-crossed. The accumulation of fluid in the central retinal tissue causes macular edema. The patient reported decreased central visual acuity, probably related to disfigurement.

Diagnosis is established by slit-lamp examination with either non-contact (Volk) or contact lenses (Mainster, three-mirror). FAG, with either diffuse or circumscribed pooling of fluoresceine within intra- retinal spaces, permits elaborated definition of macular edema. Retinal thickening will even be documented by stereoscopic fundus photography. Though not necessary for diagnosis, FAG identifies leaky vascular abnormalities accountable for fluid accumulation.

Different angiographic patterns establish more and more worsening prognosis for macular edema:

●(i) A well preserved capillary network with areas of focal leakage, with or without hard exudates, usually carries a better prognosis.

●(ii) A diffuse pattern of edema with various vascular abnormalities, presumably related to hard exudates, carries a less favorable prognosis.

●(iii) Prognosis is worse once cystoid changes are identified, whether or not associated to a central cavity (complete or incomplete cystoid macular edema).

●(iv) Prognosis is at its worst once edema is related to ischemic damage effect of the capillary bed.

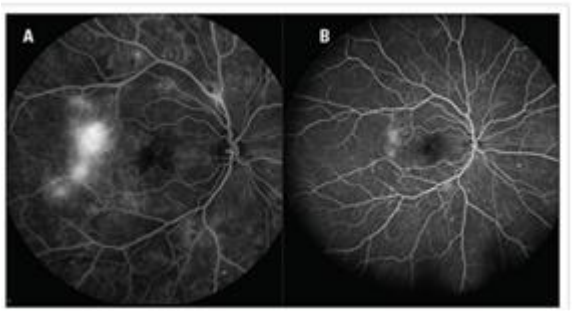
Ischemic maculopathy is characterized by basically multiplying of the foveal avascular zone.

Ophthalmic intelligibility tomography (OCT) : is a significant auxiliary test to evaluate liquid aggregation and characterize distinctive edema pattern and morphologies inside the retina.

OCT additionally permits to perceive tractional edema by showing the relation between retina and posterior hyaloid. Biomicroscopic assessment for recognizing iris new vessels must to be done previous to pupil dilatation.

In the event of uncertainty, assessment of the anterior chamber angle (ACA) and FAG of the iris vessels can help, as they are higher in sensitivity and specificity than those of biomicroscopy.

Fluorescein angiography : is also helpful when cataract or vitreous haemorrhage are present as they prevent retinal examination, if iris new vessels are detected, PDR is highly likely to coexist.[76]




Figure(5) Compared with 55° fluorescein angiography (A), widefield fluorescein angiography (B) provides a more accurate assessment of the extent of proliferative diabetic retinopathy in this patient.

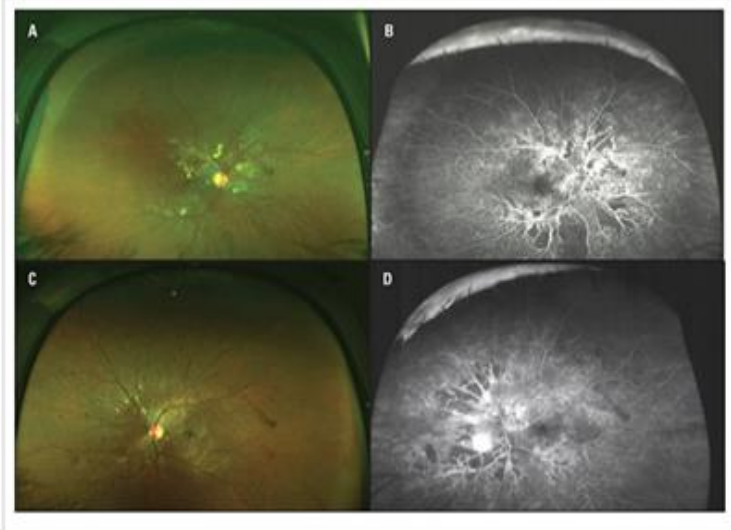



Figure (6) The peripheral retinal exam is critical to predicting which patients are likely to experience progression of diabetic retinopathy. In the right (A,B) and left (C,D)

eyes of this patient, widefield color fundus photographs and widefield fluorescein angiography show proliferative diabetic retinopathy with ischemia, capillary dropout, and neovascularization elsewhere beyond the posterior pole.

**Prevention And Management Of Diabetic Retinopathy:**

**Prevention :**

Patients with diabetes frequently ask, “Is there anything I can do to stay from getting diabetic retinopathy or to stop or treat vision loss once it occurs?”

If you've got diabetes, the National Eye Institute suggests that you simply keep your health on TRACK:

• Take your medicines as prescribed by your doctor.

• Reach and maintain a healthy weight.

• Add physical activity to your day.

• Control your ABCs—A1C, vital sign , and cholesterol.

• Kick the smoking habit.

Regular dilated eye exams reduce the danger of developing more severe complications from the disease.

It is extremely important for diabetic patients to take care of the attention examination schedule put in situ by the retina specialist. How often an examination is required depends on the severity of your disease. Through early detection, the retina specialist can begin a treatment regimen to assist prevent vision loss in most patients and preserve the activities you most enjoy.

**Management:**

1) **Medical Treatment:**
   A) Glycemic Control:

      The Diabetes Control and Complications Trial (DCCT) investigated the effect of hyperglycemia in type 1 diabetic patients, also because the incidence of diabetic retinopathy, nephropathy, and neuropathy.

      A total of 1,441 patients who had either no retinopathy at baseline (primary prevention cohort) or minimal-to-moderate NPDR (secondary progression cohort) were treated by either conventional treatment (one or two daily injections of insulin) or intensive diabetes management with three or more daily insulin injections or continuous subcutaneous insulin

infusion. Within the primary prevention cohort, the cumulative incidence of progression in retinopathy over the first 36 months was quite similar between the 2 groups, by time there was a persistent decrease within the intensive group. Intensive therapy reduced the mean risk of retinopathy by 76% (95% CI 62–85).

In the secondary intervention cohort, the intensive group had a better cumulative incidence of sustained progression during the first year. However, by 36 months, the intensive group had lower risks of progression. Intensive therapy reduced the danger of progression by 54% (95% CI 39–66).

The protective effect of glycemic control has also been for confirmed patients with type 2 diabetes. The U.K. Prospective Diabetes Study (UKPDS) demonstrated that improved blood sugar control reduced the danger of developing retinopathy and nephropathy and possibly reduces neuropathy. The overall rate of microvascular complications was decreased by 25% in patients receiving intensive therapy versus conventional therapy. Epidemiological analysis of the UKPDS data showed endless relationship between the danger of microvascular complications and glycemia, such for each decimal point decrease in HbA1c (e.g., from 8 to 7%), there was a 35% reduction within the risk of microvascular complications.

B) Blood Pressure Control:

The UKPDS also investigated the influence of tight blood pressure control.

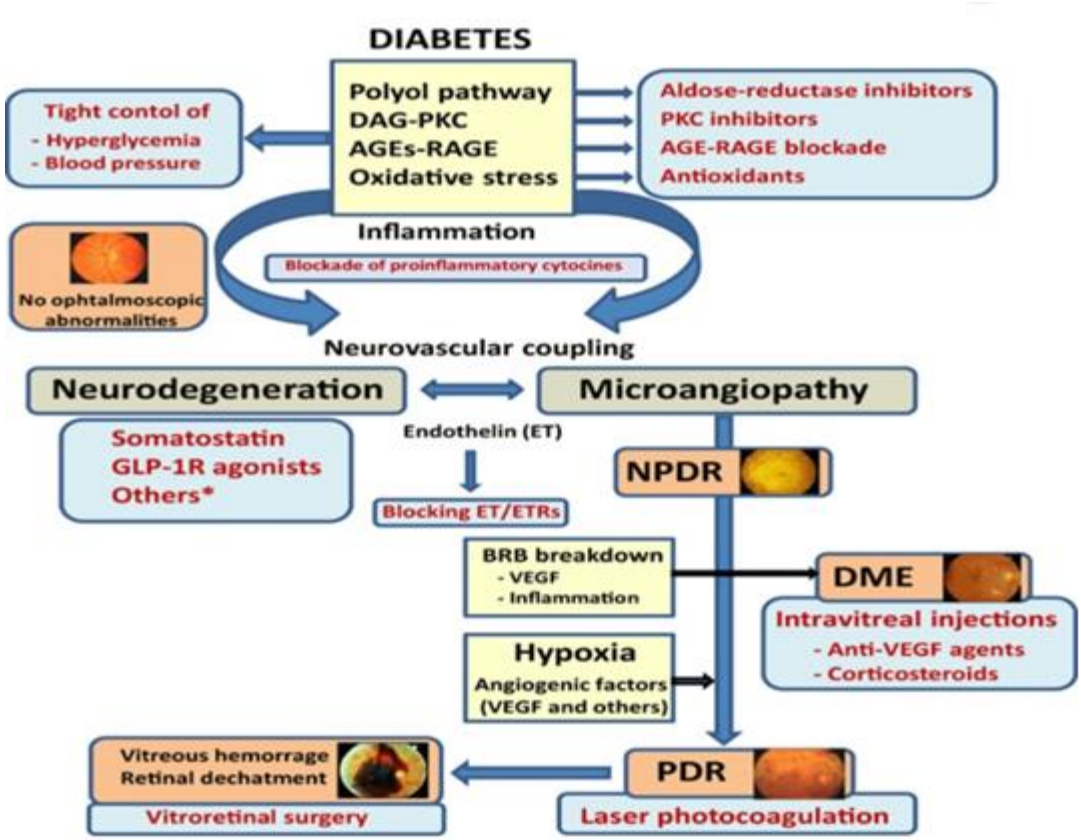
A total of 1,148 hypertensive patients with type 2 diabetes were randomized to less tight (Ↄ180/105 mmHg) and tight vital sign control (Ↄ150/85 mmHg) with the utilization of an ACE inhibitor or a -blocker. With a median follow-up of 8.4 years, patients assigned to tight control had a 34% reduction in progression of retinopathy and a 47% reduced risk of deterioration in visual acuity of three lines in association with a 10/5 mmHg reduction in blood pressure . additionally, there have been reductions in deaths associated with diabetes and strokes. [78]

