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Diabetic retinopathy: Path ahead to learn

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Abstract

Diabetic retinopathy is the leading cause of blindness in India and it typically takes a number of years to get to a point where it endangers the vision. Uncontrolled diabetes is the silent killer that can cause the number of eye disorders, such as optic neuropathy, diabetic retinopathy, glaucoma, cataracts, and ocular surface diseases. The most common of these is diabetic retinopathy. Refractive errors and cataracts are the two most common causes of vision impairment, with diabetic retinopathy emerging as the third most common cause. Diabetic retinopathy is a preventable disease if it is not treated promptly, it might cause irreversible visual loss. Effective and consistent medical screening is essential for halting the progression of diabetic retinopathy.

Keywords: Diabetic retinopathy, blindness in India, uncontrolled diabetes, eye disorders

Introduction

The World Health Organization estimates that one billion of the 2.2 billion people who experience vision impairment worldwide may have been prevented. The two most prevalent causes of vision impairment are cataracts and refractive errors; however, diabetic retinopathy has surpassed both glaucoma and age-related macular degeneration to become the third most common cause. Over 50 million individuals globally suffer from blindness, with approximately 2.5 million cases being caused by diabetic retinopathy. [WHO fact sheet]^[1].

A diabetic is a chronic metabolic condition defined by elevated blood sugar levels. Diabetes is divided into two categories: type 1, or insulin-dependent Diabetes (IDDM), and type 2, or non-insulin-dependent diabetes (NIDDM). Type 1 Diabetes is a chronic illness in which the pancreas generates little or no insulin on its own or Antibodies against their own islet cells are present in almost 90% of these patients. It was formerly referred to as juvenile diabetes or insulin-dependent diabetes. Type 1 diabetes can begin at any age. However, it usually begins in childhood or adolescence^[2, 3].

The more prevalent kind of diabetes that can occur at any age is type 2 diabetes. Individuals over 40 are more likely to have type 2 diabetes. It is caused by an insufficient or resistant response to insulin by the body. It is characterized by insufficient insulin production or an inability of insulin to attach to the cell's receptor sites by pancreatic islet cells. The incidence of type 2 diabetes has sharply increased during the last three decades in all nations^[1, 2, 3].

Notable forms of the illness include gestational diabetes and secondary diabetes. While Type 1 DM affects just 10% to 15% of individuals, Type 2 DM accounts for the majority of diabetes occurrences^[3].

Clinical features of Diabetics Mellitus^[2, 3]

There are various signs and symptoms presented with

- Polydipsia
- Polyuria
- Increase weight loss
- When there is insufficient insulin available, muscle and fat break down, producing Ketones in the urine called ketonuria
- Weakness
- Fatigue
- Experiencing irritability or other mood swings.
- Experiencing eyesight blur.

- Having sores that heal slowly.
- Having several infections, including skin, vaginal, and mouth infections.

Diabetic Retinopathy

Diabetic retinopathy (DR) is a chronic consequence of diabetes mellitus that damages the retina, impairing vision and ultimately leading to blindness. The arteries may enlarge and rupture. Alternatively, they might obstruct, which would stop blood flow. Sometimes abnormal new blood vessels also grow on the retina. However, diabetic retinopathy typically takes a number of years to get to a point where it endangers the vision [4].

Uncontrolled diabetes can be the cause of many eye disorders, such as optic neuropathy, diabetic retinopathy, glaucoma, cataracts, and ocular surface diseases. The most common of these is diabetic retinopathy. Refractive errors and cataracts are the two most common causes of vision impairment, with diabetic retinopathy emerging as the third most common cause. [WHO fact sheet] [1].

Diabetic retinopathy initially manifests only as a little visual impairment or as no symptoms at all. If untreated, it can cause vision loss and blindness. Diabetes-related vision loss can be avoided by leading an active lifestyle, eating a balanced diet, and taking prescription drugs on schedule. [4] Diabetic retinopathy can lead to other serious eye conditions: [5].

Diabetic macular edema (DME) [6,7]

- Approximately 1 in 15 diabetics will eventually develop DME.
- DME occurs when fluid leaks from retinal blood vessels into the macula, a region of the retina required for centre vision.
- This results in hazy vision.

