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Prevalence of diabetic eye diseases among target population in urban area of India

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Abstract

A cross-sectional review and transverse analysis were conducted in order to determine the prevalence of diabetic eye diseases in India's urban cities. This study illustrates about different pathological ocular conditions which are caused by diabetes.

As per the studies shown, the prevalence of diabetes is around 8.9% in India (survey till 2020). Therefore, as a result the diabetes related ocular complications are increasing accordingly.

Vision loss condition is the most prominent condition or complication which is related to prolong uncontrolled diabetes which is the leading factor globally. Many ocular conditions lead to vision loss making it an irreversible condition. Therefore, there is a strong relationship between uncontrolled blood glucose levels with different pathological ocular conditions.

Method: This study was conducted on about 300 patients who randomly visited out-patient department for detailed eye-check-up and were suffering from type-II diabetes condition. With the help of different diagnostic equipments which includes HD-OCT, Fundus photo camera, B-scan is used for evaluation of different pathological complications.

Study Design: A perspective, single centric, study was conducted in the Department of Ophthalmology at a corporate multispecialty hospital.

Inclusion Criteria: All patient's with clinically significant diabetic ocular diseases and / or complaining of blurring of vision due to diabetic eye diseases.

- Age > 40 years both Male and Female suffering from systemic illness of Diabetes.

Exclusion Criteria

- Mild to Severe NPDR
- NAION.

Keywords: Prevalence of untreated cataract, cataract, cataract in rural and urban area

Introduction

Diabetes is a metabolic, autoimmune or genetic disorder in which the blood glucose level is elevated. Insulin is the hormone secreted by pancreas of endocrine gland helps in regulating the glucose levels in blood, more prominently, islets of langerhans is responsible for the secretion. There is two subclass of endocrine gland in which Beta-cells produce insulin and Alpha-cells secretes glucagon. Hence, in diabetes condition this Beta-cell gets damaged and produces insufficient amount of or no insulin which leads to increased blood sugar level.

Types of Diabetes

Diabetes mellitus: (Type-I and Type-II)

- Diabetes insipidus
- Gestational diabetes

Diabetic eye diseases are a group of eye problems that can affect people with diabetes. When the blood vessels of the retina are damaged due to uncontrolled or prolonged diabetes, it results in a condition known as Diabetic Retinopathy (DR).

These conditions include

- Diabetic Macular Edema
- Cataract

- Glaucoma
- Vitreous Haemorrhage
- Diabetic maculopathy
- CSME
- Diabetic Papillopathy
- EOM disorders
- DMI
- Dry Eye Syndrome

Diabetic Retinopathy

It is an ocular condition in which the blood vessels of the sensitive layer of the eye that is Retina gets damaged due to uncontrolled/ high blood sugar level in the circulation. It is the major cause of blindness in adults 20-75 years of age. These blood vessels can swell and leak. Sometimes abnormal new blood vessels grow on the retina which is termed as Neovascularisation. All of these changes progresses, and if left untreated, then it may lead to vision-loss.

Different ocular pathological conditions are described below:

PDR

Proliferative Diabetic Retinopathy is the advance stage of diabetic eye diseases. It occurs when there will be formation of new blood vessels in the retina, called Neovascularization. These new vessels are very much fragile that can easily break and often bleed into the vitreous. In case of less bleeding, it appears as few dark floaters, but if they bleed a lot it might affect the complete vision.

Also these new blood vessels can form scar tissues. Scar tissues can cause problems with the macula or lead to a retinal detachment.

This is a PDR condition in which there is appearance of tiny fragile new blood vessels.

