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Prevalence of Diabetic Retinopathy and Its Relationship with Hypertension and Other Comorbidities: A Clinical Study in a Tertiary Care Hospital

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Introduction:
Diabetic retinopathy is one of the common complications of diabetes. In many cases the patient is not aware of any symptoms until it is too late for effective treatment. Through fundoscopy, early diagnosis of diabetic retinopathy and prognosis during the treatment process can be known. Diabetic retinopathy (DR) is a micro-vascular complication of diabetes affecting nearly all persons with a duration of diabetes of ≥15 years; and is the most common cause of blindness in the working-age adult population in developed countries. Vision loss results mainly from macular oedema, macular capillary non-perfusion, vitreous haemorrhage, and tractional retinal detachment. Timely and appropriate care at early stages of DR can significantly reduce visual loss over time, improve patients' quality of life, and reduce the financial burden associated with the complications of visual impairment.
Aim:*To find out prevalence of diabetic retinopathy in our patients*
Methods:*In the present study, 50 patients were enrolled attending the hospital. History, physical examination, duration of diabetes, investigation related to diabetes and funduscopic examination were performed.*
Results: *Average age of the participants was 42± 6.3 years. The positive correlation was found between HbA1c level, duration of diabetes and funduscopic changes in eye. Diabetic macular oedemawas seen in one, proliferative diabetic retinopathy was seen in three patients. Non-proliferative diabetic retinopathy was seen in two patients. Cataract was seen in eight patients*
Conclusion: *In patients with diabetes, regular retinal exams are essential. Advanced stages of diabetic retinopathy need to be treated by surgery and have limited visual prognosis. Even though new therapeutic options are available in patients with diabetes, interdisciplinary care remains. Additionally, regular ophthalmic exams are mandatory for detecting ocular complications which had no early symptom until the retinopathy progressed or developed macular oedema. Initiating treatments is essential, good metabolic and blood pressure control is indispensable for reducing the risk of ophthalmic complications along with essential life style modificationto reduce blindness in diabetic, hypertensive and comorbid patients.*
Key Words: *Diabetic retinopathy, Complication, Hypertension*

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I. Introduction

Diabetic retinopathy (DR) is a microvascular impediment of DM and can be mainspring blindness or visual impairment. Although cataract leftovers a principal mainspring of blindness in India, the other crucial retinal mainspring (especially DR) are emerging as predominant diseases for national program for control of

blindness (NPCB)[1]furthermore in vision 2020India.[2]Pervasiveness ofDR amidst diabetics has been described to be 9.6%–21.7% in various clinical studies conducted beyond India over the last decade.[3-7]The extremeoutcome of diabetes mellitus is set toremain as a result of the predicted widen in prevalencefrom 463 million in 2019 to 700 million in 2045 due to populationexpansion, lack of awareness, increased ageing, urbanisation, reducedphysical activity, uncorrected lifestyle modification and adverse dietary changes.[8]

Type 2 diabetes mellitus (T2DM) is now scrutinized as anextended world-wide health concern. Nearly 180 million adults were reported to suffer from diabetes in 1980. The number of T2DMameliorate to 422 million in 2014,[9]which will expected to be more than 552 million in 2030.[10]Largestintensified in the disease burden (among allnon-communicable diseases) between theyear 1996 and 2016 was noted for DM atnearby 80%.[11]

