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Assessing Visual Acuity, Impact Of Ocular And Systemic Factors Of Diabetic Retinopathy In Indian Population

Dr.Gopal S.Pillai, Dr. Bhibuti Sinha, Dr.Sheeba C.S,
Dr.Manabjyoti Barman, Dr.Alok Sen, Dr.S.Natarajan, Dr.Merin Dickson,
Ms.Anjana Abhilash, Ms.Sumit K U, Ms.Samruddhi Dhani,
Mr. Ashid Salim, Ms.Shamlin Joyal, Ms.Manjisa Choudhury,
Dr. Aniket Kumar, Dr. Deepthi K G, Mr.Jamil Ahmed, Dr. Poonam Jangid,

Abstract:

Purpose: *This study aims to comprehensively analyze factors related to Diabetic Retinopathy (DR), including visual acuity, DR prevalence, ocular comorbidities, and systemic diseases. It focuses on categorizing visual acuity to assess DR severity using data from the Indian Ophthalmology Clinical Trial Network's (IOCTN) Retina Registry.*

Method: *The study includes a diverse patient population from urban and rural India, enrolled in the Retinal Disease Registry of IOCTN. DR grading follows the ETDRS system and involves various ocular assessments, including visual acuity, refractive assessments, intraocular pressure measurements, and Optical Coherence Tomography (OCT) scans. SPSS software is used for statistical analysis, with qualitative data presented as numbers and percentages, and quantitative data as mean values with standard deviations.*

Results: *A study of 5421 individuals found 68.23% had diabetes, with 77.85% of them having diabetic retinopathy (DR). DR patients, averaging 57 years with a 13-year diabetic duration, showed complications like Diabetic Macular Edema (33.78%) and vitreous hemorrhage (22.25%). Advanced DR stages had poorer vision, especially in Proliferative DR. Diabetic Macular Edema worsened visual outcomes, emphasizing the need to manage advanced DR closely to prevent vision impairment.*

Conclusion: *The study analyzed Diabetic Retinopathy (DR) prevalence, visual outcomes, and comorbidities impact. Vision outcomes in DR (PDR) correlated with severity. Increasing DR uniformly decrease visual acuity. Ocular and systemic comorbidities played a role in vision impact. The findings stress the importance of holistic healthcare for DR patients, addressing both ocular and systemic factors to improve their quality of life.*

Keywords*: Diabetic Retinopathy, ETDRS grades, Visual Acuity, Ocular comorbidities*

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I. Introduction:

Diabetic retinopathy (DR), which affects 2 million individuals worldwide and contributes to 5% of all cases of blindness [1], is the most common cause in developed nations amongt hose between the ages of 15 and 64. Longer duration of diabetes and patients' poor glycemic management might lead to pathological alterations in the retinal microvascular system that progress to diabetic retinopathy (DR). Type 1 and type 2 diabetics alike are susceptible to the development of DR. [2,3] The early stages of diabetic retinopathy may be symptom-free or only cause modest vision problems.

In many developed countries, diabetic retinopathy, the prevalent and distinct microvascular consequence of diabetes mellitus (DM), continues to be the predominant factor contributing to vision impairment and avoidable blindness in people of working age.[4] DR is a chronic, progressive disease that, in its early stages, may not manifest any symptoms. If left untreated, it will progress to the sight-threatening proliferative stage, which is characterized by neovascularization of the optic disc or elsewhere, preretinal haemorrhage, and vitreous haemorrhage. [5] Devastating visual function may also result in decreased mobility, sadness, and a lower standard of living, placing a significant strain onpeople, families, communities, and civilizations.[6]

The formation of erroneous blood vessels in the retina is the hallmark of diabetic retinopathy, and its consequences include vitreous haemorrhage, retinal detachment,glaucoma, and blindness. The severity of DR usually corresponds to greater loss ofvision though concrete evidence on the correlation is still due [7].