**2) Laser Photocoagulation:**

The Diabetic Retinopathy Study (DRS) investigated whether scatter (panretinal) photocoagulation, compared with indefinite deferral, could reduce the danger of vision loss from PDR. After only 2 years, photocoagulation was shown to significantly reduce severe visual loss (i.e., best acuity of5/200or worse).The benefit persisted through the whole duration of follow-up and was greatest among patients whose eyes had high-

risk characteristics (HRCs; disc neovascularization or vitreous hemorrhage with any retinal neovascularization). The treatment effect was much smaller for eyes that didn't have HRCs.To determine the timing of photo-coagulation, the ETDRS examined the effect of treating eyes with mild NPDR to early PDR. The rates of visual loss were low with either treatment applied early or delayed until development of HRCs. Because of this low rate and the risk of complications, the report suggested that scatter photocoagulation be deferred in eyes with mild to moderate NPDR. The ETDRS also demonstrated the effectiveness of focal photocoagulation in eyes with macular edema. In patients with clinically significant macular edema, 24% of untreated eyes, compared with 12% of treated eyes, developed doubling of the visual angle. [ 79]

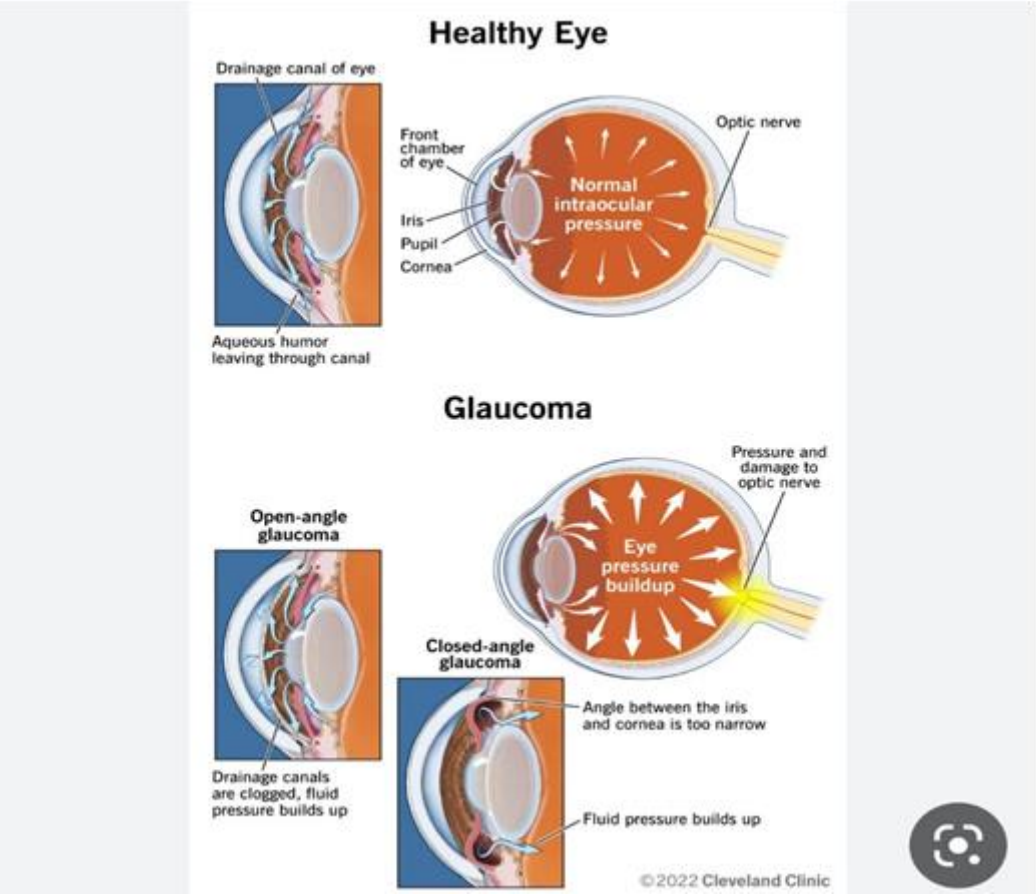
Figure (7) management of DR



# Glaucoma

Glaucoma is a group of eye diseases which result in damage to the optic nerve and vision loss.[80] The most common type is open-angle glaucoma with less common types including closed-angle glaucoma and normal-tension glaucoma. Open-angle glaucoma develops slowly over time and there is no pain. Side vision may begin to decrease followed by central vision resulting in blindness if not treated.[80] Closed-angle glaucoma can present gradually or suddenly.[81]The sudden presentation may involve severe eye pain, blurred vision, mid-dilated pupil, redness of the eye, and nausea.[80][81] Vision loss from glaucoma, once it has occurred, permanent.[80]

Figure (8 ) the different between healthy eye and glaucoma




## Risk factor for glaucoma include:

increased pressure in the eye, a family history of the condition, migraines, high blood pressure, and obesity.[80] For eye pressures a value of greater than 21 mmHg or 2.8 kPa is often used with higher pressures leading to a greater risk.[81][82] However, some may have high eye pressure for years and never develop damage.[81] Conversely, optic nerve damage may occur with normal

pressure, known as normal-tension glaucoma.[83] The mechanism of open-angle glaucoma is believed to be slow exit of aqueous humor through the trabecular meshwork while in closed-angle glaucoma the iris blocks the trabecular meshwork.[81] Diagnosis is by a dilated eye exam. Often the optic nerve shows a feature known as cupping.[80].

**Signs & symptoms:**

Open-angle glaucoma is painless and does not have acute attacks, thus the lack of clear symptoms make screening via regular eye checkups important. The only signs are gradually progressive visual field loss, and optic nerve changes (increased cup-to-disc ratio on fundoscopic examination).

About 10% of people with closed-angles present with acute angle closure characterized by sudden ocular pain, seeing halos around lights, red eye, very high intraocular pressure (>30 mmHg), nausea and vomiting, suddenly decreased vision, and a fixed, mid-dilated pupil. It is also associated with an oval pupil in some cases. Acute angle closure is an emergency.

**Causes:**

Of the several causes for glaucoma, ocular hypertension (increased pressure within the eye) is the most important risk factor in most glaucoma's patients , but in some populations, only 50% of people with primary open-angle glaucoma actually have elevated ocular pressure [84].

Open-angle glaucoma accounts for 90% of glaucoma cases in the United States. Closed-angle glaucoma accounts for less than 10% of glaucoma cases in the United States, but as many as half of glaucoma cases in other nations (particularly Asian countries)

Dietary:

No clear evidence indicates vitamin deficiencies cause glaucoma in humans. It follows, then, that oral vitamin supplementation is not a recommended treatment for glaucoma.[85] Caffeine increases intraocular pressure in those with glaucoma, but does not appear to affect normal individuals.[86]

Ethnicity:

Many people of East Asian descent are prone to developing angle closure glaucoma due to shallower anterior chamber depths, with the majority of cases of glaucoma in this population consisting of some form of angle closure.[87] Higher rates of glaucoma have also been reported for Eskimo populations, compared to white populations, in Canada and Greenland.[88]

Genetics:

Positive family history is a risk factor for glaucoma. The relative risk of having primary open-angle glaucoma (POAG) is increased about two- to four-fold for individuals who have a sibling with glaucoma.[89] Glaucoma, particularly primary open-angle glaucoma, is associated with mutations in several genes (including MYOC, ASB10, WDR36, NTF4, and TBK1 genes),[90] although most cases of glaucoma do not involve these genetic mutations. Normal-tension glaucoma, which comprises one-third of POAG, is also associated with genetic mutations (including OPA1 and OPTN genes).[91]

Various rare congenital/genetic eye malformations are associated with glaucoma. Occasionally, failure of the normal third-trimester gestational atrophy of the hyaloid canal and the tunica vasculosa lentis is associated with other anomalies. Angle closure-induced ocular hypertension and glaucomatous optic neuropathy may also occur with these anomalies,[92][93][94] ,and has been modeled in mice.[95]

Other:

Other factors can cause glaucoma, known as "secondary glaucoma", including prolonged use of steroids (steroid-induced glaucoma); conditions that severely restrict blood flow to the eye, such as severe diabetic retinopathy and central retinal vein occlusion(neovascular glaucoma); ocular trauma (angle-recession glaucoma); and uveitis (uveitic glaucoma).

**Screening:**

The United States Preventive Services Task Force as of 2013 states there is insufficient evidence to recommend for or against screening for glaucoma.[96] Therefore, there is no national screening program in the US. Screening however is recommended starting at age 40 by the American Academy of Ophthalmology.[81] There is a glaucoma screening program in the UK. Those at risk are advised to have a dilated eye examination at least once a year.

## Diagnosis:

Diagnosis is usually based on repeated complete blood counts and a bone marrow examination following observations of the symptoms. Sometimes, blood tests may not show that a person has leukemia, especially in the early stages of the disease or during remission. A lymph node biopsy can be performed to diagnose certain types of leukemia in certain situations. Following diagnosis, blood chemistry tests can be used to determine the degree of liver and kidney damage or the effects of chemotherapy on the patient. When concerns arise about other damage due to leukemia, doctors may use an X-ray, MRI, or ultrasound. These can potentially view leukemia's effects on such body parts as bones (X-ray), the brain

(MRI), or the kidneys, spleen, and liver (ultrasound). Finally, CT scans are used to check lymph nodes in the chest, though this is rarely done. Despite the use of these methods to diagnose whether or not a patient has leukemia, many people have not been diagnosed because many of the symptoms are vague, non-specific, and can refer to other diseases. For this reason, the American Cancer Society estimates that at least one-fifth of the people with leukemia have not yet been diagnosed.[97]

## Treatment:

The modern goals of glaucoma management are to avoid glaucomatous damage and nerve damage, and preserve visual field and total quality of life for patients, with minimal side effects.[98][99] This requires appropriate diagnostic techniques and follow-up examinations, and judicious selection of treatments for the individual patient. Although intraocular pressure is only one of the major risk factors for glaucoma, lowering it via various pharmaceuticals and/or surgical techniques is currently the mainstay of glaucoma treatment. Vascular flow and neurodegenerative theories of glaucomatous optic neuropathy have prompted studies on various neuroprotective therapeutic strategies, including nutritional compounds, some of which may be regarded by clinicians as safe for use now, while others are on trial.