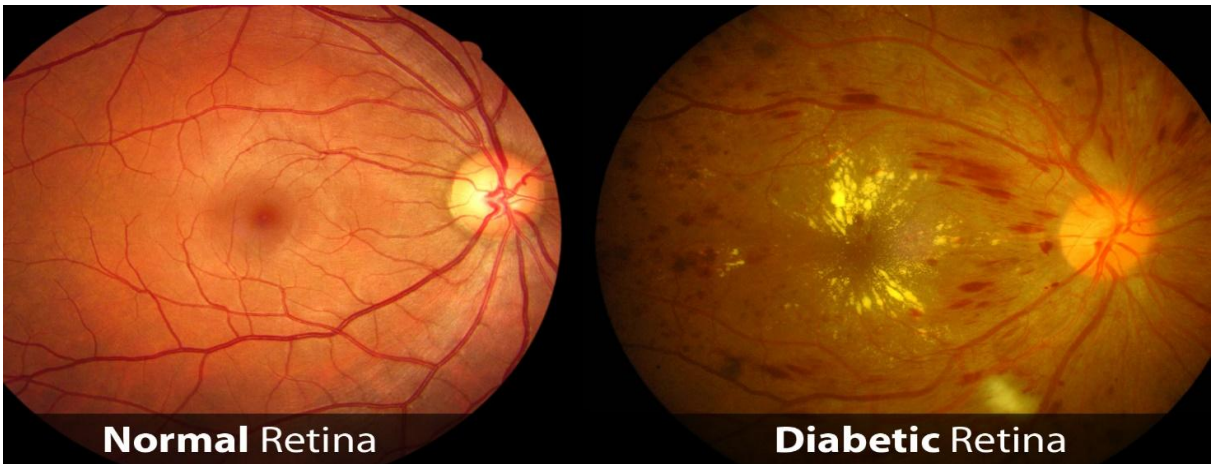

Fig 1: Comparison of Normal and Diabetic Retina

Vascular autoregulation is also affected by diabetes mellitus and other comorbid etiology as a resultit damages the microvascular system, especially in the retina and optic nerve.[12] Diabetes is also accompanying with age-related macular degeneration,[13]glaucoma,[14]and retinopathy.[12]furthermore Diabetes and retinopathy are accompanying with blindness in working-age individuals.[15]The prevalence of diabetic retinopathy is associated with the duration of type I and type II diabetes along with comorbid condition in the adult population.[16]Diabetes may also paramount to cardiovascular, nephropathic, cerebrovascular, neuropathic and foot diseases in the local Indian population.[17]

The model of DR as a primarily vascular disease was chase further. Few studies confirmed that neuro-inflammation plays anillustrious role in the pathogenesis of DR.[18-20]Some recent study used steroids, delivered intravitreally, are effective in enhancing vision in patients with diabetic macular oedema, though they cause cataract development and amplify intraocular pressure which lead to glaucoma.[21,22]

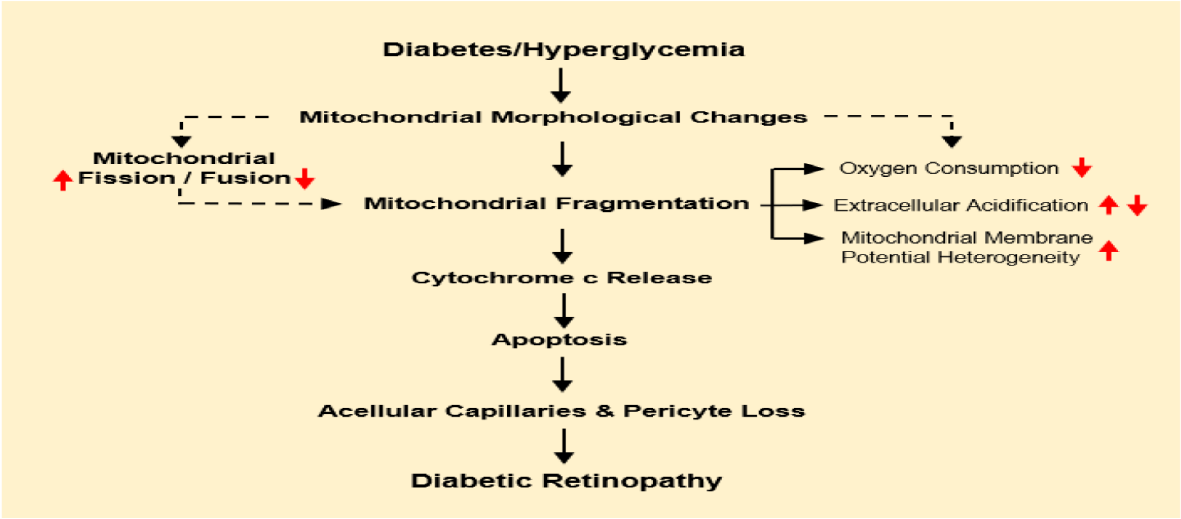

Fig 2: Pathophysiology of Diabetic Retinopathy

Intravitreal steroids have also been demonstrated to alleviate the rate of progression of DR to proliferative disease as well.[23,24]Intensified levels of inflammatory mediators ultimately accompany to breakdown of the blood-retinal-barrier, increased vascular permeability, and angiogenesis through the release of cytokines and growth factors, including vascular endothelial growth factor (VEGF).[25-27]Electroretinogram methods reported Visual dysfunction in the form of decreased sensitivity on visual field testing and diminished photoreceptor function prior to the development of vascular lesions.[28,29]