Criteria for Diabetic macular edema

- ✓ Hard exudates are 500 μm (1/3 DD) or less from the macula's centre, and the surrounding retinal tissue has thickened.
- ✓ Retinal thickening at least 1 or more DDs in size and within one disc diameter of the macula centre.
- ✓ DD- Disc Diameter

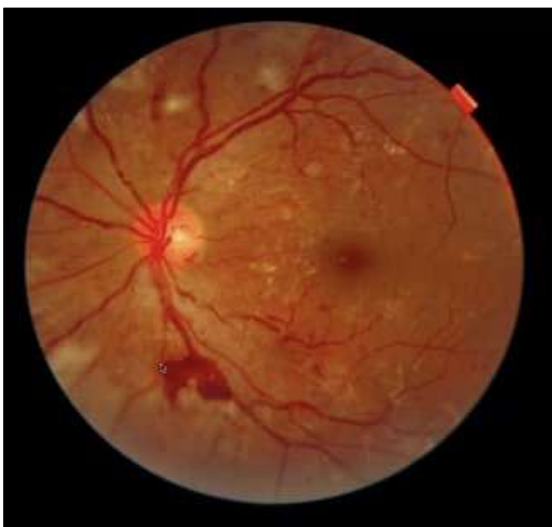


Fig 1: Showing hard exudates less than 1/3 DD from the macula's centre



Fig 2: Retinal thickening at least 1 DDs in size and within one disc diameter of the macula centre.

Neovascular glaucoma

- Unusual blood vessels that emerge from the retina as a result of diabetic retinopathy may obstruct the flow of fluid out of the eye that causes glaucoma.
- One kind of glaucoma, which is a collection of eye conditions that can result in blindness and vision loss, is brought on by this.

Retinal detachment

- Eye may develop scars as a result of diabetic retinopathy.
- Tractional retinal detachment refers to the condition when retina pulls away from the back of eye due to scarring.

Risk factors of Diabetic retinopathy [8,9]

Non-modifiable

- Age
- Puberty
- Pregnancy
- Genetics
- Socioeconomic status

Modifiable

- Physical Inactivity
- Hypertension
- Obesity
- Dyslipidemia
- Uncontrolled Diabetics
- Nephropathy

Sign and symptoms of diabetic retinopathy

- In the early stages of diabetic retinopathy, symptoms are typically absent.
- A few people develop visual abnormalities, like problem in reading or seeing things from a distance.
- Hemorrhage from the blood vessels in the retina
- Black, spider or cobweb-like patches
- Retinal scarring.
- Blood vessels may also start to bleed or new blood vessel forms.

The following symptoms could appear as disease progress

- Distorted eyesight
- The vision that fluctuates

- Hazed vision
- Spots of light
- Sudden loss of vision
- Floaters forms
- Pain or redness in the eyes
- Having trouble seeing in the dark

Clinical features in retinal findings ^[10]

- Microaneurysm
- Intraretinal hemorrhages
- Cotton wool spots- Localised oedema of the nerve fibre layer that is puffy and white-yellow in colour
- Hard exudates- A distinct white-yellow lipid accumulation at the layer of retina
- Venous tortuosity or beading
- Intraretinal microvascular abnormalities (IRMA)
- Flame-shaped Hemorrhage - One type of intraretinal bleeding
Blood builds up at the superficial layer of nerve fibres, bleeding from the plexus of capillaries. Also known as feather shaped Hemorrhage
- Dot and Blot Hemorrhage - In the retina, haemorrhages are located deeper. Blood typically builds up in the inner nuclear or outer plexiform layers, or more visibly in the peripheral retina where the nerve fibre layer is thin.
- Subretinal Hemorrhage –Bleeding under the retinal neurosensory level, or retinal pigment epithelium (RPE)

Classification of Diabetic retinopathy ^[5, 10, 11, 12]

According to the International Council of Ophthalmology (ICO) Diabetic retinopathy classified into 5 stages: No DR, Mild NPDR, Moderate NPDR, Severe NPDR, and PDR. ¹¹ Basically there are two types of diabetic retinopathy:

Non-proliferative diabetic retinopathy (NPDR)

The hallmarks of non-proliferative DR are- Microaneurysms, intraretinal haemorrhages, venous beading, and intraretinal microvascular abnormalities (IRMA). Proliferative diabetic retinopathy (PDR) may develop if treatment is delayed.