## Medication:

Glaucoma medication

Intraocular pressure can be lowered with medication, usually eye drops. Several classes of medications are used to treat glaucoma, with several medications in each class. Each of these medicines may have local and systemic side effects. Adherence to medication protocol can be confusing and expensive; if side effects occur, the patient must be willing either to tolerate them, or to communicate with the treating physician to improve the drug regimen. Initially, glaucoma drops may reasonably be started in either one or in both eyes.[100]

Poor compliance with medications and follow-up visits is a major reason for vision loss in glaucoma patients. A 2003 study of patients in an HMO found half failed to fill their prescriptions the first time, and one-fourth failed to refill their prescriptions a second time.[101] Patient education and communication must be ongoing to sustain successful treatment plans for this lifelong disease with no early symptoms. The possible neuroprotective effects of various topical and systemic medications are also being investigated.[102][103][104][105]

Prostaglandin analogs, such as latanoprost, bimatoprost and travoprost, increase uveoscleral outflow of aqueous humor. Bimatoprost also increases trabecular outflow. Topical beta-adrenergic receptor antagonists, such as timolol, levobunolol, and betaxolol, decrease aqueous humor production by the epithelium

of the ciliary body. Alpha2-adrenergic agonists, such as brimonidineand apraclonidine, work by a dual mechanism, decreasing aqueous humor production and increasing uveoscleral outflow. Less-selective alpha agonists, such as epinephrine, decrease aqueous humor production through vasoconstriction of ciliary body blood vessels, useful only in open-angle glaucoma. Epinephrine's mydriatic effect, however, renders it unsuitable for closed-angle glaucoma due to further narrowing of the uveoscleral outflow (i.e. further closure of trabecular meshwork, which is responsible for absorption of aqueous humor). Miotic agents (parasympathomimetics), such as pilocarpine, work by contraction of the ciliary muscle, opening the trabecular meshwork and allowing increased outflow of the aqueous humour. Echothiophate, an acetylcholinesterase inhibitor, is used in chronic glaucoma. Carbonic anhydrase inhibitors, such as dorzolamide, brinzolamide, and acetazolamide, lower secretion of aqueous humor by inhibiting carbonic anhydrase in the ciliary body.

**Laser:**

Argon laser trabeculoplasty (ALT) may be used to treat open-angle glaucoma. It is a temporary solution, not a cure. A 50-µm argon laser spot is aimed at the trabecular meshwork to stimulate opening of the mesh to allow more outflow of aqueous fluid. Usually, half of the angle is treated at a time. Traditional laser trabeculoplasty uses a thermal argon laser in an argon laser trabeculoplasty procedure. A newer type of laser trabeculoplasty uses a "cold" (nonthermal) laser to stimulate drainage in the trabecular meshwork. This newer procedure, selective laser trabeculoplasty (SLT), uses a 532-nm, frequency-doubled, Q-switched Nd:YAG laser, which selectively targets melanin pigment in the trabecular meshwork cells. Studies show SLT is as effective as ALT at lowering eye pressure. In addition, SLT may be repeated three to four times, whereas ALT can usually be repeated only once. Nd:YAG laser peripheral iridotomy (LPI) may be used in patients susceptible to or affected by angle closure glaucoma or pigment dispersion syndrome. During laser iridotomy, laser energy is used to make a small, full-thickness opening in the iris to equalize the pressure between the front and back of the iris, thus correcting any abnormal bulging of the iris. In people with narrow angles, this can uncover the trabecular meshwork. In some cases of intermittent or short-term angle closure, this may lower the eye pressure. Laser iridotomy reduces the risk of developing an attack of acute angle closure. In most cases, it also reduces the risk of developing chronic angle closure or of adhesions of the iris to the trabecular meshwork. Diode laser cycloablation lowers IOP by reducing aqueous secretion by destroying secretory ciliary epithelium.[106]

Both laser and conventional surgeries are performed to treat glaucoma. Surgery is the primary therapy for those with congenital glaucoma.[107] Generally, these operations are a temporary solution, as there is not yet a cure for glaucoma.

**Canaloplasty:**

Canaloplasty is a nonpenetrating procedure using microcatheter technology. To perform a canaloplasty, an incision is made into the eye to gain access to the Schlemm's canal in a similar fashion to a viscocanalostomy. A microcatheter will circumnavigate the canal around the iris, enlarging the main drainage channel and its smaller collector channels through the injection of a sterile, gel-like material called viscoelastic. The catheter is then removed and a suture is placed within the canal and tightened. By opening the canal, the pressure inside the eye may be relieved, although the reason is unclear, since the canal (of Schlemm) does not have any significant fluid resistance in glaucoma or healthy eyes. Long-term results are not available.[108][109]

**Trabeculectomy:**

The most common conventional surgery performed for glaucoma is the trabeculectomy. Here, a partial thickness flap is made in the scleral wall of the eye, and a window opening is made under the flap to remove a portion of the trabecular meshwork. The scleral flap is then sutured loosely back in place to allow fluid to flow out of the eye through this opening, resulting in lowered intraocular pressure and the formation of a bleb or fluid bubble on the surface of the eye. Scarring can occur around or over the flap opening, causing it to become less effective or lose effectiveness altogether. Traditionally, chemotherapeutic adjuvants, such as mitomycin C(MMC, 0.5–0.2 mg/ml) or 5-fluorouracil (5-FU, 50 mg/ml), are applied with soaked sponges on the wound bed to prevent filtering blebs from scarring by inhibiting fibroblast proliferation. Contemporary alternatives include the sole or combinative implementation of nonchemotherapeutic adjuvants, such as collagen matrix implant[110][111][112][113] or other biodegradable spacers, to prevent super scarring by randomization and modulation of fibroblast proliferation in addition to the mechanical prevention of wound contraction and adhesion.

**Glaucoma drainage implants ; Glaucoma valve:**

Professor Anthony Molteno developed the first glaucoma drainage implant, in Cape Town in 1966.[114]Since then, several types of implants have followed on from the original, the Baerveldt tube shunt, or the valved implants, such as the Ahmed glaucoma valve implant or the ExPress Mini Shunt and the later generation pressure ridge Molteno implants. These are indicated for glaucoma patients not responding to

maximal medical therapy, with previous failed guarded filtering surgery (trabeculectomy). The flow tube is inserted into the anterior chamber of the eye, and the plate is implanted underneath the conjunctiva to allow flow of aqueous fluid out of the eye into a chamber called a bleb. The first-generation Molteno and other nonvalved implants sometimes require the ligation of the tube until the bleb formed is mildly fibrosed and water-tight.[115] This is done to reduce postoperative hypotony—sudden drops in postoperative intraocular pressure. Valved implants, such as the Ahmed glaucoma valve, attempt to control postoperative hypotony by using a mechanical valve. Ab interno implants, such as the Xen Gel Stent, are transscleral implants by an ab interno procedure to channel aqueous humor into the non-dissected Tenon's space, creating a subconjunctival drainage area similar to a bleb.[116],[117] The implants are transscleral and different from more other ab interno implants that do not create a transscleral drainage, such as iStent, CyPass, or Hydrus.[118]

The ongoing scarring over the conjunctival dissipation segment of the shunt may become too thick for the aqueous humor to filter through. This may require preventive measures using antifibrotic medications, such as 5-fluorouracil or mitomycin-C(during the procedure), or other nonantifibrotic medication methods, such as collagen matrix implant,[119][120] or biodegradable spacer, or later on create a necessity for revision surgery with the sole or combinative use of donor patch grafts or collagen matrix implant.[121][122] And for glaucomatous painful blind eye and some cases of glaucoma, cyclocryotherapy for ciliary body ablation could be considered to be performed.[123]

**Laser-assisted nonpenetrating deep sclerectomy:**

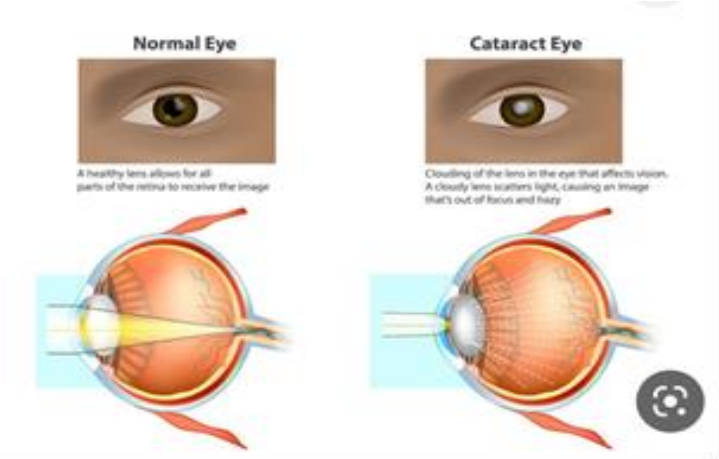
The most common surgical approach currently used for the treatment of glaucoma is trabeculectomy, in which the sclera is punctured to alleviate intraocular pressure. Nonpenetrating deep sclerectomy (NPDS) surgery is a similar, but modified, procedure, in which instead of puncturing the scleral bed and trabecular meshworkunder a scleral flap, a second deep scleral flap is created, excised, with further procedures of deroofing the Schlemm's canal, upon which, percolation of liquid from the inner eye is achieved and thus alleviating intraocular pressure, without penetrating the eye. NPDS is demonstrated to cause significantly fewer side effects than trabeculectomy. However, NPDS is performed manually and requires higher level of skills that may be assisted with instruments. In order to prevent wound adhesion after deep scleral excision and to maintain good filtering results, NPDS as with other non-penetrating procedures is sometimes performed with a variety of biocompatible spacer or devices, such as the Aquaflow collagen wick,[124] ologen Collagen Matrix,[125][126][127] or Xenoplast glaucoma implant.[128]

Laser-assisted NPDS is performed with the use of a CO2 laser system. The laser-based system is self-terminating once the required scleral thickness and adequate drainage of the intraocular fluid have been achieved. This self-regulation effect is achieved as the CO2 laser essentially stops ablating as soon as it comes in contact with the intraocular percolated liquid, which occurs as soon as the laser reaches the optimal residual intact layer thickness

## Cataract:

A cataract is a cloudy area in the lens of your eye (the clear part of the eye that helps to focus light).Cataracts can make your vision blurry, hazy, or less colorful.[129]

Figure (9 ) the different between healthy eye and cataract eye.