Thus, the standard pattern on DR has changed. Alterations inthe neurosensory retina is sometime undetectable by ophthalmoscopy. It is recognized as important early contributors tovisual decline, and now established that neurosensorydegeneration may precede visible vascular changes,or occur alongside them.[30]That is the entire neurovascularcomponent, comprised of vascular, glial, microglial andneuronal cells, is basically compromised by diabetes as well as other comorbid conditions.[31]

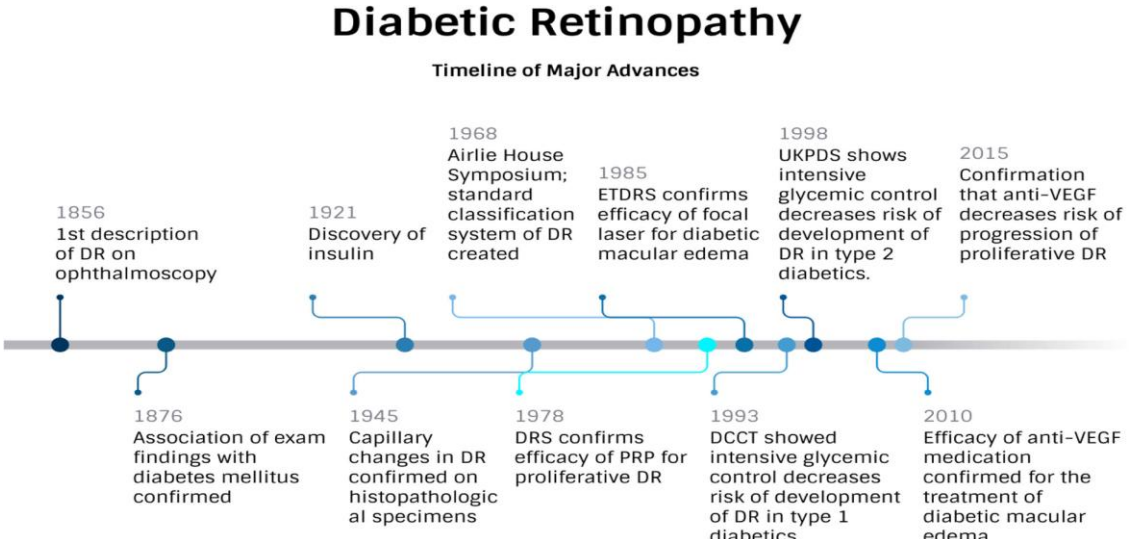

Fig 3: Diabetic Retinopathy-Timeline of Major Advances

This research found that Diabetic Retinopathy is one of the common causes of irreversible visual impairment among Indian populations. Poor glycemic control, systemic hypertension, duration of diabetes, dyslipidemia, microalbuminuria and comorbid disease along with Non-adherence are the major risk factors for the development and progression of diabetic retinopathy. Currently, increased aortic stiffness has been identified as ananticipating marker of diabetic retinopathy and peripheral neuropathy. Certain groupsof prolonged diabetic individuals are at higher risk to have progressive diabetic retinopathy and eventually visual impairment along with DME. Clinical examination, determinants and predictors are considered as prognostic markers to early diagnosis and could help physicians to develop an effective risk-based screening program for this condition along with corrective treatment tools.

II. Material And Methods

An observational study was carried out in 310 patients of Parul Sevashram hospital during the period of 6 months after obtaining an approval from Institutional Ethics Committee. The data's were collected in the Patient Profile Form (PPF) for complete duration of therapy, the analysis made from the data was reported in predesigned forms which includes information such as patient demographic details (BP, all vitals, weight, medical & medication history, ophthalmic examination etc.) and required laboratory information (RBS, HbA1c, lipid profile etc.)