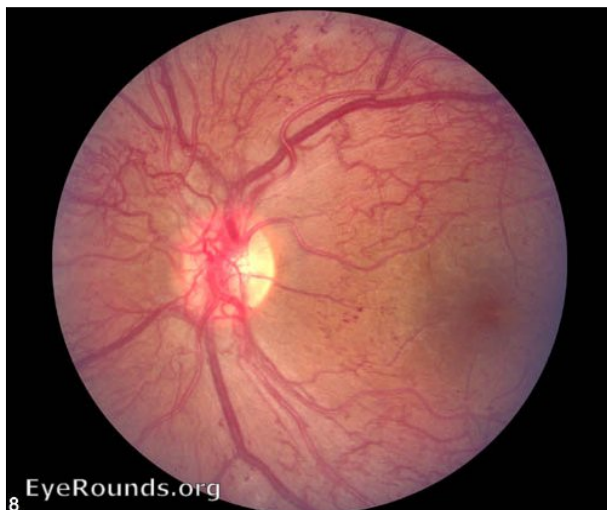


Fig 1: PDR

Diabetic Macular Edema

It is manifested as retinal thickening caused by the accumulation of intra-retinal fluid in the macula of the eye. When excess fluid builds up in the macula, it leads to vision loss. DME generally develops over time and high blood glucose levels can damage the retinal blood vessels which further leads to fluid leak and causing swelling and other complications.

We can observe the DME by the help of OCT with the presence of cystic fluid accumulation over the macula.

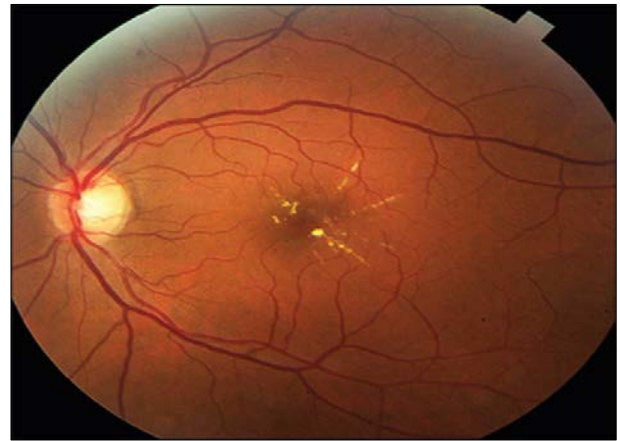


Fig 2: DME

Cataract

It is the opacification of the crystalline lens in the eye which makes the vision hazy and cloudy. It is a physiological change in eye, generally occurs after 55-60 years of age due to protein breakdown in lens. On contrary, this condition occurs early in patients having diabetes, recently a study has shown that patient having prolonged uncontrolled blood glucose level with an average of 12 years duration and average age of 50 years has early changes of cataract.

The commonest type of cataract seen in Diabetic patients are posterior sub-capsular cataract, the true diabetic cataract which is very rare. It is caused by the osmotic over-hydration of the lens and appear white punctuate or snowflake opacities.

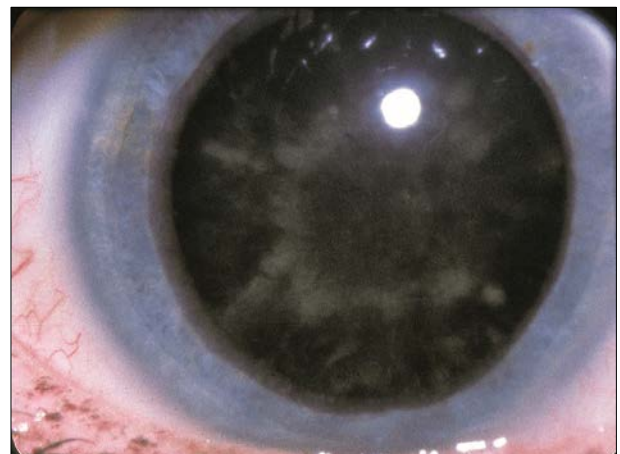


Fig 3: Snow -Flake Cataract

Glaucoma

It is a group of eye diseases that can damage the optic nerve which is responsible for sending signals to the visual cortex. If the optic nerve gets damaged it causes irreversible vision-loss, also in severe condition it can lead to blindness. Diabetes doubles the chance of having Glaucoma. In early stage, this condition will develop no symptoms but later on the patient finds him/her symptomatic.