Mild NPDR

- Micro aneurysm
- Intra-retinal hemorrhage < 4 quadrant
- Hard exudates



Fig 3: Image showing left eye with presence of Dot and Blot Haemorrhage

Moderate NPDR

- At least one hemorrhage or micro aneurysm presence of any one-
- Cotton wool spots
- Hard exudates
- Intra-retinal hemorrhage in less than 4 quadrants
- Venous beading in less than 2 quadrants
- Absence in IRMA (Intra-retinal micro vascular anomalies)



Fig 4: Image showing right eye with presence of Dot and Blot Haemorrhage, Soft exudates and Flame-shaped Haemorrhage

Severe NPDR

Any 2 of the following lesions but no sign of PDR (4-2-1 Rule)

- Severe retinal hemorrhage in 4 quadrants
- Venous beading in 2 quadrants
- Severe IRMA (Intra-retinal micro vascular anomalies) in 1 quadrants

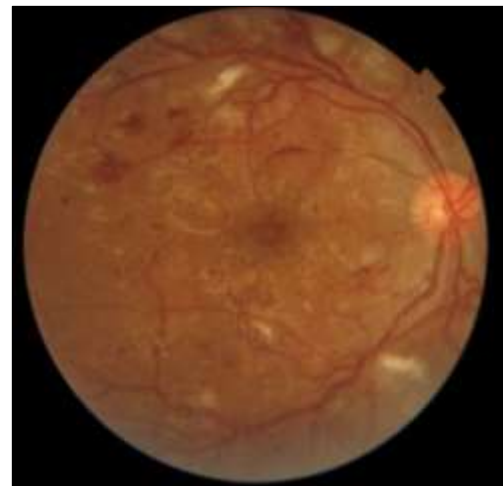


Fig 5: Image showing right eye with presence of Dot and Blot Haemorrhage, Flame-shaped Haemorrhage, Soft exudates, Hard exudates and IRMA

Proliferative diabetic retinopathy (PDR)

This more severe form of diabetic retinopathy, called proliferative diabetic retinopathy, can develop from diabetic retinopathy. These patients have either vitreous/pre-retinal haemorrhage or neovascularisation of the disc/elsewhere after their severe NPDR to PDR.

Retinal findings are

- Pre-retinal haemorrhages
- Vitreous haemorrhages
- Tractional Retinal Detachment
- Neovascularization of the iris (NVI) / Neovascularization of the angle (NVA)/ Or both
- Neovascularization of the disc (NVD) at least ¼- 1/3 disc area in extent
- NVD with Pre-retinal or vitreous haemorrhage
- Retinal oedema may arise from the leakage of new vessels.



Fig 6: Image showing Soft exudates, hard exudates and Pre-retinal haemorrhages

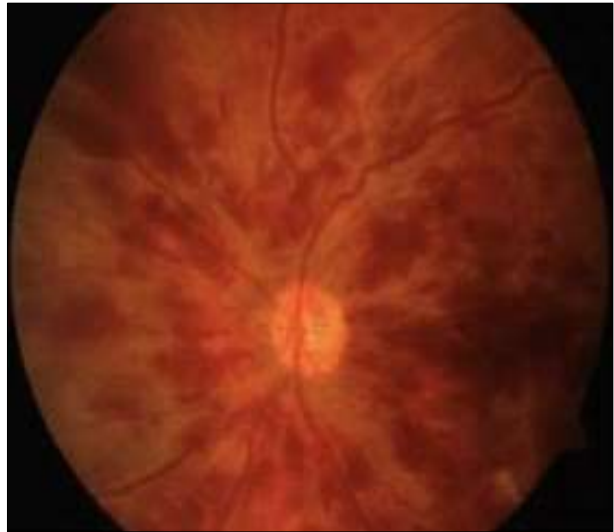


Fig 7: Image showing Vitreous haemorrhages

Summary of ICO severity grading for diabetic retinopathy ^[10, 12]

