International Journal of Research in Medical Sciences
Saxena N et al. Int J Res Med Sci. 2013 Nov;1(4):460-464
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: 10.5455/2320-6012.ijrms20131130

Research Article

Ocular involvement in diabetic patients attending tertiary care centres of eastern U.P., India: a prospective study

Nutan Saxena[1]*, A. M. Jain[1], Perwez Khan[2], Ruchika Agarwal[1], Harish Chandra Tiwari[3], Anita Thakur[1]

[1]Department of Ophthalmology, [3]Department of Community Medicine, Rama Medical College Hospital and Research Centre, Mandhana, Kanpur, U.P., India
[2]Department of Ophthalmology, GSVM Medical College, Kanpur, U.P., India

Received: 14 August 2013
Accepted: 24 August 2013

***Correspondence:**
Dr. Nutan Saxena,
E-mail: saxena.nutan@rediffmail.com

ABSTRACT

Background: Diabetes mellitus is increasing day by day in developing countries especially in India. It is a main treatable cause of morbidity in eye. Diabetic cataract, neovascular glaucoma and retinopathy are important ocular complications due to diabetes mellitus. The objective was to study the variations in ocular complications in patients of diabetes mellitus.
Methods: A prospective study from July 2012 to June 2013 was conducted in RMCH and RC, Kanpur & GSVM Medical College, Kanpur. One hundred one selected diabetic patients who are having abnormal slit lamp and fundus examination were included in this study.
Results: In our study it was found that more the duration of diabetes, greater the severity of diabetes. Well controlled diabetics have lesser complications in eyes due to diabetes.
Conclusion: Patient's age, sex, duration and control of diabetes play important role in development and severity of complications in eye due to diabetes mellitus.

Keywords: Diabetes mellitus, Cataract, Neovascular glaucoma, Retinopathy, Haemorrhage

INTRODUCTION

Diabetes is very common in developed countries. In developing countries like India it is increasing day by day. About 5% populations are affected by Diabetes in U.S.A.[1] In India about 2.4% of the rural population and 4.0 – 11.6% of the urban population is suffering from Diabetes.[2] Diabetes and its complications like nephropathy, neuropathy, microangiopathy and retinopathy are a major cause of morbidity.[3] Among ocular manifestations, diabetic cataract, neovascular glaucoma and retinopathy are common.

Diabetic cataract though rare gives snow flake appearance due to imbibitions of water droplet. The enzyme aldose reductase catalyzes the reduction of glucose to sorbitol through the polyol pathway, a process linked to the development of diabetic cataract.[4,5] Mild degree may cause changes in refractive index leading to myopia. Phacoemulsification with intraocular implantation is now a days the preferred technique for cataract removal in most of cases. This technique was developed by Kelman in 1967 and was not widely accepted until 1996.[6]

Neovascular glaucoma (NVG) is a severe form of secondary glaucoma characterized by proliferation of fibro- neovascular vessels appear on the surface of the

iris and take on an irregular, meandering.[7] The prevalence of neovascular glaucoma is significantly higher in diabetics with proliferative diabetic retinopathy as compared with all diabetics.[8] Individuals with diabetes may be more vulnerable to elevated intraocular pressure,[9] with more severe visual field loss at the same intraocular pressure level.[10]

Diabetic retinopathy is retinopathy (damage to the retina) caused by complications of diabetes, which can lead to blindness eventually. Diabetic retinopathy is the result of micro vascular occlusion and leakage. Pathologically Hyperglycemia-induces RBC changes like deformation of erythrocytes and rouleaux formation and thickening of the basement membrane. It leads to incompetency of vessel wall which in turn causes retinal vessel occlusion while intramural pericyte death make the retinal blood vessels become more permeable leading to leakage of vessels & formation of micro aneurysm.[11] Microvascular occlusion leads to capillary non perfusion and retinal hypoxia causing formation of artreriovenous shunts and neovascularization of retina.

Aims and Objectives

The present study aims to highlight the frequencies, clinical presentations, natural histories, and variations of ocular complications occurring due to diabetes mellitus.