As Glaucoma is caused due to its one of the factor of increased intra-ocular pressure so as a result, in case of diabetic retinopathy, glucose levels can damage the blood

vessels in the retina and it can cause formation of new abnormal blood vessels. They diffuse throughout the eye and forms into the anterior segment, resulting in neovascularisation of the iris and drainage angle and leads to NVG.



Fig 4: Neovascularisation of iris

Vitreous Haemorrhage: VH

Vitreous haemorrhage is a sign of advanced diabetic eye disease. In the back of the eyes there is jelly like substance present called Vitreous, In case of PDR there will be occurrence of bleeding into the back of the eye because of the formation of new abnormal fragile blood vessels. In case of VH the patients notices alots of floaters in their vision making them symptomatic.

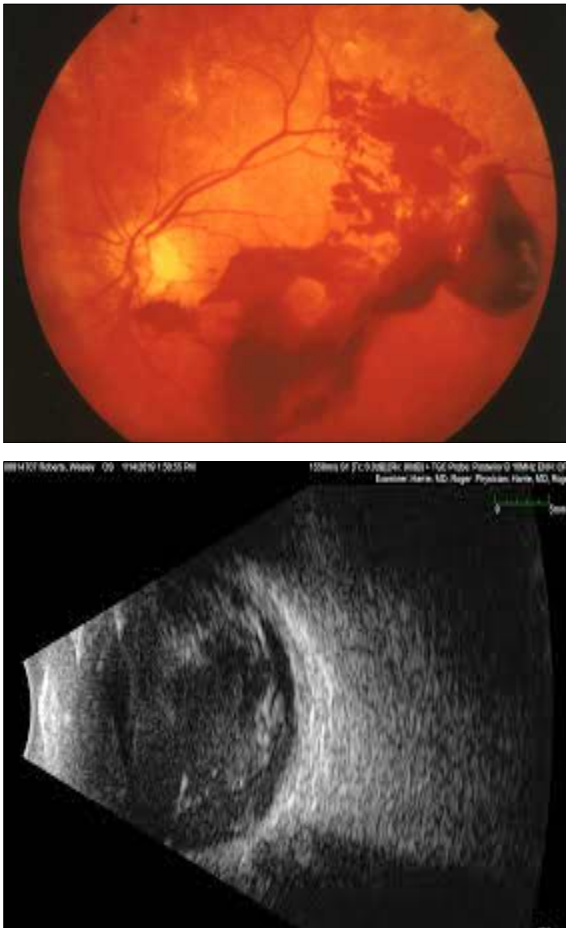


Fig 5: Vitreous haemorrhage

Diabetic Maculopathy

Diabetic maculopathy is one of the complications of diabetes, which is caused by the high blood glucose levels in the circulation that damaging the tiny blood vessels at the back of the eye i.e., Retina.

It is caused by the involvement of the fovea by oedema and/or hard exudates.



Fig 6: Appearing of fovea oedema with hard exudates

Clinically Significant Macular Edema (CSME)

It is a condition of retinal thickening at or within 500 microns or 1/3 disc diameter of centre of macula. When the blood glucose level in increased it hampers the blood vessels of retina and eventually the blood vessels start to leak causing swelling of macula.