Since DR is typically referred to as a microvasculopathy, this concept serves as the gold standard for severity categorization [8] and worsen vision loss is typically correlated with higher DR severity levels and DME. Nonproliferative diabetic retinopathy (NPDR) has a very modest connection with this factor [9,10]. This shows that additional processes or metabolic changes are also involved in the early visual impairment, excluding microvascular alterations as the only pathogenic component. Furthermore, a number of investigations have shown that microvascular and ischemic alterations may result in neurodegeneration or macular edema [11].

Clinical trials have shown that PDR treated early can preserve visual acuity [12]. Therefore, visual loss from DR may be preventable. In fact, it has been predicted that if accepted treatment procedures and standardized care for diabetics were to be applied, blindness from DR might be decreased by as much as 90% [13]. Since there are growing fears that DR-related vision loss will become a significant public health issue, it is important to monitor the epidemic's changes in order to evaluate recent public health initiatives and deploy medical resources more effectively. Thus, utilizing information from the retina Registry of IOCTN, the goal of this study was to examine current trends and anticipate the future burden of DR- related vision loss across DR grading by year, age, gender, and biophysical indications.

II. Methods:

Study Population

We analyzed data from the retinal disease registry developed by the Indian Ophthalmology Clinical Trial Network, a pan-India clinical trial facility, with centers established in both urban and rural regions of India. The registry enrolls subjects with different retinal diseases and captures data on demographics, clinical indications and extensive ophthalmic examinations. Subjects enrolled undergo a standardized interview, informed consent process, systemic and ocular examination, and laboratory investigations. The data is systematically entered into a database through a common EDC platform.

The data is stored in the data server at the lead site of the IOCTN network and is not publicly available. Grading of Diabetic Retinopathy : Many clinical research of diabetic retinopathy, including controlled clinical trials and epidemiology studies employ the ETDRS categorization system. The grading of fundus images from seven stereoscopic fields forms the basis of this approach. Each lesion is assessed in each of the nine subfields, and after thorough evaluations of the lesions, the severity of the retinopathy is summarized. Early Treatment Diabetic Retinopathy Study (ETDRS) Classification classifies DR into mild, moderate, severe NPDR and PDR

Ocular examination were performed on every subject enrolled to mark Best corrected visual acuity (BCVA). The evaluation is done using a Snellen chart with a pin hole. BCVA is the measurement of the possible ability to distinguish shapes and the details of objects at a given distance with corrective lenses, and is one of the most commonly used testing factors for eye conditions. The Snellen Chart uses a geometric scale to measure visual acuity, with normal vision at a distance being set at 20/20. Good Vision is considered as 6/6 to 6/12 vision on the Snellen scale. Moderate vision is defined as 6/18 to 6/60 and Bad Vision as below 6/60 in the study.

Refraction was measured using Auto Refractometer, Intraocular pressure by Non-Contact Tonometer and Anterior segment examination was done by a slit-lamp bio microscopy, while posterior segment examination using slit lamp bio microscopy with a 90D lens and Indirect Ophthalmoscope with 20D lens)

Optical Coherence Tomography, with Zeiss Cirrus HD OCT, was used to measure the central macular thickness, central subfield thickness and central macular volume using optical coherence tomography (OCT). This OCT device uses super luminescent diodes with a wavelength of 1,050 nm to do integrated anterior and posterior segment examinations. additionally, a high scan rate of 100,000 A-scans per second.

Statistical Analysis : The acquired patient data was updated, coded, tabulated, and transferred to a computer using a statistical tool for social sciences. While qualitative data were given as number (n) and percentage (%), quantitative data were shown as mean standard deviation. The statistical analysis plan involves descriptive statistics to summarize demographic, clinical, and visual acuity data. Continuous variables like age and duration of diabetes are presented as mean (SD) or median (IQR) based on normality, while categorical variables such as gender, comorbidities, and visual acuity categories are summarized as counts and percentages. All analyses were conducted using IBM SPSS version 26.0.