METHODS

This prospective study was carried out in Rama Medical College Hospital and Research Centre (RMCH & RC), Kanpur & GSVM Medical College, Kanpur. Diabetic patients coming to ophthalmology OPD of these two medical colleges from July 2012 to June 2013 were included in this study. Diabetic patients coming to ophthalmology OPD were registered in Retina clinic. Detailed history including family history and examination like blood pressure measurement, slit lamp examination, tonometry and indirect ophthalmoscopy was done. Routine Investigations like fasting & postprandial blood sugar, Glycosylated haemoglobin (HbA1c), urine (routine and microscopic) and renal function tests were done. Later on fundus fluorescein angiography and OCT was done. Patients having normal investigations and fundus were excluded from the study. Patients less than 20 year of age and not willing to participate in study were also excluded. Finally one hundred one selected diabetic patients who are having abnormal slit lamp and fundus examination were included in this study. On the basis of above findings we categorize the patient according to age, sex, ocular and fundus changes. We also found out co-relation of Diabetes with its duration, control, blood pressure and family history. Chi square test was used to find out significant association between different variables & $P < 0.05$ is taken as significant.

RESULTS

Out of 101 selected diabetic patients 52 (51.5%) were males while 49 (48.5%) females with age ranging from 20 to 70 years (Table 1).

Table 1: Age and sex distribution of patients.

Age(years)	Male	Female	Total
20-30	4	2	6
30-40	12	14	26
40-50	20	18	38
50-60	14	12	26
More than 60	02	03	05
Total	52 (51.5%)	49 (48.5%)	101(100%)

All six patients' age between 20-30 years had mild diabetic retinopathy. Patients between 30-40 years age group had increased severity of diabetic retinopathy along with macular oedema. As age advances from age of 40 years and above diabetic cataract, neovascular glaucoma, severe diabetic retinopathy and vitreous haemorrhage cases increases (Table 2).

Table 2: Distribution of patients according to ocular complications.

	Diabetic Cataract	Neo-vascular Glaucoma	Diabetic Retinopathy	No view of Fundus
20-30	Nil	Nil	6(100%)	Nil
30-40	Nil	Nil	26(100%)	Nil
40-50	2(5.26%)	1(2.63%)	35(92.10%)	3(7.89%)
50-60	1(3.80%)	2(7.60%)	20(76.92%)	6(23.07%)
More than 60	1(20%)	Nil	4(80%)	1(20%)
Total	4	3	91	10

Among 6 patients' age between 20-30 years 33.33% had punctate haemorrhage and same had punctate haemorrhage with hard exudates. Large haemorrhage and macular oedema was present in 16.66% cases each (Table 3).

When diabetic retinopathy is correlated to duration of diabetes mellitus, significant (X^2= 7.26, df= 2, P= <0.05) higher diabetic retinopathy changes was evident in patients with longer duration of diabetes (Table 4). Among patients with duration of diabetes less than 10 years retinal haemorrhage and macular oedema were present in 6 (5.94%) & 2 (1.98%) of cases respectively while in patients with diabetes of 10-20 years duration, 8.94% cases had retinopathy & 12.9% had combined macular edema & vitreous hemorrhage (Table 4).

Table 3: Fundus changes in diabetic retinopathy.

Age of patients	Punctuate Hemorrhage (P.H)(1)	P.H + Hard exudates (H.E)(2)	Large Retinal Hemorrhage (1+2+3)	Macular Edema (4)	Mixed (1+2+3+4)	Vitreous Hemorrhage
20-30 yrs	2(33.33%)	2(33.33%)	1(16.66%)	1(16.66%)	Nil	Nil
30-40 yrs	4(15.38%)	13(50%)	6(23.07%)	3(11.53%)	Nil	Nil
40-50 yrs	2(5.26%)	7(18.42%)	14(36.84%)	Nil	12(31.57%)	2(5.26%)
50-60 yrs	1(3.84%)	2(7.69%)	9(34.61%)	Nil	8(30.76%)	3(11.53%)
More than 60	Nil	Nil	Nil	Nil	4(80%)	1(20%)

Table 4: Co-relation of diabetic retinopathy.