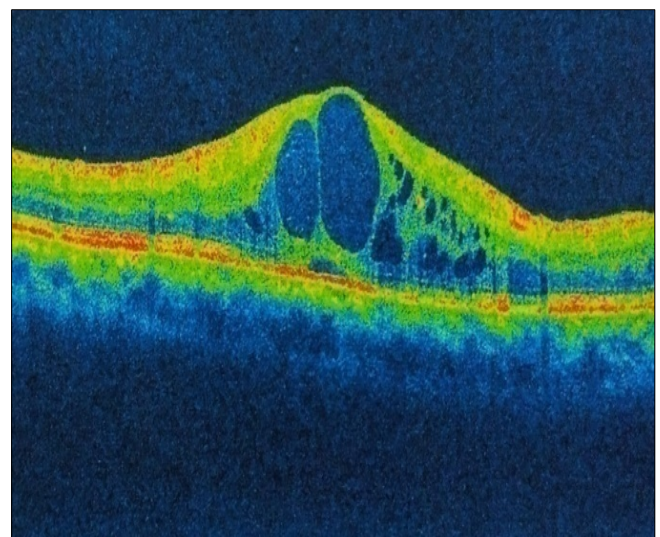


Fig 7: CSME

Diabetic Papillopathy

Diabetic Papillopathy (DP) is an uncommon ocular manifestation of Diabetes Mellitus identified by unilateral or bilateral disk swelling associated with minimal or no optic nerve dysfunction. The optic disc swelling is caused by vascular leakage and axonal edema in and around the optic nerve head.



Fig 8: Swelling of the optic disk

EOM Disorders

The Extra ocular muscle around the eyeball helps in ocular movements and it is controlled by 3rd, 4th and 6th nerves. The Cranial Nerves (CN) are more likely to get damaged in case of uncontrolled diabetic condition.

Over time, high blood glucose (sugar) levels can damage the small blood vessels that supply the nerves and this stops the essential nutrients reaching the nerves. As a result, the nerve fibres can become damaged and leads to Cranial Nerve palsy.

Diabetic Macular Ischemia

Retinal arteriolar narrowing was associated with moderate-to-severe macular ischemia in eyes with diabetic retinopathy. DMI is the presence of occlusion, atrophy and/or loss of retinal capillaries in the macula, with narrowing or obliteration of pre-capillary arterioles, in patients with diabetes mellitus.

DMI is caused by a decrease in blood flow (Ischemia) to the macula, which is responsible for central most sharp vision. Due to damage in the retinal blood vessels the blood flow gets reduced as a result the macula gets less oxygen and nutrition and become hypoxic.

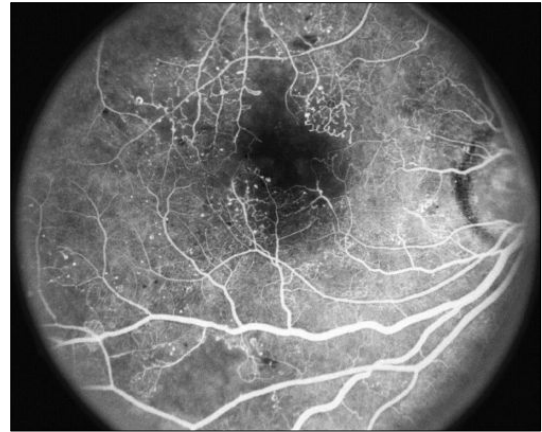


Fig 9: Macular Ischemia

The macular ischemia can diagnose under FFA because it shows the arterial and venous blood flow and also those areas appearing dark it simply indicating the loss of blood flow and become ischemic.

Dry Eye Syndrome: Diabetes mellitus (DM) has been identified as one of the leading systemic risk factors for DES. Dry eye is a condition when a person doesn't produce enough tear to lubricate and moisturize the eyes. When the Insulin hormone is not present is adequate amount in the blood circulation can lead to decrease the tear production. High blood glucose can damage nerves throughout your eyes, including the nerves in the lacrimal gland and nerves on the eyes clear window, called the cornea.

It is a common complication in case Diabetic patients. It happens due to elevated level of blood glucose.

When your blood sugar levels get elevated, it can cause nerve damage in your eyes which, in turn, can lead to decreased tear production.

Additionally, high blood sugar can cause inflammation throughout the body. This inflammation makes it harder for the lacrimal gland which is responsible for tear production.