III. Results

As part of the study, a total of 5421 subjects with retinal disease were recruited between Aug 2021 and Dec 2023. Of the 5421 data, 1722 were excluded as they were not diagnosed with Diabetic retinopathy. 4220 subjects in the population reported Diabetes and 3699 patients were diagnosed with diabetic retinopathy (DR). The dataset encompasses a total of 7112 DR affected eyes with 3413 patients exhibiting bilateral diabetic retinopathy and 286 presenting with unilateral diabetic retinopathy.

Fundus photography readings, slit-lamp examinations, and OCT scans were obtained. Treatment status and treatment plan were also recorded for future research. 10842 eyes were screened for retinal disorders among 5421 registry participants. The participants with DR had a mean age of 57.30 ± 8.85 years. The median HbA1C level is 7.80%, and the systolic and diastolic blood pressure and diastolic blood pressure are reported as 145.57+ 22.29 and 84.81 + 11.57 respectively, the mean pulse rate is recorded as 81.46 + 11.95. (table 1)

Parameters	Mean	Std. Deviation
Age	57.3044	8.84509
BMI	24.99	3.776
Systolic Blood Pressure	145.57	22.290
Diastolic Blood Pressure	84.81	11.571
Pulse Rate	81.46	11.946

Table 1: Physiological parameters among subjects

Table 2 describes the distribution of vision among the study population and is classified based on the Snellen scale of BCVA. About 56% of the study population reported good vision, table 2. Further analysis of vision was performed based on the lifestyle choices by the subjects. 34% subjects reported addiction history or either alcohol or smoking. Though the vision impact due to addiction history was studied in table 3, there is no significant impact found due to lack of sufficient sample.

BCVA in LOGMAR SCALE	n	%
good (0-0.5)	3962	56%
moderate (0.6-1.3)	1884	26%
poor (>1.3)	1266	18%
Total	7112	100%

Table 2: BCVA Examination among subjects

DR Grades		Vision			
		good (0-0.5)	moderate (0.6-1.3)	poor (>1.3)	Total
Addiction History	n	1314	626	446	2386
	%	55.1%	26.2%	18.7%	33.55%
Alcohol consumption history	n	831	353	248	1432
	%	58.0%	24.7%	17.3%	
Smoking History	n	991	514	369	1874
	%	52.9%	27.4%	19.7%	

Table 3: Vision Examination among subjects with DR and lifestyle habits.

According to data from our registry, table 4, 31.53% of DM patients have good vision, 25.6% have moderate vision, and 18.2% have poor vision. 56.1% of hypertension patients have good vision, 25.2% have moderate vision, and 16.1% have impaired vision. 58.6% Patients have good vision with CAD. Patients with CKD have good vision in 54.4%, intermediate vision in 24.8%, and impaired vision in 20.8% of cases.

13.6% of patients with dyslipidemia have poor vision, 23.8% have moderate vision, and 62.6% have good vision. The percentage of stroke patients with good vision is 1.43%, intermediate vision is 1.25%, and impaired vision is 0.86%. Patients with thyroid related disorders have good vision in 4.29%, intermediate vision in 2.79%, and impaired vision in 1.54% of cases. Fig 1 represents the distribution of comorbid condition among the subjects with poor vision.

Comorbid conditions		**Vision**			
		good (0-0.5)	**moderate (0.6-1.3)**	**poor (>1.3)**	**Total**
Hypertension	n	2481	1134	807	4422
	%	56.1%	25.6%	18.2%	
CAD	n	563	242	155	960
	%	58.6%	25.2%	16.1%	
CKD	n	493	225	188	906
	%	54.4%	24.8%	20.8%	
Dyslipidemia	n	1006	382	219	1607
	%	62.6%	23.8%	13.6%	