Cataracts form when the proteins in the lens of your eye clump together, making your lens cloudy. The lens of your eye is normally clear, letting light pass through it. The lens helps focus the light onto your retina (the light-sensitive layer of tissue in the back of your eye) so you can see things clearly. Cataracts keep you from seeing clearly because light can't easily pass through the clumps of proteins in your lens. Over time, the clumps of proteins get bigger and thicker, making it harder for you to see. Your lens may also turn yellow or brown, which can change how you see colors. After age 40, the proteins in the lens of your eye naturally start to break down. Most cataracts happen because of these natural changes. They have found some factors other than aging that make cataracts more likely, including:

- A family history of cataracts
- Diabetes
- A serious eye injury
- Eye surgery to treat glaucoma or another eye condition

- Taking steroids — medicines used to treat some health problems, like arthritis or allergies.
- Radiation treatment for cancer or other diseases.

and researchers have also found that some things make cataracts form faster, including:

- Smoking
- Drinking too much alcohol
- Spending too much time in the sun, especially without sunglasses

**Signs and symptoms of cataracts include:**

- Clouded, blurred or dim vision.
- Increasing difficulty with vision at night.
- Sensitivity to light and glare.
- Need for brighter light for reading and other activities.
- Seeing "halos" around lights.
- Frequent changes in eyeglass or contact lens prescription.
- Fading or yellowing of colors.
- Double vision in a single eye.

**Tests to diagnose cataracts:**

Specific tests you may have include:

- Slit lamp exam.
- Visual acuity test-4

❖ **Cataract types include:**

- Cataracts affecting the center of the lens (nuclear cataracts);

A nuclear cataract may at first cause more nearsightedness or even a temporary improvement in your reading vision. But with time, the lens gradually turns more densely yellow and further clouds your vision. As the cataract slowly progresses, the lens may even turn brown. Advanced yellowing or browning of the lens can lead to difficulty distinguishing between shades of color.

- Cataracts that affect the edges of the lens (cortical cataracts);

A cortical cataract begins as whitish, wedge-shaped opacities or streaks on the outer edge of the lens cortex. As it slowly progresses, the streaks extend to the center and interfere with light passing through the center of the lens.

- Cataracts that affect the back of the lens (posterior subcapsular cataracts);

A posterior subcapsular cataract starts as a small, opaque area that usually forms near the back of the lens, right in the path of light. A posterior subcapsular cataract often interferes with your reading vision, reduces your vision in bright light, and causes glare or halos around lights at night. These types of cataracts tend to progress faster than other types do.

- Cataracts you're born with (congenital cataracts);

Some people are born with cataracts or develop them during childhood. These cataracts may be genetic, or associated with an intrauterine infection or trauma. These cataracts may also be due to certain conditions, such as myotonic dystrophy, galactosemia, neurofibromatosis type 2 or rubella. Congenital cataracts don't always affect vision, but if they do, they're usually removed soon after detection.[130]. If cataracts are left untreated, they will usually worsen over time and compromise your quality of life. If left untreated for a long period of time.

- Cataracts can become “hyper-mature”;

A hyper-mature cataract is one that has become so dense that surgical removal becomes risky. Early diagnosis and surgery, if indicated, can reduce the risk, and improve your quality of life.

## Complications of cataract:

- Cataracts if left untreated can impair your vision so much that accidental injuries can occur.
- Cataracts are the number one cause of blindness in the world. Early diagnosis and removal at the right time can save your vision.
- Cataracts can increase your risk of glaucoma.

Cataracts can affect one or both eyes. Most people become aware of cataract related vision problems after the age of 60, but they can be diagnosed in younger people as well.

An eye injury or medical condition, such as diabetes or hypertension, can cause a cataract to develop [131].

## Management of cataract:

Cataract surgery is the only way to remove cataracts and restore your clear vision. During cataract surgery, an ophthalmologist removes your clouded natural lens and replaces it with an intraocular lens (IOL). An IOL is an artificial lens that permanently stays in your eye. There are many different options for IOLs that your

provider can discuss with you. The main benefit of an IOL is that it's clear — like your natural lens should be. Another benefit is that it can correct refractive errors, allowing you to rely less on glasses or contact lenses after your surgery.[132].

## Literature review

Worldly we observe a dramatic increase in the number of persons affected by diabetes ,also diabetes – associated eye diseases are rapidly emerging as a global health issue that may threaten patients' visual acuity and visual function[133]. Know the diabetic eye diseases are the major cause of blindness throughout the world, inspit of that many of diabetic patients remain unaware of their ocular condition[134]. In Francis a study showed that (42.8%) were aware that diabetes can cause blindness, and (60.3%) were aware that good diabetic control was very important[135] . However, a study in Yangon and Myanmar show that 86% were aware that diabetes could damage their eyesight, although 92% realized they should visit an ophthalmologist regularly, but only 57% had seen an ophthalmologist[136] . In South India according to study was done between 2001 and 2002 showed 84% knew that DM could affect the eye, and only 50% of them knew that routine eye checks were necessary even if DM was well controlled[137]. Another study done in Nepal concluded that nearly two-fifths of patients had no awareness that diabetes could affect the eye which could result in blindness[138].

However, in Northwest Ethiopia about 79.1% of diabetic patients were aware that diabetes can affect the eye[139].

However the awareness among some Middle East countries was as follows: in Oman, the knowledge about DM diagnosis and eye care was found to be 72.9%. and18%,

respectively, and the grade for their attitude toward eye involvement and eye care were18% and 29.9%,respectively ; 75.62% of Saudi diabetic patients were aware of the eye disorders DM can cause, 73.80% were aware of the need of a regular eye check-up, and 95% of all participants went for regular ocular examination ; in Jordan, 88.2% of the patients were aware that diabetes can affect their eyes and 81% reported that DR can lead to loss of vision, 29.5% of participants have had an ocular examination in the previous year[140] .In Syria almost all patients (93.8%) thought that DM could affect the eye. 67.3% believed that it could cause blindness. 86.9% of the patients conceived that DM patients should visit an ophthalmologist regularly. 37% did not visit any ophthalmologists at all, while 63% reported they had visited Their ophthalmologist[141].

And in Yemen we have one study which revealed that 109 patients were female and 73 were male ,distribution within age group ,22 patients were less than 40

years, 102 of patients were between 40-50 years old and 58 of patients were within 60 years old and more .This study show that there is important relationship between level of education and awareness about DM complication and ability to avoid it by control of DM ,this study revealed that patients who didn't know of complications of DM with illiteracy of education were 68%,patients with basic level of education were 42%,and patient with 2nry level of education were 41% also patients with university level were 31%.The study show that no considerable relationship between duration of disease and awareness of ocular complication of DM, this study showed 58.3% of patients diagnosed the disease for less than 10 years ,while 41.8% diagnosed there disease for more than 10years. This study show 23.6 know cataracts while 17.8% know glaucoma,57.3 know retinopathy ,79.0% of the patients award that blindness was complication of DM .This study found relation between awareness and knowledge of eye disease. The study show also that Distribution of patients according to variation related to the eyes .it was found that 78.6% had eye complication or problems .This study show also the distribution of patients according to visit eye doctor ,found that 9.3% visit eye doctor 2 to 1 per years ,4.4% 1 per year, 49.5 occasional and 67% never visit the eye doctors[142].

## JUSTIFICATION

1- In Yemen, there are few studies and shortage in researches concerning awareness about ocular manifestation among diabetic patients.

2- Awareness and knowledge about ocular manifestations and the importance of regular eye checkup among diabetic patients can delay the development visual disabilities and eye complications, and should be this research we will determine the level of awareness and its reflection effects in the community.

## AIM OF STUDY:

### General aim:

To assess the awareness, knowledge, attitude, and practice about diabetic eye diseases among diabetic patients in Sana'a city, 2022.

### Specific aims of the study:

1-This study will be calculate the percentage of awareness and knowledge, attitude and practice about diabetic eye disease among diabetic patients in Sana'a city ,2022.

2-This study will be assess the level of awareness and knowledge about diabetic eye disease among diabetic patients in Sana'a ,2022.

3-This study will be find the correlation between awareness about diabetic eye disease among diabetic patients and age ,sex ,education level and resident in Sana'a city,2022.

4- This study will be assess the association between the socio-economic background and the awareness and knowledge about diabetic eye disease among diabetic patients in Sana'a city,2022 .

# Chapter 2 :

# Materials& methodology

## METHODOLOGY :

### Study type

This study was cross section prospective hospital based, descriptive ( KAP) study in Sana'a city from 15-11-2022 to 15-12-2022 .

### Study site

In our study, we chose the main governmental hospitals in Sana'a, because the research team lives in Sana'a and is located near the hospitals in order to facilitate our work, also it has a more densely populated area and large numbers of patients come to it and provide an appropriate educational environment characterized by it, where there are special departments For medical diseases such as diabetes patients, the major government hospitals in the governorate were also chosen it they provide free services to which large numbers of patients from other governorates flock. .

Al-Thawra General Hospital is one of the largest hospitals in the capital and has special section to receive chronic diseases such as diabetes. Al-Jumhouri Hospital has a special section for eye diseases, where they are referred to internal clinics for examination and diagnosis of diabetes. Al-Kuwait Hospital receives a large number of patients and it provides free services and care, and it also has a special section for diabetes patients. .

### Study Population

Patients who attended for consultation from primary healthcare center at OPD and diagnose with type 2 diabetes for less than 5 years was included in the study, also those who have not had diabetic eye disease yet was included in the study. Patients with any systemic disorder that might hamper their cognitive functions and would prevent the patient from answering the questionnaire like poor general condition , Alzheimer's disease, senile dementia and stroke was excluded from the study, also patients who have had diabetic eye diseases and who have hypertension was excluded from the study. .

### Data Collection Method

All participants were enrolled after explaining the purpose of the study, and relevant information about the study was obtained from the participants using a questionnaire administered by the interviewer. This included but is not limited to knowledge about the complications of ocular diabetes and the attitude of patients towards the prevention of ocular complications of diabetes. Trained interviewers

provided translation services to participants who was illiterate. The average time required to administer a single questionnaire will be 10 minutes, and this was administered in the language the respondent understood. .

Patients were asked to answer a questionnaire that includes questions that was divided into five main sections: 1. Basic socio-demographic information that includes age, gender, educational level and family history of diabetes and 2. General information about the patient's knowledge of diabetic eye disease. 3.Symptoms of the disease. 4.Treatment and prevention of disease Finally, patients was asked about the severity of the disease. .

## Sampling

Was calculated by using records of the three hospitals from previous 3 months ago .by going to those hospitals and calculating the number of patients who had been diagnosed as DM that come to out patient department in previous 3 months ( May, June, July) 2022. Which were 1058 cases , then divide it by 3 , so the result will be represent the average of the cases in 1 month in each hospital which equal 352.6 ,so the total expected sample will be 355 .