Over time, if left untreated, dry eye may lead to:

- Eye pain
- Corneal scarring
- Vision loss

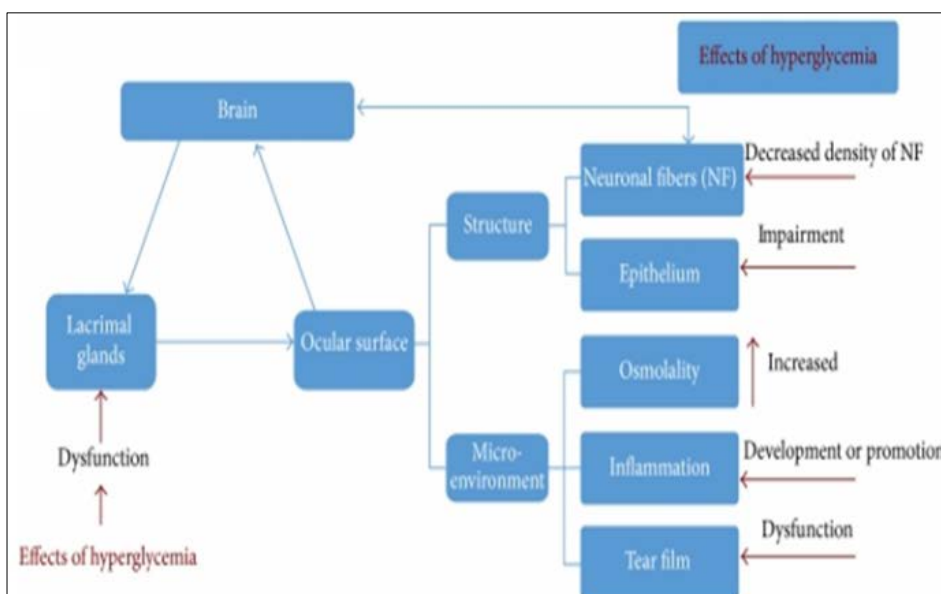


Fig 10: Effects of Diabetes over the Lacrimal gland

Review of Literature

Shukla UV, Tripathy K. Diabetic Retinopathy. 2023 Feb 22. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. PMID: 32809640.

This is a meta-analysis and a cross-sectional study about Diabetic retinopathy which is caused in urban areas among the targeted population. Study elaborates about different ocular pathological conditions which are caused by a prolonged DR (on an average of 8 years of DR). Different treatment plans are enlisted in this article with their significance factor.

Grading diabetic retinopathy from stereoscopic colour Fundus photographs--an extension of the modified Airlie House classification. ETDRS report number 10. Early Treatment Diabetic Retinopathy Study Research Group. Ophthalmology. 1991 May; 98(5 Suppl):786-806.

Studies shows about the prevalence of different ocular conditions and diabetes among a target population. It has a significance role in early detection of diabetic-related complications in order to provide best treatment to the patients.

Aim and Objectives**Aim**

To determine the prevalence of diabetic ocular diseases among the target population in urban cities of India.

Null Hypothesis (H0)

There is no vision related changes in different ocular conditions caused due to diabetes.

Alternate Hypothesis (H1)

To determine and study the different ocular diseases caused due to diabetes. Understanding the visual changes and functionality in different conditions.

Objectives

To study the prevalence of ocular diseases caused due to diabetes in target population of urban area.

To determine the visual changes caused due to diabetes related ocular complications.

Materials and Methods

This is a transverse cross-sectional analysis study carried out between September 2022 to April 2023 at the ophthalmology department of a corporate speciality hospital, Bhubaneswar, Odisha.

Study Design

A perspective, single centric, cross-sectional analysis.

Inclusion Criteria

- A random inclusion of patients irrespective of gender and age who visited our out-patient department for detailed eye examination suffering from Diabetes conditions.
- Age > 40 years both Male and Female suffering from systemic illness of Diabetes.