Table 4: BCVA Examination among subjects with DR and different comorbidities

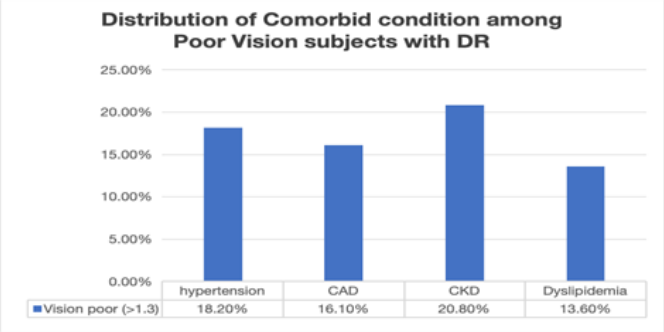

Fig 1: Presence of systemic co morbid conditions in DR patients with Poor vision (BCVA less than 1.3 in logmar scale).

The following table (5) provides valuable insights into the impact of different DR stages and ocular comorbidities on visual function, which is crucial for understanding and managing diabetic eye complications. Patients with mild NPDR tend to have the highest percentage of good vision (84.40%), while those with PDR neovascular glaucoma show the highest percentage of poor vision (76.00%). Visual function tends to decline as DR severity progresses, with higher percentages of poor vision in more advanced stages. The presence of Diabetic Macular Edema (DME) often corresponds to a higher proportion of moderate and poor vision across various DR stages. Combinations of DR stages with DME and tractional retinal detachment generally result in poorer visual function outcomes.

Grades of DR			**good (0-0.5)**	**moderate (0.6-1.3)**	**poor (>1.3)**	**Total**	**Chi- square test**	**p value**
	NPDR	n	2371	847	235	3453	667.8	P<.001
		%	68.7%	24.5%	6.8%	100.0%		
	PDR	n	1591	1037	1031	3659		
		%	43.5%	28.3%	28.2%	100.0%		
With Diabetic Macular Edema	NPDR	n	748	421	100	1269	610.092a	P<.001
		%	58.9%	33.2%	7.9%	100.0%		
	PDR	n	313	315	108	736		
		%	42.5%	42.8%	14.7%	100.0%		
With out Diabetic Macular Edema	NPDR	n	1623	426	135	2184	56.201b	P<.001
		%	74.3%	19.5%	6.2%	100.0%		
	PDR	n	1278	722	923	2923		
		%	43.7%	24.7%	31.6%	100.0%		

Table 5: Distribution of grade of DR with DM and the resulting vision outcomes

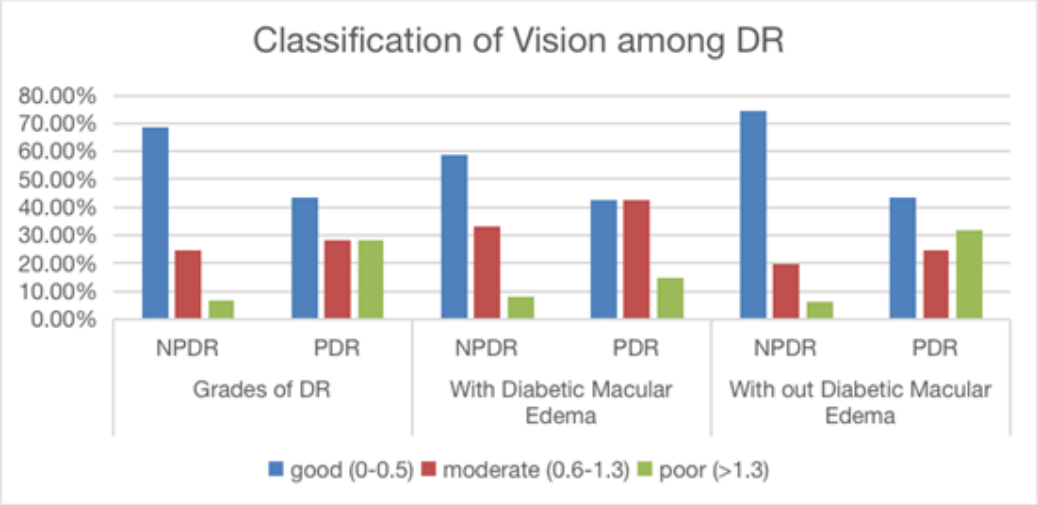

Fig 2: Classification of visual acuity among DR severity grading with or without DME

