Magnitude of Diabetic Retinopathy in Outpatients Presenting with Cataract in a Tertiary Care Hospital

Jayasri Krishnaraj[1], Kalaimamani Ezhilvendhan[2], Danish Halim[3]

[1]Department of Ophthalmology, Vinayaka Mission Kirupananda Variyar Medical College and Hospital, Salem, Tamilnadu, India. [2]Department of Ophthalmology, Vinayaka Mission Kirupananda Variyar Medical College and Hospital, Salem, Tamilnadu, India. [3]Department of Ophthalmology, Vinayaka Mission Kirupananda Variyar Medical College and Hospital, Salem, Tamilnadu, India.

ABSTRACT

BACKGROUND

Worldwide the incidence of diabetes and its complications is increasing in leaps and bounds. Our aim is to study the prevalence of diabetic retinopathy in outpatients presenting with cataract in the Department of Ophthalmology in a tertiary care hospital.

METHODS

All patients who had cataract were screened from January 2015 to June 2016 and patients with diabetic retinopathy were included in the study.

RESULTS

In our study 40% were found to have diabetic retinopathy of various stages. There is a significant association of NPDR with respect to CSME and there is highly significant association ($p<0.01$) of disease progression to advanced diabetic eye disease after the disease enters the PDR stage.

CONCLUSIONS

The more severe the diabetic retinopathy, the worse is the visual prognosis. In cataract patients, early detection and prompt treatment of retinal diseases like diabetic retinopathy can prevent their progression and there by improve the visual outcome following cataract surgery.

KEY WORDS

Non-Proliferative Diabetic Retinopathy, Clinically Significant Macular Oedema, Proliferative Diabetic Retinopathy

Corresponding Author:
Jayasri Krishnaraj,
Associate Professor,
Department of Ophthalmology,
Vinayaka Mission Kirupananda Variyar Medical College and Hospital,
Salem, Tamilnadu, India.
E-mail: jayasridr@gmail.com

DOI: 10.14260/jemds/2019/852

Financial or Other Competing Interests: None.

How to Cite This Article:
Krishnaraj J, Ezhilvendhan K, Halim D. Magnitude of diabetic retinopathy in outpatients presenting with cataract in a tertiary care hospital. J. Evolution Med. Dent. Sci. 2019;8(52):3937-3940, DOI: 10.14260/jemds/2019/852

Submission 03-11-2019,
Peer Review 15-12-2019,
Acceptance 21-12-2019,
Published 30-12-2019.

BACKGROUND

Patients with cataract most often have retinal pathology which may affect the visual prognosis and outcome following cataract surgery. Diabetic retinopathy and age-related macular degeneration are both age dependent diseases of retina which manifest around the same age as cataract. Also, the occlusive diseases affect the patients in the senile cataract age group. Risk factors associated with Diabetic Retinopathy.

Duration of Diabetes Mellitus

According to studies there is a strong association between the duration of systemic disease and prevalence of diabetic retinopathy (DR). The Wisconsin Epidemiological Study of Diabetic Retinopathy (WESDR) found that 13% and 90% of Type I DM patients taking insulin had NPDR or PDR in the 5 years and 10-15 years duration respectively. Whereas 40% and 84% of Type II DM patients taking insulin had NPDR or PDR in less than 5 years and 15-19 years duration respectively against 24% and 53% of Type II DM not taking insulin.[1]

Hyperglycaemia

HbA1c is glycosylated haemoglobin, an Amadori product which is used as a marker to know the status of Blood sugar control over 3 months of duration. In a study conducted by the diabetes Control and Complication Trial (DCCT) found that there was 35-40% reduction in the risk of retinopathy progression for every 10% decrease in HbA1c levels. This also represented five times risk of retinopathy when the HbA1c levels are around 10% compared to those with 7%.[2] Similar study was done by the United Kingdom Prospective Diabetes Study (UKPDS) where type II DM patients were assigned to conventional and more intensive glycaemic control with either insulin or a sulfonylurea [3]. After 12 years, the rate of retinopathy progression was decreased by 21% in cases with laser photocoagulation and reduced by 29% in cases with intensive therapy compared to conventional therapy.

Hypertension

The UKPDS study [4], comparison between more intensive blood pressure control (systolic <150 mmHg) to less intensive control (systolic <180 mmHg) showed 37% decrease in microvascular complications in intensive group.