Exclusion Criteria

- Patients who were diagnosed Mild to severe NPDR (Non-proliferative diabetic retinopathy) were excluded from the study.

- Also patients detected with NAION (Non-arteritic anterior ischemic optic neuropathy) were excluded from this study.

Sample Size

A total data of 300 patients are collected as sample size which included male and female with age group of > 40 years or equivalent which belongs to urban areas of population.

Methodology

This study is an analysis on the patients suffering from Diabetes illness who visited hospital for detailed eye examination. A comprehensive eye examination was conducted which includes detailed history, visual acuity, objective and subjective refraction, intra-ocular pressure, pupillary examination, undilated slit-lamp evaluation by optometrists at the department. The detailed history of systemic illness revealed that the patients were suffering from diabetes condition from certain duration.

Subsequently, patients were dilated (Tropicamide plus/Tropicamide plane) and were asked to wait for about 30-45 minutes in patient waiting area of hospital. After that, ophthalmologists conducted detailed examination using 20D and 90D lens for Fundus examination for all the quadrants.

In cases, where the ophthalmologists were unable to find any clinical findings using both the lens (20D or 90D) they advised for other diagnostics procedures.

Other diagnostics procedures included OCT (optical coherence tomography) (TOPCON SS OCT and HEISENBERG SD OCT), Fundus photo (using FFA machine) and FFA (Fundus Fluorescein angiography), USG (Ultrasonography) B-scan (APPA B-SCAN) were advised to the patients by ophthalmologists. These procedures were carried out by optometrists at the diagnostic department.

Diagnostic procedures:

OCT (optical coherence tomography)

This procedure was advised in order to evaluate the retinal layers. As because most of the ocular complications includes retinal layers as there signs. Also, OCT measures the ONH (optic disc head) and RNFL (Retinal nerve fibers layer) because certain ocular complications damages these structures. Conditions such as Diabetic Macular edema, Cystoid Macular Edema are the prominent conditions often diagnosed using OCT (macula) technique

Fundus photo (using FFA machine)

With the help of FFA machine, the Fundus is studied, as it includes the image of all quadrants with posterior pole. Generally, FFA is advised to the patients having prolonged diabetes in order to determine any leakage caused in retina. 80% of ocular pathological conditions gets diagnosed using FFA machine as because it is the most precise diagnostic equipment.

Fundus Fluorescein Angiography (FFA)

It is an invasive diagnostics procedure which helps in determination of any pathological retinal and choroid conditions. Conditions such Macular Ischemia, certain diffuse leakages, occlusions of retinal blood vessels, micro aneurysms, PDR (determination of neovascularisation) and more are ruled out using FFA.

The procedure is performed using sodium Fluorescein dye of adult dosage of about 500mg intravenously (antecubital vein). A vial of sodium Fluorescein dye (2ml of 25%, 2.5ml of 20%, 5ml of 10% or 10ml of 5%) is required. Other materials includes a 23 gauge vein needle, 5ml of syringe, armrest, tourniquet and an alcohol swab are needed. FFA machine comprises of different filters (diffuse, red free, blue filters) for capturing of Fundus photo whichever required for diagnosing purposes.

USG B-scan

B-scan is advised to the patients when there is no view of posterior segment using all other equipments. Generally, in conditions such as Vitreous Haemorrhage, total or mature cataracts, B-scan is advised to get an overall view of posterior segment.

As therefore, diagnostics procedures plays a vital role in diagnosing the diabetic related ocular conditions or diseases. Therefore, mentioned methodology was performed in every case depending on their need.

Results

A total of 300 patients data were collected in order to determine the prevalence of ocular conditions caused due to Diabetes. A collectively data was evaluated irrespective of age and gender. We have collected data which fulfils the inclusion and exclusion criteria of the study in a period of 8 months.