Diabetic retinopathy is a complication of diabetes, caused by high blood sugar levels damaging the back of the eye (retina). As per our study reports, table 5 presents, about 28% (2005 cases) of diabetic retinopathic patients have DME. When fluid leaks into the retina, the surrounding tissue swells, which results in DME. Vitreous hemorrhage was reported in 28% of DR patients. While tractional RD is reported in 13% of the patients. Increased IOP (intraocular pressure) inside the eye is the most common risk factor for glaucoma. Elevated intraocular pressure can lead to glaucoma. Glaucoma happens when high IOP damages the optic nerve. These nerves in both eyes connect directly to the brain and transmit electrical signals that the brain turns into images. If the Glaucoma remains untreated, it leads to vision loss.

In both PDR and NPDR groups, vision tends to decline with increasing severity. The percentage of patients with good vision decreases as NPDR severity increases; for instance, 84.4% of mild NPDR patients have good vision compared to only 52.2% in very severe NPDR. (table 6) Complications such as Vitrectomy, Tractional Retinal Detachment, and Neovascular Glaucoma significantly worsen vision outcomes, with 50.6%, 54.3%, and 76% respectively experiencing poor and worsened vision. Neovascular glaucoma is found to be 1% of individuals with DR, Lasered PDR is reported in 44% and post-vitrectomy in 7% of individuals with DR. (Fig 2) Early intervention is crucial for preserving vision, as evidenced by good outcomes in Lasered PDR, where 52.8% maintained good vision.

DR Grades	n	%
Non proliferative diabetic retinopathy (NPDR)	3453	100%
Mild NPDR	496	14%
Moderate NPDR	1855	54%
Severe NPDR	1012	29%
Very severe NPDR	90	3%
Diabetic macularedema	2005	28%
Proliferative diabetic retinopathy	3659	100%
Early PDR	825	23%
Vitreous Hemorrhage	1036	28%
Tractional Retinal Detachment	470	13%
Neovascular glaucoma	50	1%
Lasered PDR	1621	44%
Post Vitrectomy	253	7%

Table 6: Occurance of Ocular comorbidities in DR

The following table(7) provides valuable insights into the impact of different DR stages and ocular comorbidities on visual function, which is crucial for understanding and managing diabetic eye complications. Patients with mild NPDR tend to have the highest percentage of good vision (84.40%), while those with PDR neovascular glaucoma show the highest percentage of poor vision (76.00%). Visual function tends to decline as DR severity progresses, with higher percentages of poor vision in more advanced stages. The presence of Diabetic Macular Edema (DME) often corresponds to a higher proportion of moderate and poor vision across various DR

stages. Combinations of DR stages with DME and tractional retinal detachment generally result in poorer visual function outcome, shown in Fig 3.