		Retinal Haemorrhage	Macular Edema & Vitreous Haemorrhage	X^2-test & P- value
Duration of Diabetes	Under 10 years	6 (5.94%)	2 (1.98%)	X^2= 7.26, df=2, P= <0.05
	10-20 years	9(8.94%)	13 (12.9)	
	Over 20 years	48 (47.5%)	19 (18.8%)	
Diabetes	Controlled (39)	11 (10.8%) 35	13 (12.8%) 21(16.83%)	X^2= 5.12, df=1, P= <0.05
	Not controlled(62)	52 (51.4%)	21(20.8%)	
Blood Pressure	Controlled (46)	30 (29.7%)	17 (16.8%)	X^2= 0.50, df=1, P= >0.05
	Not controlled (65)	33 (32.6%)	17 (16.8%)	
Family history of Diabetes	Yes	34 (33.7%)	21(12.8%)	X^2= 0.54, df=1, P= >0.05
	No	29 (28.7%)	13 (20.8%)	

Among 26 cases (100% cases were suffering from diabetic retinopathy) of age group 30-40 years, 23.07% cases had large retinal haemorrhage with hard exudates and 11.53% cases of macular oedema. Punctate haemorrhage with or without hard exudates were 15.38% and 50.00% respectively. In between 40 & 50 years age 5.26% cases of punctuate haemorrhage, 18.42% with hard exudates, 36.84% with large retinal haemorrhage and 31.57% each of mixed retinal haemorrhage and macular oedema while 5.26% cases of vitreous haemorrhage was found in this study. Subsequently in 50-60 years age group 30.76% cases of mixed retinal haemorrhages along with macular oedema, 34.61% cases of large retinal haemorrhage with hard exudates,11.53% cases of vitreous haemorrhage, 7.69% cases each of punctuate haemorrhage & with hard exudates and only 3.84% of punctate haemorrhage were found. Among cases having age more than 60 years 80% cases mixed of

large haemorrhage with hard exudates, macular oedema and 20% cases of vitreous haemorrhage were found in present study (Table 3).

In patients of more than 20 years of diabetes significantly higher percentage of complications like retinal hemorrhages (47.5%) & combined macular edema and vitreous haemorrhage (18.8%) were seen (Table 4).

In patients with un-controlled diabetes significantly (X^2= 5.12, df= 1, P= <0.05) higher diabetic eye changes was seen (51.4% retinal haemorrhages & 20.8% macular oedema/ vitreous haemorrhages) as compared to patient with well controlled diabetes (retinal haemorrhages, 10.8% & macular oedema/ vitreous haemorrhages, 12.8%). It means patients in whom diabetes was not controlled having relatively higher diabetic eye changes.

Patients with uncontrolled blood pressure did not showed significant difference in changes of diabetic retinopathy. 33 (32.67%) cases with uncontrolled blood pressure while30 (29.70%) patients with controlled blood pressure showed evidence of retinal haemorrhages. Similarly patients having family history of diabetes did not showed significant difference in changes of diabetic retinopathy as compared to patients with negative family history of diabetes mellitus.

DISCUSSION

Diabetic retinopathy is the most well-known ocular complication of diabetes and the leading cause of blindness among people 20–64 years of age in the U.S.A.[12] The incidence of diabetic cataract and neovascular glaucoma though rare but it accounts for less than one third of total selected cases who are having ocular complications due to diabetes. In our study 3.96% cases of diabetic cataract while 2.97% cases of neovascular glaucoma were there. It means cataract cases were slightly higher. There is additional evidence that the risk of cataract increases with increasing diabetes duration and severity of hyperglycemia.[13] Deposition of advanced glycation end products in the lens has been postulated as one possible pathogenic mechanism for diabetic cataract.[14] The incidence of ocular complications of diabetes is relatively higher among females than males while females were lesser in number though male:female was 1:1.02 only. It might be due to negligence about health among females in India. The incidence of severity of diabetic retinopathy increases as age advances. Younger patients less than 30 years had only mild diabetic retinopathy and no other ocular complications. Above 40 years as age & duration of diabetes increases, severity of diabetic retinopathy increases, vitreous hemorrhage and other complications like cataract & neovascular glaucoma occur. Cases of less than 40 years age had all the retinal complications other than vitreous haemorrhage, in these 90% cases were of diabetes less than 10 years duration there perhaps it is due to its relation with duration of occurrence of diabetes. As duration of diabetes increases severity of diabetic retinopathy increases. Diabetic retinopathy of more than 10 years duration all ocular complications like proliferative retinopathy, vitreous haemorrhage, macular oedema, cataract and neovascular glaucoma occur. More severe cases of proliferative diabetic retinopathy are seen in patients suffering from diabetes longer than 20 years duration. In our study there were 5 patients of more than 60 years, instead of controlled Diabetes and blood pressure we found 3 cases (60%) each of mixed retinal haemorrhages, hard exudates, macular oedema and vitreous haemorrhage while 2 cases (40%) are having uncontrolled diabetes and blood pressure. It means duration of diabetes also play important role in development of diabetic retinopathy. There is higher incidence of haemorrhages in diabetic retinopathy in patients with well controlled diabetes than in those non controlled diabetes. The incidence and severity of diabetes does not show much difference with the rise of blood pressure. It is quite surprising that macular oedema and vitreous haemorrhage do not show any difference in patients whose blood pressure was not controlled. Tight control of hyperglycemia, blood lipids, and blood pressure has been shown to be beneficial to proven its development or progression.[15,16] In major clinical trials, tight control of blood glucose and blood pressure has been demonstrated to reduce the risk of retinopathy and associated blindness.[17] In all tables we recorded only 97 cases because in one patient due to mature cataract and 3 cases of neovascular glaucoma fundus findings could not be elaborated. The incidence of ocular complications of diabetes is much more with family history of diabetes rather than those who are not having family history of diabetes.