Out of the total, 180 patients reported as male and 120 patients reported as female respectively making as a ratio of 3:2. Age group of the patient varied between 40 years to 85 years with an average age of 66 years.

As reported, different ocular pathological conditions were diagnosed of patients included in the study which helped in determination of most common or prevalent ocular condition.

Different conditions reported are as follows

Table 1: Diagnosed ocular diseases

Ocular Diseases diagnosed of patients (Survey of 300 patients data)	
Vitreous Haemorrhage	Ischemia
Advance PDR	Cataract
Diabetic Macular Edema	6 th Cranial Nerve Palsy
Dry Eyes	Cystoid Macular Edema
Diabetic Papillopathy	NVG
Diabetic Maculopathy	

(These are the some common conditions which were diagnosed and included in this study. The prevalence is determined among these conditions).

Pie chart showing prevalence of ocular conditions in a sequence manner:

(Following are the conditions which fulfils the inclusion criteria)

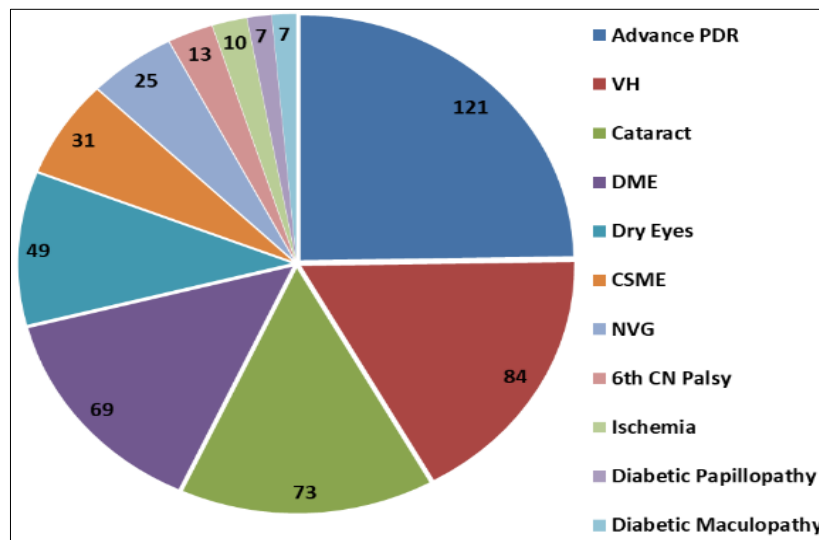


Fig 11: Prevalence of ocular diseases

Following table determines the number of cases reported in male and female respectively leading to the total cases.

(Some patients diagnosed with multiple ocular disorders)

Table 2: Number of cases (In male and female)

Sl. No.	Ocular Manifestations (From survey)	No. Of cases reported in Male	No. Of cases reported in Female	Total	Percentage (%)
1	Advance PDR	72	49	121	24.74%
2	VH	60	24	84	17.17%
3	Cataract	37	36	73	14.92%
4	DME	32	37	69	14.11%
5	Dry Eye	23	26	49	10.02%
6	CSME	17	14	31	6.33%
7	NVG	18	7	25	5.11%
8	6 th CN Palsy	9	4	13	2.6%
9	Ischemia	7	3	10	2.04%
10	Diabetic Papillopathy	5	2	7	1.43%
11	Diabetic Maculopathy	6	1	7	1.43%

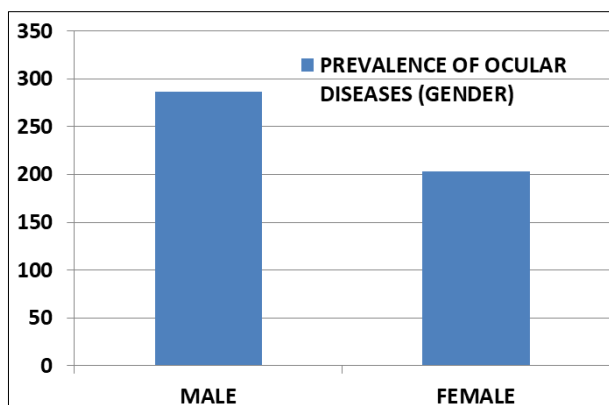


Fig 12: Following graph shows that males are being more diagnosed with different ocular disorders than females.