DR Grades		Vision			
		good (0-0.5)	**moderate (0.6-1.3)**	**poor (>1.3)**	**Total**
Non proliferative diabetic retinopathy(NPDR)	**n**	2371	847	235	3453
	%	68.70%	24.50%	6.80%	
Mild NPDR	**n**	414	60	16	488
	%	84.40%	12.30%	3.30%	
Moderate NPDR	**n**	1309	436	112	1855
	%	70.50%	23.50%	6.00%	
Severe NPDR	**n**	603	315	9	1012
	%	59.40%	31.10%	9.50%	
Very severe NPDR	**n**	49	32	11	90
	%	52.20%	35.60%	12.20%	
Diabetic macular edema	**n**	1061	736	208	2005
	%	52.90%	36.70%	10.40%	
Proliferative diabetic retinopathy	**n**	1591	1037	1031	3659
	%	43.50%	28.30%	28.20%	
Early PDR	**n**	439	282	104	825
	%	53.20%	34.20%	12.60%	
Vitreous Hemorrhage	**n**	250	262	524	1036
	%	24.10%	25.30%	50.60%	
Tractional Retinal Detachment	**n**	79	136	255	470
	%	16.80%	28.90%	54.30%	
Neovascular glaucoma	**n**	7	5	38	50
	%	14.00%	10.00%	76.00%	
Lasered PDR	**n**	856	456	309	1621
	%	52.80%	28.10%	19.10%	
Post Vitrectomy	**n**	85	67	101	253
	%	33.60%	26.50%	39.90%	

Table 7: Proportion of Ocular comorbidities reported in DR patients.

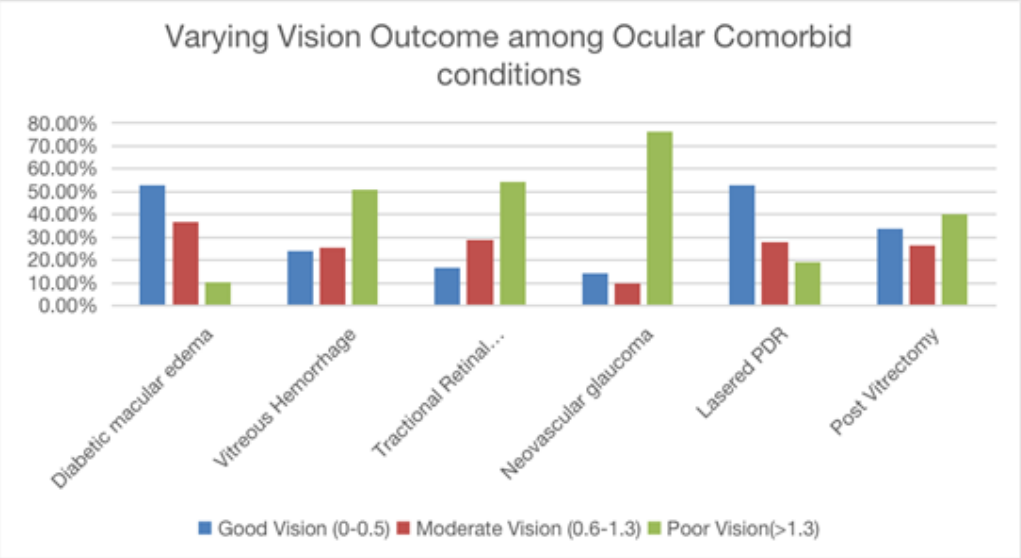

Fig 3: Classification of Vision with Ocular comorbidities reported in DR patients

IV. Discussion

Prevalence of DR in Indian population:

One ofthe most frequent microvascular problems in people with diabetes is diabetic retinopathy [DR], which is also the main cause of vision loss. According to population- based studies, diabetic people suffer DR symptoms and have DR conditions that can impair vision which include Diabetic Macular Edema and Proliferative Diabetic Retinopathy. After 10 years since the onset of diabetes, the incidence of DR in Type 1 Diabetes (T1DM) is 71–90%, however it is 67% in Type 2 Diabetes (T2DM).