## Data Entry And Analysis

The collected data was analyze by computer use statistical package of social services version 24 (SPSS), Data represented in tables and graphs, qualitative variables will show as absolute frequencies (number), and relative frequencies (percentage),percentage of change will calculate for change in knowledge, attitude and practice scores after the intervention ,it equals the change in value divided by the absolute N value of the original value multiplied by 100 suitable statistical tests of significance we send after check for normality using Kolmogorov-Smirnov and shapiro-Wilk tests. Wilcoxon signed-rank test is use fit comparison of psiref scores, and Mc Nemar test is use forvcategoricsl data, Stepwise linear regression models we will use to preduct the change in knowledge score. Post intervention, the results are consider highly statistically significant when the significant probability is less than 0.001($p<0.001$). .

Quantitative variables eg. Age, we will express as mean +- SD & (range),and categorical. .

## Ethical Consideration

Permission was taken from the director of the center, the purpose of study wad explained to the patients and data was collected after obtaining verbal consent from the patient. The research and ethics committee of the faculty Medicine and Health Sciences of 21 September university will approve this study.

# Chapter 3 :

## Results

# Results:

Number of valid questionnaires is 294.

Mode 50

Total samples taken 294 of them (135) % 45.9 males and (159) % 54.1 Female havebeen diabetes for less than ten years. Where and we started the questionnaire with a pivotal question. Have you heard the impact of diabetes on visions? So that the answer to the person yes been completed with the questionnaire. If he said no, we did not complete the questionnaire.

## 1- Age.

The average age for targeted personnel was 50.51 years. Also we found the age group between the ages of 40 to 50 years, the highest class of diabetes with 34.4%, while the age group is more than 80 years old, they are less 1.7% and this because of the age consult your doctor to home.

**Table (1) The average of the total sample.**

**Al-Thawra , Al-Jamhouri and, Al-Kuwait hospitals, Sana'a 2022**

**Statistics**

| | | |
|---|---|---|
| N | Valid | 294 |
| | Missing | 0 |
| Mean | | 50.5102 |
| Median | | 50.0000 |
| Std. Deviation | | 13.86717 |
| Range | | 86.00 |
| Minimum | | 12.00 |
| Maximum | | 98.00 |

**Age groups** :

**Table (2)age groups and percentage Frequency. Al-Thawra , Al-Jamhouri and, Al-Kuwait hospitals, Sana'a 2022.**

| **Age** | Frequency | Percent |
|---|---|---|
| less 20 | 9 | 3.1% |
| 21-30 | 12 | 4.1% |
| 31-40 | 45 | 15.3% |
| 41-50 | 101 | 34.4% |
| 51-60 | 66 | 22.4% |
| 61-70 | 41 | 13.9% |
| 71-80 | 15 | 5.1% |
| more than 80 | 5 | 1.7% |
| Total | 294 | 100.0% |

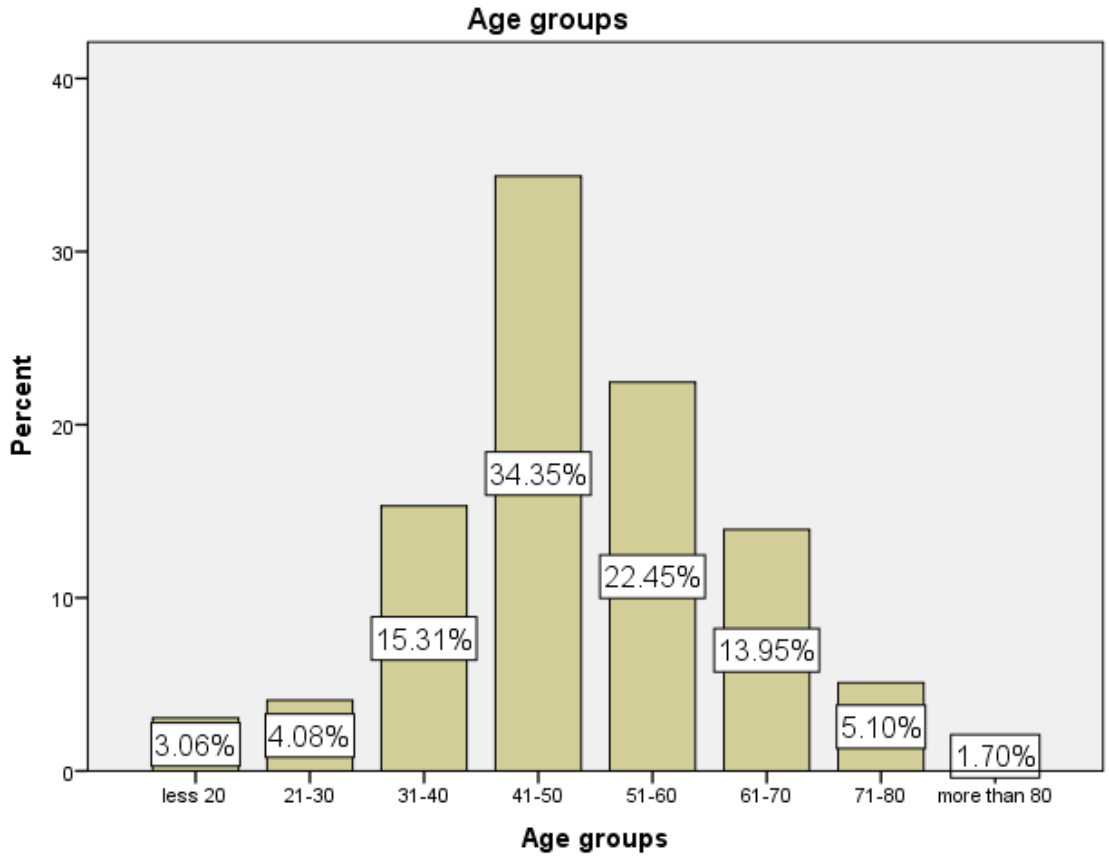



Figure (10 ) age groups and percentage Frequency.

**2-sex:**

In terms of sex, (135)45.9% of males and (159) 54.1% of females were the beginning of diabetes for less than ten years. Here we found that females more visit your doctor and attention to more than men.

**Table (3) male vs female numbers, Al-Thawra , Al-Jamhouri and, Al-Kuwait hospitals, Sana'a 2022.**

| Sex | | Frequency | Percent |
|---|---|---|---|
| Valid | male | 135 | %45.9 |
| | female | 159 | %54.1 |
| | Total | 294 | %100.0 |

### 3- Residence:

With regard to the homeland, we found that the latest hospitals in diabetes in the city is (209 ) people, suggesting that available education is also available because of its proximity to health services and educational channel scenes. While population Living in the village (85) people 28.9% and returned. This is the lack of poor education, awareness, and far of health services.

**Table (4) frequency of patients from urban and rural, , Al-Thawra , Al-Jamhouri and, Al-Kuwait hospitals, Sana'a 2022.**

| Residence | | Frequency | Percent |
|---|---|---|---|
| Valid | urban | 209 | %71.1 |
| | rural | 85 | %28.9 |
| | Total | 294 | %100.0 |

### 4- education level:

In terms of educational level, the number most uneducated by 132 was 44.9% because of the absence and weakness of the State to encourage and motivate people to read and education, we also found (52)17.7% primary educational level due to early exit from school to the labor market.

**Table (5) shows the educational level, Al-Thawra , Al-Jamhouri and, Al-Kuwait hospitals, Sana'a 2022.**

| education level | | Frequency | Percent |
|---|---|---|---|
| Valid | not educated | 132 | %44.9 |
| | primary | 52 | %17.7 |
| | preparatory | 29 | %9.9 |
| | secondary | 48 | %16.3 |
| | university | 33 | %11.2 |
| | Total | 294 | %100.0 |

## 5- Have you heard of the seriousness of diabetes on the eye?

As well as people who heard diabetes and her mandates on the eye,(221) people were at a rate of 75.2%.This is highest number of total samples because of the high diabetes in Yemen, the frequent social places and the fighting of people with each other.

**Table (6)The number of people who know the seriousness of diabetes on the eye and those who do not know, , Al-Thawra , Al-Jamhouri and, Al-Kuwait hospitals, Sana'a 2022.**

| | | Frequency | Percent |
|---|---|---|---|
| Valid | no | 67 | %22.8 |
| | I don't know | 6 | %2 |
| | yes | 221 | %75.2 |
| | Total | 294 | %100.0 |

## 6- Source to hear the informations

While (105) people were 47.51% of the source of information and guidance on complications and the effects of diabetes on the eye of doctors.( 74) people were 33.48% heard from another person infected.

Table (7)The source of the information received:

**Table (7)The source of the information received, Al-Thawra , Al-Jamhouri and, Al-Kuwait hospitals, Sana'a 2022.**

| | Frequency | Percent |
|---|---|---|
| doctor | 105 | 47.51% |
| patient | 74 | 33.48% |
| media | 22 | 9.95% |
| relatives | 37 | 16.74% |
| other | 7 | 3.17% |

## Knowledge :

### knowledge about diabetic patient for complication of diabetes mellitus on eyes among participants:

The general concepts of DM patient's about the natural of disease and it's complications upon eyes, and knowledge score was good with highest percentage 53.8% and bad for 46.2% ,and the first question was Do you think that DM may cause weakness of sight then the highest percentage was for the answer of yes by 93.7% while answer No and I do not know by 0.5% & 5.9% respectively, the second question was about Do you think that DM may cause dryness of eyes then the highest percentage was for the answer of yes by 59.7% while answer No and I do not know by 5.4% & 34.8 respectively, the third question was Do you think that DM may cause pain to eyes then the highest percentage was for the answer of yes by 60.6% while answer No and I do not know by 10% & 29.4 respectively. the fourth question was Do you think that DM may cause decrease in visual field then the highest percentage was for the answer of yes by 78.3% while answer No and I do not know by 1.4% & 20.4 respectively, the fifth question was Do you think that DM may cause flashing or blurring of vision then the highest percentage was for the answer of yes by 84.6% while answer No and I do not know by 0.9% & 14.5% respectively, the sixth question was Do you know that DM has relation with emergence of cataract and glaucoma then the highest percentage was for the answer of no and I do not know by 4.5% & 57% respectively while answer yes by 38.5% ,the seventh question was Do you think that DM may cause retinopathy then the highest percentage was for the answer of yes by 62% while answer No and I do not know by 1.8% & 36. 2% respectively, the eighth question was Do you think that DM may cause blindness then the highest percentage was for the answer of yes by 74.7% while answer No and I do not know by 3.2% & 22.2 respectively, the ninth question was do you know that retinopathy due to DM is the major cause of blindness then the highest percentage was for the answer of yes by 58.8% while answer No and I do not know by 5% & 36.2 respectively, the tenth question was is it possible that you be suffering from complication of DM without you know then the highest percentage was for the answer of yes by 74.7% while answer No and I do not know by 5.9% &19.5% respectively.