Dyslipidemia

According to WESDR and Early treatment diabetic retinopathy study (ETDRS) elevated levels of cholesterol were associated with greater severity of retinal hard exudates. ETDRS found elevated levels plasma triglycerides were associated with greater risk of developing high risk PDR.[5] Statins and fenofibrate are lipid modulators used commonly. Fenofibrate reduces the risk of progression of diabetic retinopathy while only mildly altering plasma lipid profile.

Fundoscopic Lesions in Diabetic Retinopathy

Fundoscopic lesion in NPDR - microaneurysm (25-100 µm) which typically arise in the posterior pole as deep red dots, but can also be present in mid periphery and periphery in severe cases. On, FFA, they appear as hyperfluorescent dots in the arteriovenous transit and persists in later phases. Intraretinal haemorrhages appear as dot and blot haemorrhages which are typically small with sharply demarcated borders owing to its location in outer plexiform layer, is difficult to differentiate with MA. Flame shape haemorrhages are larger with wispy margins owing to its location in the nerve fibre layer (NFL). On FFA, appear hypofluorescent as they block normal fluorescence from the underlying choroid which helps in differentiating from MA. Haemorrhage at the disc is not a feature of diabetic retinopathy and should raise suspicion for neovascularization or co morbid condition of nerve head.

Hard exudates are sharply demarcated yellow-white lipid deposits in the outer plexiform layer. On OCT they appear as hyperreflective foci within the retina. They should be distinguished from drusen by stereoscopic viewing. Drusen being outside the retinal layer. Hard exudates are often distributed at the border between oedematous and non-oedematous retina. It may also form circinate ring around the areas of prominent vascular hyperpermeability such as clusters of microaneurysms. On FFA, they appear hypofluorescent by blocking choroidal fluorescence. When severe they get organised and cause subretinal fibrosis. Cotton wool spots or soft exudates are seen in the NFL, are white patches with wispy borders. It is due to relative ischemia of that area and is a sign of progression of the disease. On FFA, they are hypofluorescent by blocking normal choroidal fluorescence. Retinal vessels show changes like arterioles may appear thin and white while the venules may appear dilated and tortuous. Venous looping and beading can be seen. Intraretinal microvascular abnormalities appear as segments of dilated and tortuous retinal vasculature which are barely seen on ophthalmoscopy. They are differentiated from extraretinal NV by careful biomicroscopy owing its location within the layer of retina. On FFA, they appear hyperfluorescent in arteriovenous phase, often situated at the border of areas of capillary non perfusion. They may persist for months or years.

Investigations in Diabetic Retinopathy

Ancillary ocular imaging modalities which are commonly used for management of diabetic retinopathy are fundus photography, fluorescein angiography and Optical coherence tomography. It is a valuable clinical tool for evaluating progression of diabetic retinopathy in individual patients and in participants of a trial. It is not as sensitive as stereoscopic evaluation at detecting subtle features of diabetic retinopathy such as IRMA and extraretinal NV. But is of great help in record keeping, information sharing and used as teaching tool with patients.

Fluorescein Angiography

Following intravenous injection of hydrocarbon dye fluorescein sodium, photography or videography is done using appropriate filter. Its finding in diabetic retinopathy would be discussed elsewhere.

Optical Coherence Tomography (OCT)

It is fast and a non-invasive imaging technique where low coherence interferometry involving near infrared light is used to create cross-sectional image of intraocular structures.

In NPDR it is commonly used to characterize DME and abnormalities of vitreo-retinal interface. DME can be classified on the basis of OCT in the following image.

Type	Features
Type 1	Macular thickening: sponge-like swelling of the retina with a generalised, heterogeneous, mild hypo reflectivity compared to normal retina.
Type 2	diffuse macular oedema without cysts
Type 3	Cystoid macular oedema: presence of intraretinal, round or oval cystoid areas of low reflectivity, which are typically separated by highly reflective septae.
Type 3	Tractional macular oedema: presence of epiretinal membranes, vitreomacular traction or both.
Type 4	Serous retinal detachments: focal, arch-like elevations of neurosensory retina overlying a hypo reflective, dome-shaped space.

Classification of Diabetic Macular Oedema Based on OCT

In a study, by Nirmalan PK et al[6] on "The prevalence of vitreoretinal disorders in a rural population of southern India" found that vitreoretinal diseases appear to be a major public health problem in India. Emphasis on diabetic screening, diabetic therapy, and appropriate laser therapy of diabetic retinopathy must be explored. In a study, by Suman S Thapa[7] et al on "The prevalence and pattern of vitreo-retinal diseases in Nepal" found that the prevalence of vitreoretinal disorder in our population was 5.35%, age related macular degeneration, diabetic retinopathy, hypertensive retinopathy and retinal vein occlusion were the major retinal problems.