The retina Registry of IOCTN showed an increase in the prevalence of DR with duration of disease, which was consistent with various other studies. According to findings by Dipali C. and Iva Kalita, patients with DR changes had an average duration of diabetes of 8.095 ± 4.867 years for type 1 diabetes and 7.16 ± 5.05 years for type 2 diabetes. Whereas mean duration of diabetes among diabetic people with no retinopathy changes was 5.517 ± 4.928 years among type 1 diabetes and 3.788 ± 4.494 years among type 2 diabetes. The prevalence of DR among type 1 DM patients increases from 15.0% in those with less than five years' duration of the disease to 80.0% in those with more than 15 years' duration. Similar to type 1 DM, type 2 DM has an increase in DR prevalence from 13% in those with diabetes under 5 years to 80% in those with diabetes over 15 years.[14]

Researchers Dr. Salil Gadkari and Dr. Quresh Maskati investigated the prevalent rate of diabetes throughout India, and their findings indicated that prevalence increased noticeably with age (OR: 2.367) and diabetes duration (OR: 3.318). In diabetics who had only recently been diagnosed (within the past six months), it ranged from 9.23% to 35.12%. Like in many previous investigations, men were more impacted (OR: 1.212). [15] In the epidemiological study conducted in Wisconsin by Drs. Rajiv Raman and Tarun Sharma, the prevalence of DR ranged from 28.8% in those with diabetes for less than five years to 77.8% in those with diabetes for 15 or more years.[16]

Vision Outcomes in DR:

According to research by Ronald Klein and B. Klein. The incidence of retinopathies, their development, and their progression to proliferative retinopathy was highest in younger individuals taking insulin and lowest in elderly individuals not taking insulin. The frequency of clinically significant macular oedema and legal blindness was highest in older-onset insulin users. Males and females did not differ significantly from one another. The data from the Wisconsin Epidemiologic Study of Diabetic Retinopathy provide reliable incidence rates of diabetic retinopathy and visual impairment.[15]

Diabetic retinopathy is one of the most sight-threatening complications of diabetes mellitusand one of the most important emerging causes of blindness. Globally, it is responsible for roughly 2.4 million incidents of blindness. Diabetic retinopathy affects 4.8% of the world's population. Recent epidemiological data show that France (16.6%) and Germany (10.6%)have the highest prevalence rates of diabetic retinopathy in people over 60. [17]. Accordingto a prospective international cohort study with 4,662 adult participants that was followed up for 8.4 years, the UK had the highest incidence of vision loss inpatients with any type of diabetic retinopathy (43.3%), followed by Switzerland (42.3%), Poland (31.8%), and Germany (29.9%). [18].

Germany had the highest prevalence of mild to moderate diabetic retinopathy (8.5%), followed by non-proliferative (1.7%) and proliferative diabetic retinopathy (0.6%). One of the main causes of blindness among people aged 25 to 65 in the West is diabetic eye disease. The most common cause of blindness in patients with diabetes is macular edema. Morphological changes that lead to blindness frequently develop without any symptoms and remain unnoticed by patients [17]

Visual Acuity in DR patients with Comorbidities:

Diabetic mellitus is a significant high risk factor for many ocular complications. Study on cataract surgery patients evidently show that presence of DM and advanced age, low post operative visual acuity, presence of interoperative and post-operative complications were significant factors for poor visual outcome [19]. When considering the impact of DM on Diabetic retinopathy patients, visual outcomes would be even more consequential.

Patients with diabetic retinopathy, glaucoma, macular generation, vitreous hemorrhages or a combination of these ocular comorbidities are known to cause lesser chances of improvement in visual function after surgery. A study on ocular co-morbidities and visual function after surgery reports age, sex, short preoperative surgical waiting period, low preoperative high and postoperative corrected distance visual acuity to have high significance on vision outcomes [20]. These risk factors were considered in our study to report the distribution of DR patients with ocular comorbidities and the visual acuity measured during the baseline visit.

Our study reports 1248 DR patients with DME which constitutes 33.7%. Study characterizing prevalence of DME in initial stages of DR, independent of severity grading, shows progressive increase in vision loss [21]. The increase in vision loss was studied over a period of 3 years follow up although an association with age or gender was not studied.Visual acuity studies have presented significant negative correlation with the presence of ocular comorbidities, but these ocular comorbidities did not show strong relation with age of the patient [22].