Mild Non-Proliferative Diabetic Retinopathy	Micro aneurysms only
Moderate Non-Proliferative Diabetic Retinopathy	More than just microaneurysms but less than Severe NPDR
Severe Non-Proliferative Diabetic Retinopathy	Any of the following: More than 20 intraretinal hemorrhages in each of 4 quadrants; Definite venous beading in 2+ quadrants; Prominent IRMA in 1+ quadrant and no signs of proliferative retinopathy
Proliferative Diabetic Retinopathy	Neovascularization; Vitreous/preretinal hemorrhage

Schedule of retinal examination and referral in diabetic's patient

No Diabetic Retinopathy: Every 1-2 year (No Referral Required)

NPDR (Non-proliferative retinopathy)

- **Mild:** Every 1-2 year (No Referral Required)
- **Moderate:** 4-6 months (Referral Required)
- **Severe/Very Severe:** 3-4 months (Referral Required)
- **PDR (Proliferative retinopathy):** < 1 month (Referral Required)
- **Macular Edema (Non central involvement):** 3-4 months (Referral Required)
- **Macular Edema (Central involvement):** 1 months (Referral Required)

Investigations in Diabetic Retinopathy

- Snellen chart
- Fundus photography – Gold standard test
- Fluorescein angiography (FFA) – detect neovascularisation (New vessels) of the retina and also helpful in recognising diffuse diabetic macular oedema, ischaemic maculopathy, and leaky microaneurysms.
- Optical coherence tomography (OCT)
- Ocular ultrasonography [USG]
- Visual field testing
- Slit-lamp bio microscopy

- Automated retinal imaging system
- Retinal photography
- Direct ophthalmoscope

Management of Diabetic retinopathy ^[12, 13]

- Laser photocoagulation was the cornerstone of treatment for proliferative retinopathy and diabetic macular oedema.
- Intravitreal pharmacotherapy (With corticosteroid injections or anti-VEGF injections)
- Laser photocoagulation
- Insulin, oral hypoglycemic drugs, or lifestyle modifications to control diabetics
- Vitreoretinal surgery ex- Vitrectomy is crucial in preventing vision loss.

Nursing management of Diabetic retinopathy ^[10, 13]

- Identify the patient who is at risk for diabetic retinopathy, and consult a doctor to initiate the treatment as soon as possible to prevent irreversible vision loss.
- Examine the diabetic patients and educate them about the sign and symptoms of diabetic retinopathy ex- blur vision, hazy vision.
- Closely monitor diabetic patient for glycemic control. Assure diabetic patients of consistent blood glucose monitoring and rigorous glycemic management.

- Early detection and efficient care are essential to halting the disease's progression to irreversible vision loss.
- Controlling of blood pressure, cholesterol and glucose regulation is vital in preventing diabetic retinopathy.
- Obtaining prompt medical attention if vision changes occur
- Eating a balanced and healthful diet
- Regular exercise should be done
- Quitting smoking
- Keeping a healthy weight
- Nurses can educate patients about diabetes management, including medication, diet, and exercise.
- Nurse teaches patient how to check their blood sugar levels.
- Nurses can encourage patients to have annual eye exams
- According to current guidelines, the target HbA1c should be between 6.5% and 7.0%; however, for type I diabetes, a target HbA1c of less than 7.0% and for type II diabetics, less than 7.5%, is more appropriate. 16
- Nurses can emphasis on maintaining the target HbA1c level.

Conclusion

Diabetic retinopathy is a preventable disease if it is not treated promptly, it might cause irreversible visual loss. Effective and consistent medical screening is essential for halting the progression of diabetic retinopathy. "An ounce of prevention is worth a pound of cure" is a well-known saying that states that preventing a negative thing from happening is preferable to fixing it after it has already occurred. Although diabetic retinopathy is a silent killer, irreparable vision loss can be prevented by controlling diabetics, maintain adequate weight and regular eye checkups for the signs. Consequently, a nurse's participation in patient education and eye screening for diabetic retinopathy is crucial.

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