**Table (8) Knowledge of participants diabetic patients towards diabetic eye disease, Al-Thawra , Al-Jamhouri and, Al-Kuwait hospitals, Sana'a 2022.**

| Knowledge | No | | I don't know | | yes | |
|---|---|---|---|---|---|---|
| | Count | N % | Count | N % | Count | N % |
| Do you think that DM may cause weakness of sight? | 1 | 0.5% | 13 | 5.9% | 207 | 93.7% |
| Do you think that DM may cause dryness of eyes? | 12 | 5.4% | 77 | 34.8% | 132 | 59.7% |
| Do you think that DM may cause pain to eyes? | 22 | 10.0% | 65 | 29.4% | 134 | 60.6% |
| Do you think that DM may cause decrease in visual field? | 3 | 1.4% | 45 | 20.4% | 173 | 78.3% |
| Do you think that DM may cause flashing or blurring of vision? | 2 | 0.9% | 32 | 14.5% | 187 | 84.6% |
| Do you know that DM has relation with emergence of cataract and glaucoma? | 10 | 4.5% | 126 | 57.0% | 85 | 38.5% |
| Do you think that DM may cause retinopathy? | 4 | 1.8% | 80 | 36.2% | 137 | 62.0% |
| Do you think that DM may cause blindness? | 7 | 3.2% | 49 | 22.2% | 165 | 74.7% |
| do you know that retinopathy due to DM is the major cause of blindness? | 11 | 5.0% | 80 | 36.2% | 130 | 58.8% |

| | | | | | | |
|---|---|---|---|---|---|---|
| Is it possble that you be suffering from complication of DM without you know? | 13 | 5.9% | 43 | 19.5% | 165 | 74.7% |

**knowledge score:**

**Table (9) knowledge score and awareness, Al-Thawra , Al-Jamhouri and, Al-Kuwait hospitals, Sana'a 2022.**

| knowledge score | Frequency | Percent |
|---|---|---|
| bad | 102 | 46.2% |
| good | 119 | 53.8% |
| Total | 221 | 100% |

## Attitude:

Through our descent to the esoteric clinics of government hospitals (Kuwait - Al -Thawra - Republican) and asking the question to the cases (Are people who have diabetes are subject to eye diseases), so we embraced that the answers are varying from the total cases that we asked them the question, which is 221 cases and is estimated at 100 %, the answers are yes I was counted by 91.4 %, the answer was not counted by 0.9 %, and some cases were the answer. I do not know 7.7 %. From these statistics, we found that good answers from the total cases are 57.9 %, and bad answers with a rate of 42.1 % .

Likewise, the second question (Is it necessary to visit an ophthalmologist in order to examine the complications of diabetes on the eyes) We also noticed different answers. Some answered yes, I counted 88.7%, some answered no with a percentage of 2.3%, and some did not have knowledge at a rate of 9.0%, so we noticed that the majority answered yes. . We also asked them the following question (Is periodic eye examination important for detecting complications of diabetes in the eye?) Many of the cases answered yes, with a percentage of 87.8%, and in some cases their answer was 0.9%, which is the lowest percentage, and some of them did not know, so their percentage was 11.3% .There are many

good answers The lack of badness indicates awareness of diseases and their knowledge of complications, as most of the cases were the source of their knowledge from doctors. As for the third question addressed to them (Is the periodic examination of the eye important to discover the complications of diabetes on the eye), the answer rate is yes, 87.8 %, and the answer is not by 0.9 %, and some of them do not know, and this percentage is about 11.3 %and also the fourth question (do you think you need to examine the eye in a way My role when diabetes) The majority were their answers yes, and this percentage is about 81.4 %, and some were their answer, no, and they attributed them 6.3 %, and some do not know, and this percentage is about 12.2 % . As for the fifth question (Will control and control diabetes at the normal rate reduce the risk of diabetes on the eye), we noticed that most of the answers were yes and estimated at a rate of 92.3 %, and some of them were their answer, not by 0.9 %, and some do not know, and they attributed them about 6.8 % . They were also asked the following question( Have you ever visited an ophthalmologist?) The answers were as follows: Yes by 55% and no By 39% and I don't know by5% Then we asked them the following question ( does exercise reduce the complications of diabetes on the eye The answers were as follows: Yes by 81% and no by 5% and I don't know by 14% They were also asked the following question ( does stopping smoking reduce the complications of diabetes on the eye?) ) The answers are as follows Yes by 73.8 % and not at 4.5 % and I don't know by 21.7 %. We also asked them the following question (does checking the cumulative sugar every six months reduce the risk of complications of diabetes on the eye). The answer was as follows :Yes, by 81.4% . Not by 5.0%,I don't know 13.6%%

Then we asked them the following question ( Do you think that controlling high blood pressure and keeping it in the normal range reduces the risk to the eye?) The answers were as follows :Yes, by 72% And not by 1% And I don't know about 26%.

They were also asked the following question( Does high cholesterol in the blood increase the risk of complications of diabetes on the eye) The answers were as follows: Yes by 71% and no by 1% and I don't know by 27.6% .

They were also asked the following question( is an eye exam every six months important to reduce the complications of diabetes on the eye). And the answers were different, some of them answered yes and their percentage was 79% some answered No and their percentage was 5% and others their answer was I don't know and their percentage was 15.8% , and we asked them the following question (Does taking and adhering to diabetes medications reduce the complications of diabetes on the eye ) . The answer was 94.1% yes, Not by 0.9%, I don't know 5.0%.

We also asked the patients ( does adherence to the diabetic diet reduce the complications of diabetes on the eye?) ) So shut the answers, Yes I counted 92.8 % and the other was a weekend and I counted down to 0.9 % and others, it was their vacation. I don't know and count by 6.3 %. Also, we asked them the following question ( Do you think that smoking increases the complications of diabetes on the eye?) ) The answers were as follows . Yes by 72.4 % and not increased by 1.8% of the people who had their vacation. B I don't know 25.8 %. They were also asked ( Does reducing food containing cholesterol reduce the risk of complications of diabetes on the eye?)) . The answer was as follows :Yes by 78.7%, ،no by 1.8% ,and I don't know 19.5%.

They were asked ( Does controlling blood pressure reduce the complications of diabetes on the eye?)). The answer was :Yes, 76.9%, No by 2.3% and I don't know 20.8%.

**Table (10) Attitudes of participants diabetic patients towards diabetic eye diseases, Al-Thawra , Al-Jamhouri and, Al-Kuwait hospitals, Sana'a 2022.**

| | No | | I don't know | yes | |
|---|---|---|---|---|---|
| | N % | Count | N % | Count | N % |
| Are people who have diabetes are subject to eyediseases? | 0.9% | 17 | 7.7% | 202 | 91.4% |
| Is it necessary to visit an ophthalmologist in order to examine the complications of ?diabetes on the eyes | 2.3% | 20 | 9.0% | 196 | 88.7% |
| Is periodic eye examination important for detecting complications of diabetes in ?the eye | 0.9% | 25 | 11.3% | 194 | 87.8% |

| | | | | | |
|---|---|---|---|---|---|
| do you think you need to examine the eye in a way My role when diabetes | 6.3% | 27 | 12.2% | 180 | |
| Will control and control diabetes at the normal rate reduce the risk of diabetes on the eye) | 0.9% | 15 | 6.8% | 204 | 92.3% |
| Does adherence to a diabetic diet reduce the complications of diabetes on the eye? | 0.9% | 14 | 6.3% | 205 | 92.8% |
| Do you think that smoking increases the complications of diabetes on the eye? | 1.8% | 57 | 25.8% | 160 | 72.4% |
| Do you think that controlling high blood pressure and adjusting it in the normal range reduces the risk to the eye? | 1.4% | 58 | 26.2% | 160 | 72.4% |
| Does high cholesterol in the blood increase the risk of diabetes complications on the eye? | 1.4% | 61 | 27.6% | 157 | 71.0% |
| Is an eye examination every six months important to reduce the complications of diabetes on the eye? | 5.0% | 35 | 15.8% | 175 | 79.2% |

## Attitude score

**Table(11) attitude score, Al-Thawra , Al-Jamhouri and, Al-Kuwait hospitals, Sana'a 2022.**

| attitude score | | Frequency | Percent |
|---|---|---|---|
| Valid | bad | 93 | 42.1% |
| | good | 128 | 57.9% |
| | Total | 221 | 100% |

### 11- What is the reason for not examining?

**Table (12) Reasons for not settling the examination , Al-Thawra , Al-Jamhouri and, Al-Kuwait hospitals, Sana'a 2022.**

| | Frequency | Percent |
|---|---|---|
| Unknown | 42 | 34.71% |
| Material cause | 61 | 60.4% |

## Practice:

**Table (13) Practice of participants diabetic patients towards diabetic eye diseases, Al-Thawra , Al-Jamhouri and, Al-Kuwait hospitals, Sana'a 2022.**

| | No | | I don't know | | yes | |
|---|---|---|---|---|---|---|
| | Count | N % | Count | N % | Count | N % |
| Have you visited an ophthalmologist before? | 88 | 39.8% | 11 | 5.0% | 122 | 55.2% |
| Does exercise reduce the complications of diabetes on the eye? | 11 | 5.0% | 31 | 14.0% | 179 | 81.0% |
| Does stopping smoking reduce the complications of diabetes on the eye? | 10 | 4.5% | 48 | 21.7% | 163 | 73.8% |
| Does controlling blood pressure reduce the complications of diabetes on the eye? | 5 | 2.3% | 46 | 20.8% | 170 | 76.9% |

| | | | | | | |
|---|---|---|---|---|---|---|
| Does taking diabetes medications and sticking to them reduce the complications of diabetes on the eye? | 2 | 0.9% | 11 | 5.0% | 208 | 94.1% |
| Does examination of cumulative sugar every 6 months reduce the risk of complications of diabetes on the eye? | 11 | 5.0% | 30 | 13.6% | 180 | 81.4% |
| Does reducing cholesterol-containing food reduce the risk of diabetes complications on the eye? | 4 | 1.8% | 43 | 19.5% | 174 | 78.7% |

**practice score:**

**Table (14) practice scores, , Al-Thawra , Al-Jamhouri and, Al-Kuwait hospitals, Sana'a 2022.**

| practice score | | Frequency | Percent |
|---|---|---|---|
| Valid | bad | 75 | 33.9% |
| | good | 146 | 66.1% |
| | Total | 221 | 100% |

The p value is 0.000 with relation of knowledge score to attitude score and practice score

The p value is 0.003 with relation of practice score to education level , increase the educational level associated with good practice .