- Observation was carried out to find out the scope of the study in the Parul Sevashram hospital
- Relevant literatures were reviewed.
- Data collection form was designed.
- Data of the patients was recorded in Patient Profile Form and analysed for the role of (Study title After Confirmation)

❖ **Study Criteria**

▪ **Inclusion criteria**

1. Age about ≥18 years
2. Patients without microangioma
3. Absence of ocular disease.

4. Subjects having confirm diagnosis of Type-II DM andHypertension ≥ 6 month with comorbid condition.

- **Exclusion criteria**

1. Pregnant, lactating women
2. Mentally ill or other psychological subjects
3. Subject who are on antineoplastic medication
4. Patients with optic neuropathy, age-related macular degeneration,Glaucoma, retinal & choroidal disease, retinal nerve injury and retinal artery/vein occlusion.
5. Patients with hematopathy, neuropathy, keratopathy, vitreous hemorrhage and other retinal vascular or systemic diseases causing retinal changes.
6. Cataract or other eye disease that may interfere with fundus examinations
7. Any eye surgery within a period of 6-months
8. Previous laser therapy
9. Dilatation of the pupil < 5 mm
10. Other comorbid disease or condition which can interfere with study as per investigators discretion.

- **Biochemical estimations**

Physical examination, all vitals, RBS, HbA1c, Funduscopic examination, ophthalmic examination and echocardiography.

- **Statistical analysis**

The data was represented graphically in MS-Excel with median values.

III. Result

Overall, 310 patients were enrolled on the basis of Hospital visit, among them 75% were male and 25% were female. Whereas 29% patients were newly diagnosed with diabetes and 71% patients had history of diabetes more than 2 years. The mean age of the study population was 48 ± 11 years. All study related history, physical examination, duration of diabetes, investigation related to diabetes, funduscopic and other ophthalmic examination was performed as per need. Among them 25 % patients were on insulin therapy, 39 % patients were on OHA and 36 % patients were taking both therapy depending on the severity of illness. The table below presenting the prevalence of DR in the different age group population. The overall prevalence of DR in the population was 32%.

Age at onset (Year)	No of Patients	Diabetic Retinopathy		Prevalence (%)
		Present	Absent	
<30	20	2	18	10
30–39	50	17	33	34
40–49	100	39	61	39
50–59	60	13	47	21.67
>60	80	25	55	31.25

Table 1: Age Wise Distribution of the Screened Diabetic Patients and Percent Prevalence of Diabetic Retinopathy.

Of the subjects, 53 (17.6%) were smokers, 16 (5.2%) had CAD, and 146 (48.7%) had hypertension. Patients who had diabetes more than 5 years or older had higher fasting plasma glucose as well as higher HbA1c levels compared to newly diagnosed diabetic subjects. Patients who had diabetes and hypertension were pervasiveness to developed DR than diabetic patients.

Disease conditions	No of Patients	Diabetic Retinopathy		Prevalence (%)
		Present	Absent	
Diabetes	138	29	109	21.01
Diabetes + Hypertension	146	62	84	42.47
Diabetes + CAD	16	5	11	31.25

Table 2: Disease Wise Distribution of the Screened Diabetic Patients and Percent Prevalence of Diabetic Retinopathy

The positive correlation was found between HbA1c level, duration of diabetes and funduscopic changes in eye. Diabetic macular oedema were found in 21 patients, proliferative diabetic retinopathy was seen in 20 patients. Whereas non-proliferative diabetic retinopathy were seen in 26 patients and Cataract in 29 patients.

IV. Discussion

The prevalence of diabetes mellitus is growing rapidly worldwide. DM is a major systemic cause of blindness in the major part of the world. Diabetic retinopathy is most important cause of visual impairment in working-age adults. Macular oedema can happen with or without other signs of retinopathy.

The presence of diabetic retinopathy is found to be minimal (9.20%) in less than 2 years of diabetes age. It's more in patients having diabetes of duration of 10 to 20 years (69.57%) and in all patients with duration of diabetes more than 20 years.