CONCLUSION

In diabetes mellitus age and duration of its occurrence matters most, the incidence of its complications like diabetic cataract, neovascular glaucoma and diabetic retinopathy increases as age and duration of diabetes increases. Cataract due to diabetes occurs mainly in older age group. Diabetics with high blood pressure do not play much role in severity of diabetic retinopathy. It is very surprising factor in this analysis only retinal haemorrhages are in more uncontrolled blood pressure in diabetics while macular oedema and vitreous haemorrhage are same in both uncontrolled and controlled blood pressure in diabetics was not controlled.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Moy CS. Diabetes 1991 vital statistics. Alexandria VA: American diabetis association; 1991.pg 13.

2. Wild S, Roglic G, Green A, Sicree R, King, H. Global prevalence of Diabetes. pg - 1047-53.
3. Klein R. Retinopathy in a population based study. Trans American Ophthalmol. Society 1992; 90: pg - 561-94.
4. J. H. Kinoshita, "Mechanisms initiating cataract formation. Proctor lecture," Investigative Ophthalmology, vol. 13, no. 10, pp. 713–724, 1974.
5. J. H. Kinoshita, S. Fukushi, P. Kador, and L. O. Merola, "Aldose reductase in diabetic complications of the eye," Metabolism, vol. 28, no. 4, pp. 462–469, 1979.
6. J. L. Goldstein, "How a jolt and a bolt in a dentist's chair revolutionized cataract surgery," Nature Medicine, vol. 10, no. 10, pp. 1032–1033, 2004.
7. Ritch, R., Shields MB, Krupin T, The Glaucomas, St. Louis, MO: Mosby; 1989:1067.
8. Striga, M. et al. Ophthalmologica 1993; 207:144–147.
9. Jacobson DR, Murphy RP, Rosenthal AR: The treatment of angle neovascularization with panretinal photocoagulation. Ophthalmology 86: 1270–1277, 1979.
10. Zeiter J H, Shin DH, Baek NH: Visual field defects in diabetic patients with Primary Open angle glaucoma.Am. J Ophthal 111:581-584, 1991.
11. Pardianto G et al. (2005). "Understanding diabetic retinopathy". Mimbar Ilmiah Oftalmologi Indonesia 2: 65-6.
12. Congdon NG, Friedman DS, Lietman T: Important causes of visual impairment in the world today. JAMA 290:2057–2060, 2003.
13. P.-J. Guillausseau, P. Massin, M.-A. Charles, et al., "Glycaemic control and development of retinopathy in type 2 diabetes mellitus: a longitudinal study," Diabetic Medicine, vol. 15, no. 2, pp. 151–155, 1998.
14. R. Turner, "Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33),"The Lancet, vol. 352, no. 9131, pp. 837–853, 1998.
15. Negahban K, Chern K: Cataracts associated with systemic disorders and syndromes. Curr Opin Ophthalmol 13:419-422, 2002.
16. Pirie A: Epidemiological and biochemical studies of cataract and diabetes. Invest Ophthalmol 4:629–637, 1965.
17. Mohamed Q, Gillies MC, Wong TY: Management of diabetic retinopathy: a systematic review. JAMA 298:902–916, 2007.

DOI: 10.5455/2320-6012.ijrms20131130
Cite this article as: Saxena N, Jain AM, Khan P, Agarwal R, Tiwari HC, Thakur A. Ocular involvement in diabetic patients attending tertiary care centres of eastern U.P., India: a prospective study. Int J Res Med Sci 2013;1:460-4.