

Diabetes and glaucoma: How deep is the relation?

Dr. Chaithra C M¹, Dr. Kshama.K²

^{1,2}Senior Resident, Department of Ophthalmology, Mysore Medical College and Research Institute, Mysore, Karnataka, India

Corresponding Author:

Dr. Chaithra C M, Senior Resident, Department of Ophthalmology Mysore Medical College and Research Institute, Mysore, Karnataka, India

Abstract

Background and aim: India is one of the 7 countries of the IDF (International Diabetes Federation) SEA (south-east Asia) region. 463 million people have diabetes in the world and 88 million people in the SEA Region; by 2045 this will rise to 153 million. There were over 77,005,600 cases of diabetes in India in 2020. In our study we tried to determine the risk factors for development of Glaucoma, especially in Type-2 diabetics and its magnitude.

Methods: a cross sectional study done in KIMS OPD, Bangalore between January 2018-may 2019. Diabetes was diagnosed by history and measurement of blood sugar levels. Glaucoma was diagnosed by assessing optic disc morphology, visual fields, and intraocular pressure. Systemic blood pressure was also measured for the patients. Statistical significance was indicated by $P < 0.05$.

Results: Study cohort included 350 patients with Type-2 Diabetes (150 males and 250 females), mean age of 52 \pm 9 years. Prevalence of glaucoma was 16% (95% CI; 13.4-18.3). Out of this 16%, 50% had primary open angle glaucoma, 32% primary angle closure, 12.5% neovascular glaucoma, 5.3% other types. 77% diabetics didn't have Diabetic retinopathy. Presence of glaucoma was significantly associated with the duration of Diabetes (chi-square=5.80 and $p < 0.015$). Presence of Diabetic retinopathy was Not significantly associated to the presence of glaucoma (odds ratio=1.42). Even presence of systemic hypertension did not affect the magnitude of glaucoma in diabetics.

Conclusion: Screening for glaucoma while screening Diabetic cases may yield us more cases of glaucoma and the duration of diabetes is one of the most important determinants for development of glaucoma.

Keywords: Glaucoma, diabetes mellitus

Introduction

- India is one of the 7 countries of the IDF (International Diabetes Federation) SEA (south-east Asia) region. 463 million people have diabetes in the world and 88 million people in the SEA Region; by 2045 this will rise to 153 million. The prevalence of diabetes in India is 8.9% in 2020 and there were over 77,005,600 cases of diabetes in India in 2020. The prevalence of DR in diabetics in India is around 18%. Based on the accelerated "VISION-2020 initiatives" to address cataract, which is considered the leading cause of age-related visual impairment, the contribution of glaucoma and DR to global blindness is significant

and continues to increase.

- There are about 80 million glaucoma patients in the world and nearly 12 million are affected in India. Most of the glaucoma patients doesn't have early warning signs and hence early screening is necessary. The prevalence of glaucoma in diabetics ranges from 4.96% to 14.6%. Due to asymptomatic state of early changes in DR, annual screening is must and it should include neovascular screening for glaucoma also.

Materials and Methods

A cross sectional study done from January 2018-May 2019 which included diabetics coming for regular eye check-up as well as with established glaucoma status in KIMS, Bangalore.

To calculate the sample size for this study, we assumed the prevalence of glaucoma in diabetes to be 11.1% and to achieve 95% confidence intervals (CIs) and clustering effect of 1.5 and to compensate for the loss of data, an additional 5% was added to the sample size so we considered 350 patients with type 2 diabetics (150 males, 250 females).

- Mean age of 50+/- 9 years.
- Measurement of blood sugar levels including FBS, PPBS and HbA1C levels.
- Glaucoma was diagnosed by assessing optic disc morphology, visual fields, and intraocular pressure.
OCT was done in relevant cases.
- Systemic blood pressure was also measured manually for all patients.

Inclusion criteria: Patients with type 2 Diabetic irrespective of ocular signs and symptoms attending OPD.

Exclusion criteria: Patients with secondary glaucoma due to retinal vein occlusion, uveitis, trauma etc.