# Chapter 4 :

# Discussion

# Discussion

Diabetic eye disease is the second leading cause of blindness in Yemen . Screening for diabetic eye disease should be done immediately after receiving a diagnosis of type 2 DM and within 5 years , after initial screening if no abnormalities are detected the people's should be screened every 3 months.

## Sociodemographic variables:

This study attempted to assess diabetic patient's awareness of diabetic eye diseases in Sana'a . We conducted this study for one month from 15/11/2022 to 15/12/2022 in 3 governmental hospitals ( Al-Thawra , Al-Kuwait , Al-Jumhouri ) . The majority of participants were in Al- Thawra hospital (43.9% ), because it has a special diabetic center whereas Al-Kuwait hospital has ( 23.8 %) , and Al- Jamhori hospital has ( 32.3 %) .

The majority of patients (34.4%) were between 41-50 years old , this may be due to this age is the age of diagnosis of DM type 2 , and our study particularly included the patients who are within 5 years of diagnosis ,and excluded the longer duration . Similar to that study in Tabuk [143 ].

The study revealed that the participatings female (54.1%) are more than male (45.9%) that could be due to sedentary life style of female in comparison with male ,also obesity is more common in female than male .

The percentage of participants who live in urban areas was (71.1%) while (28.9%) live in rural . This could be due to that our study was done in urban area ,also lack the appropriate health care which forces people to go to urban area for treatment ,unlike in the study number [144] were (46.5%) live in urban which was lower than who live in rural (53.5%) .

The highest percentage was the illiterate patients (44.9%) which can be explained by the highest percentage who were 41-50 years old , unlike to the study in Syria [ 145] were (46%) were post college, while illiterates were (25.8%) .

We found that the percentage of diabetic patients who believe that DM can affect the eyes (75.2%) which is higher than that studies in Pakistan (55.5%) ,and in Syria (67.3%) and lower than that study in Jordan 81.9%. Studies [146],[147],[148].

The main source of information about diabetic eye diseases among the diabetic patients in our study was from the doctors (47.51%) , then from other

diabetic patients (33.48%) ,close to study in Egypt the highest source of information was doctors (71%) [144] , but unlike to study in Syria the highest source is other diabetic patients (40%) ,and (32.4%) from doctors [145] , the patients cannot get enough informations from doctors could be due to the number of cases that follow their doctors is significant, leaving the physician with insufficient time to advise their patients.

## Knowledge :

Awareness creation is major step in the make of a successful program to fight against any disease in the community [148].

The knowledge is not the same as awareness , understanding the causes or treatment of disease is knowledge , whereas hearing about the problem only is awareness[149].

As reported , eye manifestation are important health problem in diabetic mellitus patients[150].

In our study the percentage of knowledge about diabetic mellitus effect on the eye among diabetic patients including ( weakness of sight , Dryness of eyes , pain to eyes , decreases visual field , flashing or blurring of vision , cataract and glaucoma , retinopathy , and blindness )was found as this percentage was (53.8%) was high knowledge, while (46.2%) was low knowledge and this result is relatively similar to that study in Sana'a city (50.3%).. study [151].. this percentage in our study is much lower than that of many other study as Jordan (93.8%), Aden city (86.26),Saudi Arabia (80.9%).. studies[152],[153],[154], respectively. The high percentage of Jordan may be due to all their patients were visiting their doctor and they may read are heard about diabetic complication on the eyes .In our study we found that the percentage of diabetic patients who believe that Diabetic mellitus can causes weakness of sight is (93.7%)

Which is much higher than that study in china (53.6%)and Goa(90%).. studies [155],[156], respectively. And lower than that study in Jordan (99.4)The high percentage in Jordan study maybe due to level of postgraduate is (12.0%) study [157] is high compare to our study was( 11.2%)This reflect level of awareness about diabetic complication on the eye .also we found that the percentage of Diabetic patients who believe that diabetic can causes dryness of eye is (59.7%)Which is much higher than that study in Rourkela (7.29%)

This high percentage maybe due to the patients get this information from each other , this approved by the most source of information about diabetic complication among diabetic patients which revealed it from other diabetic patients. Also we found that the percentage of diabetic patients who believe

that diabetic can effect to vision as pain to eye , decreases visual field and blurring of vision are (60.6%),(78.3%),(84.6%) respectively, Which are high percentage maybe due to diabetic complication on the eyes most prevalence in our community this is relation to high level of non-educated people (44.9%)as our study result, so patient see or heard about diabetic complication on the eye between each other..

The percentage of knowledge the patients about decrease of vision (78.%3) which is higher than results of study in Karachi found that 17.5% of respondent considered diabetes as the cause of decreased vision . because a lot of people in my country faced the problem of decrease of vision after suffering from diabetes.[158](a).

It found the percentage of knowledge the patients about the blurring of vision were (84.6%),which higher than that results of study in the world nearly half the patients believed that D.M can affect the eye and 40% believed that it can cause vision loss . Because many of the patients were complaining about the effect of their eyesight shortly after they got diabetes ,in addition, except for their knowledge and contact with their relatives or with people affected like them ,they also had their eyesight damaged[159] .

The percentage of knowledge the patients about cataract and glaucoma due to diabetes in our study (38.5%) which is lower than study In Jordan.by Bakkar et al and Kempen et al In South Africa have Demonstrated that over 80% of the patients were aware of ocular complications of diabetes and in another study found diabetic patients who had heard about cataract (n = 215, 89.2%) or glaucoma (n = 176, 73%),The problem is that many people In my country are not fully informed about the complications of diabetic eye disease.[160](a,b)

The percentage of specific awareness of DR among diabetic patients was (62.0%) for high knowledge, which is lower than that results of study in Jordan (88.2%) and Saudi Arabia (86.9%) and In another study found patients (79.7%) were aware that DM could cause DR.This may be becausee they are unconcerned about the problem and Its treatment ,as none of them or their family have experienced It.[161](a,b) respectively

It Is found that the percentage of diabetic patients who believe that DM can causes blindness is (74.7%) which is much higher than Pakistan (55.5%), In China (50.7%) In Syria (67.3%),and lower than another study in China (79.6%) and Jordan (81.9%).lower levels of Patient awareness have been attributed to lower level of Formal education, treatment In private sector and Information from

health care workers.[162](a,b,c,d,e) respectively.

The percentage of people who know that it is possible for them to have complications of diabetes without being aware were (74.7%). Because they heard about the complications of diabetes from those who were Infected or it may be hearing them from another source after a while they had diabetes, they saw themselves that they may be infected unknowingly.

## Attitude :-

In our study, we found that the result of the attitude was good at a rate of 57.9%, this may indicate an increase in the number of cases whose vision was damaged due to diabetes, and the rate of not good was 42.1%

The question (Does adherence to the diet reduce the complications of diabetes on the eye?) as it got the highest percentage of the attitude and the percentage was 92.8%, and this indicates that the diabetes doctors are educating their patients about the benefit of the diet ,

and question (Does high cholesterol in the blood increase the complications of diabetes on the eye?) Where he got the lowest percentage in the attitude, and it was 71%, but in general it is considered a good percentage. But his obtaining the lowest percentage indicates that some patients do not know what is blood cholesterol

however the question (Good control of the sugar level at the normal level reduces the risk of sugar on the eye?) Where the good percentage was 92.3%, and this indicates that the diabetes doctor made aware of diabetes patients of the need to control sugar in the normal range so that it does not harm the eyesight. As there is a previous study in Jeddah, Kingdom Saudi Arabia in 2014 and 2017 showed almost the same percentage, as out of 243 people there were 197 who answered yes [163]..

The question (Are people with diabetes at risk of developing eye diseases?) The good percentage of the attitude was 91.4%, and this indicates the prevalence of symptoms of diabetes in the eye among the community,

also The questions (Is it necessary to visit an ophthalmologist in order to examine the complications of diabetes on the eye?) The good percentage of the attitude was 88.7%..,

A question (Is eye examination every six months important to reduce the complications of diabetes on the eye?) as good percentage of the attitude was 79.2%, and (Is periodic eye examination important to discover the complications

of diabetes on the eye?) got a score of 87.8% .. Where there is a similar result for all the previous three questions in previous research in Switzerland in 2011 and 2012 [164] .

Finally the seventh and eighth questions got the same percentage. And the percentage was good, and this indicates the incidence of diabetes, and the prevalence of diabetes among smokers.

## Practice:-

In our study, we found that the score of the practice was 33.9% for I don't know , and 66.1% for financial reasons, and this indicates the deterioration of the economic situation in the country and not providing health insurance..

In our study, , it was found that 55% of Yemenis participants visited an ophthalmologist compared to other countries like Oman , Tanzania and United States where the numbers show 50%[165], 59% [166],and 91%[167], respectively . The higher USA percentage exceeds by far other countries and is probably due to higher health maturity among the American population of the complication of DM to the eyes.

It is of special important to note that the study found 81% of Yemenis participants engage in daily physical exercise activities compare to 58% in the country of Pakistan[168] . Moreover , the study found that 73.8 participants where non-smokers and 81% , 78.7% monitor their level of HBAIC and lipid control respectively . In a country like Pakistan only 22% do monitoring of their level of HBAIC and LIPID[168].

When it came to BP levels , 76.9% of Yemenis do some kind of monitoring , in a country like Switzerland , BP level monitoring number by individuals jumped to 91.3%[169]. Also it was found that 94.1% of Yemenis patients take their doses of medication regularly more than that of patients in India which was 70%[170].

# Chapter 5 :

# Conclusion

# &

# Recommendations

## Conclusion :

The largest percentage of participants were in A-Thawra hospital then AL-Jumhouri hospital then AL-Kuwait hospital. The majority of participants were between 41 to 50 years old. Most of the participants were living urban areas because we conducted this study in Sana'a city where high quality ophthalmic centers exit only in big cities. Majority of them were illiterate ,while the preparatory were the least .Awareness about diabetic effects on eye in general and specific knowledge of diabetic eye diseases among diabetic patients in this research is high. Most of diabetic patients believe on blindness, loss of vision and blurring of vision especially was high but about other complication as glaucoma and cataract was low in the knowledge. Percentage of good results in attitude was 57,9% while not good results was 42,17%. We found high level of positive practice which includes: Taking medication regularly ,exercise , checking up of HBA1C (every 3 months) . Also, a moderate level of positive practice includes: Reducing food that contain cholesterol, stopping smoking , controlling of blood pressure within normal range. However, lowest level of positive practice includes: Visiting ophthalmologist.