Duration of DM (years)	Total no of patients	Diabetic retinopathy		Prevalence %
		Present	Absent	
< 2	87	8	79	9.20
2 to 5	68	15	53	22.05
5 to 10	79	21	58	26.58
10 to 20	46	32	14	69.57
> 20	20	20	00	100

Table 3: Correlation between DR with Duration of DM

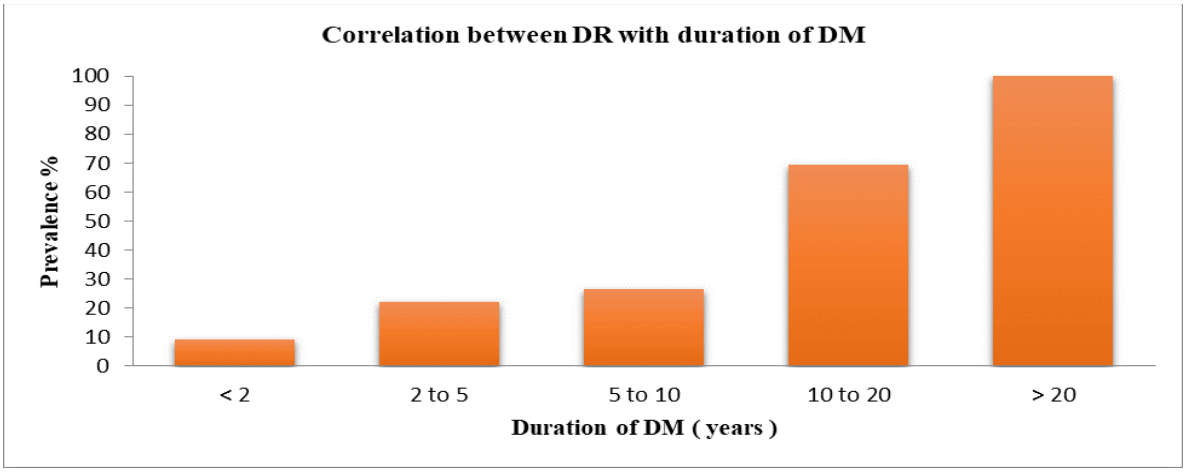

Fig4: Correlation betweenDR with Duration of DM

Age at diagnosis <30 years (6.67% of patients) the prevalence of retinopathy was 10% whereas with an age at diagnosis >30 years the prevalence of retinopathy was 33.57% among that 59% in insulin treated and 22% in non-insulin treated patients. There was no relationship between the risk of severity of retinopathy and number of cigarettes smoked daily while diabetic. These data suggest that there is no excess risk of retinopathy in smokers or non-smokers.

The correlation between diabetic retinopathy and blood pressure was analysed in 146 patients whereas the prevalence rate was high (42.47%) in hypertensive + diabetic patients. Similar statement was also noted that elevated blood pressure has been anticipated as one of the major risk factor for development and increase the rate of diabetic retinopathy.[32]Systolic and pulse blood pressures were extensively higher in retitopathic patients as compare to non- retinopathic patients.

Another similar studyalso supported our result that the non-proteinuric groups pulse blood pressure was higher in patients with retinopathy than inthose without and in the proteinuric groups systolic pressure was higher in patients with retinopathy than in non-retinopathic.[33]

HbA1c	Total no. of Patients	Diabetic Retinopathy		Prevalence %
		Present	Absent	
Good control (≤ 7%)	104	15	89	14.42
Fair control (7.1 -8.5%)	96	35	61	36.46
Poor control (>8.5%)	100	46	54	46.00