As per the study, males are highly being affected due to diabetes and its ocular complications

Discussion

As prevalence of diabetes itself is around 73% including both urban and rural areas of India, so as a result, its ocular related complications is also increasing day by day with its duration but the difference was not statistically significant. As in an older stage adults are at higher prevalence, the same reported in the study. Therefore, it is very important to spread awareness among the population regarding diabetes and its ocular complications.

In urban cities, it is observed that the population is having a sedentary lifestyle which ultimately leads to different systemic conditions including diabetes. There is negative impact of current habits of dietary among urban areas which leads to obesity and diabetes, as because diet plays an important role in maintaining our health status.

It is very important to guide the diabetic patients for eye examination at least twice a year (Detailed dilated Fundus eye examination).

Physical activity and a healthy diet keep a human body out of these incurable diseases and maintain a proper health status.

As of now, it is mandatory to aware peoples having diabetes about DR. Because of their negligence behaviour, DR causes various pathological conditions which advances and results in significant vision loss or blindness.

According different studies, it has been proved that the duration of diabetes increases the incidence of DR. Prolong diabetes results into different ocular as well as other complications in the body.

Conclusion

Through this cross-sectional and transverse study, it is concluded that the prevalent ocular complication or disease due to diabetes is: Advance Proliferative Diabetic Retinopathy

References

1. Shukla UV, Tripathy K. Diabetic Retinopathy. 2023 Feb 22. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; c2023 Jan. PMID: 32809640.
2. Freyberger H, Bröcker M, Yakut H, Hammer J, Effert R, Schifferdecker E, *et al.* Increased levels of platelet-derived growth factor in vitreous fluid of patients with proliferative diabetic retinopathy. *Exp Clin Endocrinol Diabetes.* 2000;108(2):106-9.

3. Grading diabetic retinopathy from stereoscopic colour Fundus photographs--an extension of the modified Airlie House classification. ETDRS report number 10. Early Treatment Diabetic Retinopathy Study Research Group. *Ophthalmology.* 1991 May;98(5):786-806.
4. Tripathy K, Sharma YR, RK, Chawla R, Gogia V, Singh SK, *et al.* Recent advances in management of diabetic macular edema. *Curr Diabetes Rev.* 2015;11(2):79-97.
5. Glassman JA, Ayala AR, Jampol LM, Aiello LP, Antoszyk AN, Arnold-Bush B, *et al.* Diabetic Retinopathy Clinical Research Network. Wells Aflibercept, bevacizumab, or ranibizumab for diabetic macular edema. *N Engl J Med.* 2015 Mar 26;372(13):1193-203.
6. Stewart MW, Browning DJ, Landers MB. Current management of diabetic tractional retinal detachments. *Indian J Ophthalmic.* 2018 Dec;66(12):1751-1762.
7. Screening guidelines for diabetic retinopathy. American College of Physicians, American Diabetes Association, and American Academy of Ophthalmology. *Ann Intern Med.* 1992 Apr 15;116(8):683-5.
8. Wong TY, Cheung CM, Larsen M, Sharma S, Simó R. Diabetic retinopathy. *Nat Rev Dis Primers.* 2016 Mar 17;2:16012. DOI: 10.1038/nrdp.2016.12. PMID: 27159554.
9. Ciulla TA, Amador AG, Zinman B. Diabetic retinopathy and diabetic macular edema: pathophysiology, screening, and novel therapies. *Diabetes Care.* 2003 Sep;26(9):2653-64. DOI: 10.2337/diacare.26.9.2653. PMID: 12941734.