## Recommendations:

In order to enhance the awareness of health issues of DD complications , the following is recommended :

1- Facilitate districts cities with clinic centers that provide the services needed to DM patients .

2- Engage health service providers in an health campaign to increase health awareness among segments of the population.

2- Notify physicians about the importance of alerting patients about the complications and risks of DM negligence on the eyes.

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# Appendix

# (Questionnaire)

Republic of Yemen

Ministry of Higher Education

And Scientific Research

21 September University of Medical and Applied science

الجمهورية اليمنية

وزارة التعليم العالي و البحث العلمي

جامعة ٢١ سبتمبر للعلوم الطبية و التطبيقية

كلية الطب البشري

السلام عليكم ورحمة الله وبركاته

**<u>الموضوع \ ملئ الاستبيان المرفق .</u>**

يطيب لنا أن نضع بين يديك هذا الاستبيان الذي تم تصميمه لغرض البحث العلمي بهدف جمع المعلومات اللازمة لموضوع الدراسة :(الوعي ،المعرفة ،المواقف والممارسة حول مضاعفات مرض السكر على العين بين امراض السكر ).

_نرجو التكرم بتعبئة الاستبيان بوضع علامة صح في المكان المناسب ،وسوف تكون المعلومات التي تفيدون بها موضوع السرية التامة ولن تستخدم الا لغرض البحث العلمي .

مع خالص الشكر والتقدير ..

الطب البشري بجامعة ٢١ سبتمبر للعلوم الطبية والتطبيقية .

- البيانات الديمغرافية:

العمر : ☐

الجنس : ذكر ☐ انثى ☐

الاقامة : المدينة ☐ الريف ☐

المستوى التعليمي : غير متعلم ☐ ابتدائي ☐ اعدادي ☐

ثانوي ☐ جامعي ☐

- الوعي والمعرفة:

١-هل سمعت بخطورة مرض السكر على العين ؟ نعم ☐ لا ☐ لا اعلم ☐

٢-إذا سمعت بهذه الخطورة ما هو مصدر معلوماتك ؟ **طبيب** ☐ **مريض مصاب** ☐

**وسائل الاعلام** ☐ **الاقارب** ☐

**أخرى** ☐

٣-هل مرض السكر يؤدي إلى ضعف النظر ؟

نعم ☐ **لا** ☐ لا أعلم ☐

٤-هل مرض السكر يؤدي إلى جفاف العين؟

نعم ☐ لا ☐ لا اعلم ☐

٥-هل مرض السكر يؤدي إلى ألم في العين؟

نعم ☐ لا ☐ لا اعلم ☐

٦-هل مرض السكر يؤدي إلى نقص في مجال الإبصار ؟

نعم ☐ لا ☐ لا اعلم ☐

**7**-هل مرض السكر يؤدي إلى غشاشة أو وميض في مجال الرؤية؟

نعم ☐ لا ☐ لا اعلم ☐

**8**-هل تعلم أن مرض السكر له علاقة بتكون المياه البيضاء والزرقاء في العين؟

نعم ☐ لا ☐ لا اعلم ☐

٩-هل مرض السكر يؤدي إلى اعتلال او تدمير شبكية العين؟

نعم ☐ لا ☐ لا اعلم ☐

١٠-هل مرض السكر يؤدي إلى العمى؟

نعم ☐ لا ☐ لا اعلم ☐

11- هل تعلم أن اعتلال شبكية العين نتيجة السكر هو السبب الرئيسي للعمى؟

نعم ☐ لا ☐ لا اعلم ☐

١٢- هل من الممكن أن تكون مصاب بمضاعفات مرض السكر بدون أن تعلم؟

نعم ☐ لا ☐ لا اعلم ☐

**المواقف والممارسة:**

١ـ هل يعتبر الأشخاص الذين لديهم مرض السكر عرضة للإصابة بأمراض في العيون ؟

نعم [ ]. لا [ ]. لا اعلم [ ]

٢ـ هل يجب زيارة طبيب العيون من أجل فحص مضاعفات مرض السكر على العيون ؟

نعم [ ]. لا [ ]. لا اعلم [ ].

٣ـ هل الفحص الدور للعين مهم لاكتشاف مضاعفات السكر في العين ؟

نعم [ ]. لا [ ]. لا اعلم [ ].

٤ـ هل تعتقد أنك تحتاج إلى فحص العين بشكل دوري عند الإصابة بمرض السكر؟

نعم [ ]. لا [ ]. لا اعلم [ ]

٥ـ هل التحكم وضبط السكر في المعدل الطبيعي يقلل من الخطورة على العين ؟

نعم [ ]. . لا[ ]. لا اعلم [ ]

٦ـ هل الالتزام بالحمية الغذائية لمريض السكر يقلل من مضاعفات السكر على العين ؟

نعم [ ]. لا [ ]. لا اعلم [ ].

٧ـ هل تعتقد أن التدخين يزيد من مضاعفات السكر على العين ؟

نعم [ ]. لا [ ]. لا اعلم [ ].

٨ ـ هل تعتقد أن التحكم بارتفاع ضغط الدم وضبطه في المعدل الطبيعي يقلل من الخطورة على العين ؟

نعم [ ]. لا [ ]. لا اعلم [ ].

٩ـ هل ارتفاع الكوليسترول في الدم يزيد من خطورة مضاعفات السكر على العين؟

نعم [ ]. لا [ ]. لا اعلم [ ]

١٠ـ هل فحص العين كل ستة أشهر مهم لتقليل مضاعفات السكر على العين؟

نعم [ ]. لا [ ]. لا اعلم [ ].

١١ـ إذا لم تفحص ما سبب عدم الفحص :-

عدم المعرفة : نعم ☐ لا ☐

سبب مادي : نعم ☐ لا ☐

١٢ـ هل زرت طبيب عيون من قبل ؟

نعم [ ]. لا [ ]. لا اعلم [ ].

١٣-هل ممارسة الرياضة يقلل من مضاعفات مرض السكري على العين ؟

نعم [ ]. لا [ ]. لا اعلم [ ].

14- هل أخذ ادوية السكر والالتزام بها يقلل من مضاعفات مرض السكري على العين ؟

نعم [ ]. لا [ ]. لا اعلم [ ].

15-هل فحص السكر التراكمي كل ٦ أشهر يقلل من خطورة مضاعفات مرض السكري على العين ؟

نعم [ ]. لا [ ]. لا اعلم [ ].

16-هل التقليل من الطعام المحتوي على الكوليسترول يقلل من خطورة مضاعفات مرض السكري على العين ؟

نعم [ ]. لا [ ]. لا اعلم [ ].

**Demographic data :**

The Age :

[ ]

The Gender:

Male [ ]. Female [ ].

The Residence :

Urban [ ]. Rural [ ].

Educational level :

Illiterates [ ]. Primary school [ ]

Secondary school [ ]. Collage [ ]

.

**Awareness and Knowledge :**

1- Have you heard about the risk of Diabetic disease in the eye?

Yes [ ]. No [ ]. I don't know[ ]

2- If you have heard about this risk, what is the source of information ?

Doctor [ ]. Other diabetic patient .[ ]

Relatives [ ].

Other [ ].

3- Do you think that DM may cause weakness of sight ?

Yes [ ]. No [ ]. I don't know[ ].

4-Do you think that DM may cause dryness of eyes ?

Yes [ ]. No[ ]. I don't know [ ].

5- Do you think that DM may cause pain to eyes ?

Yes [ ]. No[ ]. I don't know [ ].

6- Do you think that DM may cause decrease in visual field ?

Yes [ ]. No[ ]. I don't know [ ].

7-Do you think that DM may cause blurring of vision or flashing ?

Yes [ ]. No[ ]. I don't know [ ]

8-Do you know that DM has relation with emergency of glaucoma and cataract ?

Yes [ ]. No [ ]. I don't know [ ].

9-Do you think that DM may cause retinopathy?

Yes [ ]. No [ ]. I don't know [ ].

10- Do you think that DM may cause blindness ?

Yes [ ]. No [ ]. I don't know [ ].

11- Do you know that diabetic retinopathy is the main cause of blindness ?
Yes [ ]. No [ ]. I don't know [ ].

12-Is it possible that you be suffering from complications of DM without you know ?

Yes [ ]. No [ ]. I don't know [ ].

**Attitudes and practice:**

1- Are people who have diabetes are subject to eye diseases ?

Yes [ ]. No [ ]. I don't know [ ].

2- Is it necessary to visit an ophthalmologist in order to examine the complications of diabetes on the eyes?

Yes [ ]. No [ ]. I don't know [ ].

3- Is periodic eye examination important for detecting complications of diabetes on the eye?

Yes [ ]. No [ ]. I don't know [ ].

4- Do you think you need a regular eye examination when you have diabetes?

Yes [ ]. No[ ]. I don't know [ ].

5-Does controlling DM in the normal range reduce the risk to the eye?

Yes [ ]. No [ ]. I don't know [ ].

6- Do you think that smoking increases the DM complications on the eye?

Yes [ ]. No [ ]. I don't know [ ].

7-Do you think that controlling high blood pressure and adjusting it in the normal range reduces the risk to the eye?

Yes [ ]. No [ ]. I don't know [ ].

8- Does adherence to a diabetic diet reduce the complications of diabetes on the eye?
Yes[ ]. No [ ]. I don't know [ ].

9- Have you visited an ophthalmologist before?
Yes [ ]. No [ ]. I don't know [ ]

10-Does routine exercise reduce the diabetic complications on the eye ?

Yes [ ]. No [ ]. I don't know [ ]

11- Does taking diabetic medication regularly reduce the diabetic complications on the eye ?

Yes [ ]. No [ ]. I don't know [ ]

12- Does examination of cumulative sugar every three months reduce the risk of DM complications on the eye ?

Yes [ ]. No [ ]. I don't know [ ]

13 - Does high cholesterol in the blood increase the risk of diabetes complications on the eye ؟؟

Yes [ ]. No [ ]. I don't know [ ].

14- is an eye examination every sex months important to reduce the complication of diabetic to the eye ?

Yes [ ]. No [ ]. I don't know [ ].

15- If not examined , What is the reason for not examining :

Ignorance Yes [ ]. No [ ]

Low income Yes [ ]. No [ ]

16- Does reducing cholesterol -containing food reduce the risk of DM complications on the eye?
Yes [ ]. No[ ]. I don't know [ ].