Table 4: Correlation between Glycaemic Control and Diabetic Retinopathy

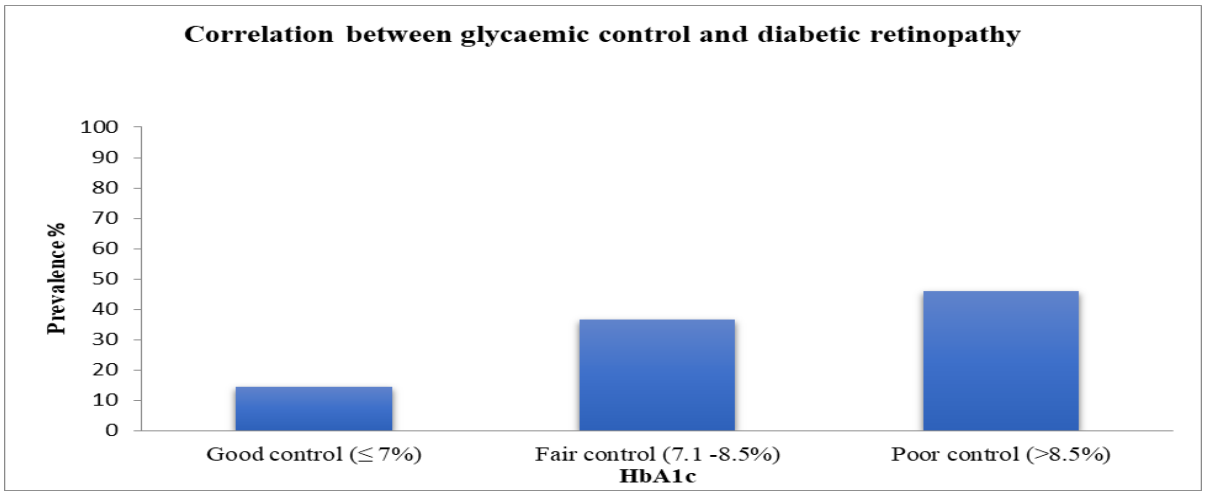

Fig5: Correlation between Glycaemic Control and Diabetic Retinopathy

Physiologic relationship between hyperglycaemia and diabetic retinopathy, it is important to evaluate the role of glycaemic control on prevalence of diabetic retinopathy. In present study we found that patients having HbA1c value ≤ 7% that is good control had low prevalence of retinopathy (14.42%) as compared to patients having HbA1c value.HbA1c values between 7.1-8.5% (36.46%) and poor control (HbA1c values >8.5%) i.e46%. Proliferative diabetic retinopathy was round in higher proportion of patients with poor control as compared to fair control (and good control of HbA1c values. A statistically significant association between severity of retinopathy and HbA1c values was found.[34]

V. Conclusion

In patients with diabetes, regular retinal exams are essential. Advanced stages of diabetic retinopathy need to be treated by surgery and have limited visual prognosis. Even though new therapeutic options are available in patients with diabetes, interdisciplinary care remains. Additionally, regular ophthalmic exams are mandatory for detecting ocular complications and initiating treatments that is essential. Good metabolic and blood pressure control is indispensable for reducing the risk of ophthalmic complications along with essential life style modification. Clinical examination, determinants and predictors are considered as prognostic markers to early diagnosis and could help physicians to develop an effective risk-based screening program for this condition along with corrective treatment tools for irreversible visual impairment of DR.

LIMITATION

The only limitation of this study was few Ophthalmologic reports which was possibility not perfect. Higher laboratory parameter like OCT (Optical coherence tomography), BCVA (Best corrected visual acuity), FA (Fluorescein angiography), IOP (Intraocular pressure), EDTRS (Early Treatment Diabetic Retinopathy Study) and DARC(Detection of apoptosing retinal cells) were required for proper differentialdiagnosis. Our study used only few parameters i.e. HbA1c, Funduscopic examination and RBS that was probably not enough reveals long standing inflammatory status, comorbid disease and other medical conditions in the human body which might interfere with the study result.

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ABBREVIATION

BCVA - Best corrected visual acuity
BP - Blood pressure
CAD- Coronary artery disease
DARC - Detection of apoptosing retinal cells
DM- Diabetes mellitus
DME- Diabetic macular edema
DR- Diabetic retinopathy
EDTRS -Early treatment diabetic retinopathy study

FA - Fluorescein angiography
HbA1c- Haemoglobin A1c
IOP - Intraocular pressure
NPCB-national program for control of blindness
OCT - Optical coherence tomography
OHA- Oral hypoglycaemic agent
PPF- Patient profile form
RBS- Random blood sugar
T2DM- Type 2 diabetes mellitus
VEGF- Vascular endothelial growth factor

CONFLICT OF INTEREST
No conflict

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