In Aimal Khan et al[8] study, "To evaluate the frequency and pattern of eye diseases in Retina Clinic of a Tertiary Care Hospital in Karachi" found there is a tremendous impact of increasing retinal blindness secondary to retinal diseases especially diabetic retinopathy in Pakistan. In a study, Hatef E et al[9] "Prevalence of retinal diseases and their pattern Tehran: The Tehran eye study" found considerable prevalence of retinal diseases in the population. The prevalence might be underestimated due to the lack of fundus photography. In a study, by Boniface Ikenna Eze et al [10] on "The burden and spectrum of vitreoretinal diseases among ophthalmic outpatients in a resource-deficient tertiary eye care setting in South-Eastern Nigeria" found retinal vascular disorders and age-related maculopathy are the leading retinal diseases.

METHODS

This study was a Cross Sectional Study conducted in the Department of Ophthalmology, Vinayaka Mission's Kirupananda Variyar Medical College & Hospital, Salem for a period of one and half years from January 2015 to June 2016. Around 700 patients with complaints of defective vision who attended the outpatient department and diagnosed to have cataract are screened. Among them 50 patients were found to have posterior segment pathologies. Prior to commencement, the study was approved by the Ethical and Research Committee, Vinayaka Mission's Kirupananda Variyar Medical College & Hospital, Salem. Patients with normal posterior segment, patients with glaucoma and patients with vitreoretinal diseases other than diabetic retinopathy were excluded from the study.

All the patients fulfilling selection criteria were explained about the nature and purpose of the study and a written informed consent was obtained before enrolment. Patient's records were analysed for data according to age, sex and clinical diagnosis made after detailed fundus evaluation with binocular indirect ophthalmoscope, slit lamp using 20 D and 90 D lenses and fundus photography. Data was entered and analysed for simple frequency using SPSS version 21.0. Tests for significant inter group differences were performed using the chi square test with a $p<0.05$ and $p<0.01$ considered statistically significant and highly significant respectively.

RESULTS

Sex	N	Minimum age	Maximum Age	Mean Age	SD
Male	30	42	72	59.33	6.47
Female	20	39	73	60.85	8.13
Total	**50**	**39**	**73**	**59.94**	**7.14**

Table 1. Mean Age among Males and Females

Non-Proliferative Diabetic Retinopathy (NPDR)	Frequency	%
Mild	10	53
Moderate	5	26
Severe	2	11
Very severe	2	11
Total	**19**	**100**

Table 2. Percentage of Various Grades of Non-Proliferative Diabetic Retinopathy

Clinically Significant Macular Oedema (CSME)	Frequency	%
Nil	37	74
Right eye	5	10
Left eye	3	6
Both eyes	5	10
Total	**50**	**100**

Table 3. Frequency and Percentage of Unilateral and Bilateral Clinically Significant Macular Oedema

Proliferative Diabetic Retinopathy (PDR)	Frequency	%	Frequency of Advanced Diabetic Eye Disease	%
No	42	84	48	96
Yes	8	16	2	4
Total	**50**	**100**	**50**	**100**

Table 4. Frequency and Percentage of Proliferative Diabetic Retinopathy and That of Patients Who Had Progressed to Advanced Diabetic Eye Disease

It is to be highlighted that all the patients who had progressed to ADED had uncontrolled diabetes of 10 or more years duration.

DISCUSSION

The retinal disease pattern noted at Vinayaka Mission's Kirupananda Variyar Medical College and hospital (V.M.K.V.M.C.H.) was comparable to those noted at other institutions in the developing world. Vitreoretinal diseases appear to be a major public health problem in rural southern India.[6] In a study of pattern of vitreoretinal disease in Pakistan it was found that there is a tremendous impact of increasing retinal blindness secondary to retinal diseases especially diabetic retinopathy.[8]

The male to female ratio was 1.5:1. This was similar to the study done by Aimal Khan et al[8] and Teshome T et al.[11] The higher male attendance of hospitals for healthcare in developing countries contributes to the male preponderance.