The registry reports 87% DR patients among the total DM patients (4220) with varying gradings. The registry also reports on the presence of other comorbidities like hypertension, stroke, CAD, CKD, dyslipidemia, and thyroid related diseases. Our investigations to attempt a correlation between visual loss and such comorbidities did not result in any significant findings. Nevertheless, there is a significant portion of the DR patients reporting heart diseases or hypertension (59%) which could be impacting the blood circulation aspect of the ocular health.

A study on visually impaired patients, 9% reported patients suffered from consequences of stroke, 27% musculoskeletal conditions,22% heart diseases, 10% COPD/asthma and 5% gastrointestinal issues [23]. A study evaluating the relation between BCVA, age, type of diabetes, DR and ocular comorbidity reported that significant vision loss is found in diabetic patients not because of DR but other coexisting ocular-comorbid conditions [24].

In order to assess the relationship between best corrected visual acuity (BCVA), age, type of diabetes, sight-threatening diabetic retinopathy (STDR), and ocular comorbidity, 1549randomly selected people with diabetes mellitus (DM) from a countywide digital photographic screening program underwent standardised logarithm of minimum angle of resolution (logMAR) BCVA measurement. In an individual eye, lenticular opacity (including capsular opacification) contributed significantly to 49% of cases of moderate visual loss (logMAR 0.50 to 0.98, Snellen 6/18 or worse but better than 6/60), 29% of cases of Acuity Blindness (logMAR > or =1.0, Snellen 6/60 or worse), 15% of cases of diabetic maculopathy, 13% of cases of other media causes, and 10% of cases of amblyopia.various ocular comorbidities are major contributors to vision loss in the diabetes population, along with diabetic retinopathy [25]

The lens becomes cloudy with age, which is the main cause of cataracts. In people with diabetes, it typically appears earlier in life. A person with diabetes has a greater likelihood of developing cataracts. IOP (intraocular pressure) increases inside the eye are the cause of glaucoma. Adults with diabetes have a doubled risk of developing glaucoma. Additionally at risk are people over 40 and those with a family history of glaucoma. [1]

Impact of low visual outcome in DR patients:

Studies on impact of vision impairment invariably report the declining quality of life especially in the older population. Older patients often report one or more existing comorbidities at baseline period and the impact of low vision further aggravates the difficulties. The quality of life is significantly impacted when in comparison to other chronic conditions. It appears to have a negative impact, lower than stroke, multiple sclerosis, chronic fatigue syndrome, major depressive disorder, and severe mental illness, but greater than type II diabetes, coronary syndrome, and hearing impairments [26].

While studying the quality of life over a wide range of chronic conditions, Sprangers et al.has characterized clusters of diseases based on levels of difficulties. It was discovered that urogenital problems, hearing loss, psychiatric illnesses, and dermatological conditions all have a comparatively positive impact on functioning. Heart disease, cancer, endocrinology, visual impairments, and chronic respiratory disorders were among a group of disease clusters occupying a middle position [27]. The patient's self-reported co- morbidity and other factors may affect the ophthalmologist's decision to perform surgery or how they deal with older patients who frequently have complex medication regimens. Additionally, research using pre-structured co-morbidity surveys is necessary to determine whether elderly patients with limited eyesight and certain co-occurring illnesses have worse QOL at follow-up or are more likely to undergo a sudden decrease in QOL [23].

V. Conclusion:

This study provided a comprehensive analysis of the prevalence, visual outcomes, and the impact of comorbidities in patients with Diabetic Retinopathy. The vision outcome in DR is directly aligned with severity. The increasing grading of DR imply decrease in visual acuity. The other factors such as ocular comorditidies and systemic disease reported in the patients also contributes to the impact of vision. The study list the major ocular complications that are commonly reported with DR. The findings emphasize the need for a holistic approach to healthcare that considers both ocular and systemic comorbidities in DR patients to enhance their quality of life and well-being.

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