Results

Table 1: Diabetes+ Glaucoma

	Diabetes+ glaucoma (n=46)	
POAG	31	67.3%
PACG	7	15.3%
NVG	5	10.8%
Others	3	6.5%

Table 2: Duration of Diabetes

Duration of Diabetes	Glaucoma		P value
	Present	Absent	
<5years	19	155	<0.05
5-9years	27	149	
Total	46	304	

Table 3: Diabetic retinopathy

Diabetic retinopathy	Glaucoma	
	Present	Absent
1a (non-proliferative diabetic retinopathy)	9(19.5%)	21(6.9%)
1b (sight threatening diabetic retinopathy)	11(23.9%)	27(8.8%)
NO	26(56.5%)	256(84.2%)
Total	46	304

Table 4: Hypertension

HTN	Glaucoma	
	Present	Absent
Present	15	125
Absent	31	179
	46	304

Odds ratio 1.80(not significant)

Discussion

In our study,

- Prevalence of glaucoma in diabetics was 13.1%.which falls within the range reported from other studies worldwide. Statistically significant association was there between duration of diabetes and glaucoma
- In an Australian study, the prevalence of glaucoma among diabetics was 7.7%. In Western India, the prevalence of glaucoma among diabetics is 15%. Ellis *et al.* found that 20% of diabetics had glaucoma. The prevalence of glaucoma among diabetics in Oman was reported at 8.9%. In Botswana (Africa), 2.5% of patients with diabetes had glaucoma. A study in the United Kingdom reported a 2.5 times higher risk of glaucoma among diabetics. Large studies such as the Rotterdam Eye Study and Malay Eye Study also suggested that diabetes was not a risk factor for open angle glaucoma. The wide variation in prevalence in the literature may be due to differences in race, geographic locations and the method of measurements among studies.

We found no gender-related differences in the prevalence of glaucoma among diabetics. Among African females, a strong association of diabetes and glaucoma was observed. In Oman, the prevalence of glaucoma was significantly higher among male diabetics compared to female diabetics. So there is no proper study for gender predilection. Prevalence of POAG was 67% in our study and it proved that diabetes is one of the important risk factor for POAG.

- Most studies in the literature have focused on POAG and diabetes and concluded that diabetes is a risk factor for POAG.

The duration of diabetes was a significant predictor of glaucoma in our study. Duration naturally increases with the age of the patient. As age was not significantly associated to glaucoma in our study, it is less likely to influence the positive association of duration of diabetes to glaucoma.

There are some limitations to our study. Ideally, a longitudinal study is required to study the risk factors for glaucoma. Our cross-sectional study reports trends only. The subsample size of the type of religion and diet was small. Therefore, their influence on the association of diabetes and glaucoma should be interpreted with caution.

Early detection and timely intervention of sight threatening diseases like diabetic retinopathy and glaucoma is highly recommended! Nearly 30% of individuals with open angle glaucoma have diabetes. Therefore, DR screening among diabetics is recommended. We believe that combined screening for DR and glaucoma should depend on the magnitude of both of these potentially blinding conditions, and it should be implemented in routine ophthalmic check-up. Although population based glaucoma screening is not recommended, periodic comprehensive eye assessment of all patients older than 40 years (including diabetics) could be an alternative strategy for early detection of glaucoma and diabetic retinopathy.

Conclusion

- Duration of Diabetes is one of the most important determinant other than high intraocular pressure for the development and progression of glaucoma.
- Systemic hypertension didn't affect the development of glaucoma in our study.

References

1. Chopra V, Varma R, Francis BA, Wu J, Torres M, Azen SP. Los Angeles Latino Eye Study. Group. Type 2 diabetes mellitus and the risk of open-angle glaucoma the Los Angeles Latino Eye Study. 2008 Feb;115(2):227-232.e1. Epub 2007 Aug 22.
2. Mitchell P, Smith W, Chey T, Healey PR. Open angle Glaucoma and diabetes: the Blue Mountains eye study, Australia. 1997 Apr;104(4):712-8.
3. Dharmadhikari S, Lohiya K, Chelkar V, Kalyani VK, Dole K, Deshpande M, *et al.* Magnitude and determinants of glaucoma in type II diabetics: A hospital based cross-sectional study in Maharashtra, India. Oman J Ophthalmol. 2015 Jan-Apr;8(1):19-23. DOI: 10.4103/0974-620X.149858.
4. Hou H, Shoji T, Zangwill LM, Moghimi S, Saunders LJ, Hasenstab K, *et al.* Progression of Primary Open-Angle Glaucoma in Diabetic and Nondiabetic Patients. Am J Ophthalmol. 2018 May;189:1-9. DOI: 10.1016/j.ajo.2018.02.002. Epub 2018 Feb 13.
5. Zhou M, Wang W, Huang W, Zhang X. Diabetes mellitus as a risk factor for open-angle glaucoma: a systematic review and meta-analysis. PLoS One. 2014 Aug19;9(8):e102972. DOI: 10.1371/journal.pone.0102972. eCollection 2014.