However greater uptake of cataract surgical service by males may be another reason for increased number of males with retinal diseases. The mean age group in our study was 59.33 years in males while in females it was 60.85 years. This is similar to the findings from a study conducted by Onakpoya OH et al[12] and can be compared to the study done in Malaysia where majority (61.9%) patients were above the age of 50 years. In our study 40% were found to have diabetic retinopathy of various stages. In a study by Aimal Khan et al,[8] he found 39.8% of patients to be suffering from diabetic retinopathy. This was also similar to the results from Nepal eye hospital where diabetic related conditions were most common cause for visiting the retina OPD.[8]

In study conducted by Karki DB et al[13] and Onakpoya OH et al[12] diabetic retinopathy accounted for 9.7% and 9.6% retinal diseases respectively. This warrants timely screening, evaluation, treatment, follow up and education for diabetic related conditions. The rate of proliferative diabetic retinopathy varied from 2.0% in persons who had diabetes for less than five years to 15.5% in persons who had diabetes for 15 or more years.[14] The Diabetes Control and Complications Trial (DCCT) demonstrated that a region of intensive therapy aimed at maintaining near normal blood glucose values markedly reduces the risks of development or progression of retinopathy and other complications of insulin dependent diabetes mellitus.[15] The occurrence of CSME, which is one of the major cause of decreased vision in diabetic was found to be 65%. In the study by Aimal Khan et al,[8] CSME was found in 45% of patients. There was significantly high association ($p< 0.01$) of disease progression to advanced stage after the disease enter the PDR stage.

CONCLUSIONS

There is a significant impact on vision secondary to vitreoretinal diseases which show increase in incidence with age. The more severe the diabetic retinopathy, the worse is the visual prognosis. In cataract patients, early detection and prompt treatment of retinal diseases like diabetic retinopathies and vaso-occlusive diseases can prevent their progression and there by improve the visual outcome following cataract surgery.

REFERENCES

[1] Klein R, Klein BE, Moss SE, et al. The Wisconsin epidemiologic study of diabetic retinopathy: III. Prevalence and risk of diabetic retinopathy when age at diagnosis is 30 or more years. Arch Ophthalmol 1984;102(4):527-32.

[2] The relationship of glycemic exposure (HbA1c) to the risk of development and progression of retinopathy in the diabetes control and complications trial. Diabetes 1995;44(8):968-83.

[3] Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). UK Prospective Diabetes Study (UKPDS) Group. Lancet 1998;352(9131):837-53.

[4] Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. UK Prospective Diabetes Study Group. BMJ 1998;317(7160):703-13.

[5] Chew EY, Klein ML, Ferris FL, et al. Association of elevated serum lipid levels with retinal hard exudate in diabetic retinopathy: Early Treatment Diabetic Retinopathy Study (ETDRS) Report 22. Arch Ophthalmol 1996;114(9):1079-84.

[6] Nirmalan PK, Katz J, Robin AL, et al. Prevalence of vitreoretinal disorders in a rural population of southern India: the Aravind comprehensive eye study. Arch Ophthalmol 2004;122(4):581-6.

[7] Thapa SS, Thapa R, Paudyal I, et al. Prevalence and pattern of vitreo-retinal diseases in Nepal: the Bhaktapur glaucoma study. BMC Ophthalmol 2013;13:9.

[8] Khan A, Riaz Q, Soomro F, et al. Frequency and patterns of eye diseases in retina clinic of a tertiary care hospital in Karachi. Pak J Ophthalmol 2011;27(3):155-9.

[9] Hatef E, Fotouhi A, Hashemi H, et al. Prevalence of retinal diseases and their pattern in Tehran: the Tehran eye study. Retina 2008;28(5):755-62.

[10] Eze BI, Uche JN, Shiweobi JO. The burden and spectrum of vitreo-retinal diseases among ophthalmic outpatients in a resource-deficient tertiary eye care setting in South-eastern Nigeria. Middle East Afr J Ophthalmol 2010;17(3):246-9.

[11] Teshome T, Melaku S, Bayu S. Pattern of retinal diseases at a teaching eye department, Addis Ababa, Ethiopia. Ethiop Med J 2004;42(3):185-93.

[12] Onakpoya OH, Olateju SO, Ajayi IA. Retinal diseases in a tertiary hospital: the need for establishment of a vitreo-retinal care unit. J Natl Med Assoc 2008;100(11):1286-9.

[13] Karki DB, Malla OK, Byanju RN, et al. Analysis of 400 cases of posterior segment diseases visiting retina clinic of Nepal Eye hospital. Kathmandu Univ Med J (KUMJ) 2003;1(3):161-5.

[14] Klein R, Moss S. A comparison of the study populations in the diabetes control and complications trial and the Wisconsin epidemiologic study of diabetic retinopathy. Arch Intern Med 1995;155(7):745-54.

[15] The relationship of glycemic exposure (HbA1c) to the risk of development and progression of retinopathy in the diabetes control and complications trial. Diabetes 1995;44(8):968-83.