

## Prevalence of glaucoma in patients with type 2 diabetes mellitus at tertiary care hospital of Gwalior

Girish Dutt Chaturvedi<sup>1,\*</sup>, Ritu Chaturvedi<sup>2</sup>

<sup>1,2</sup>Resident, Dept. of Ophthalmology,  
G.R Medical College, Gwalior MP

**\*Corresponding Author**

E-mail: drgirishgw1@gmail.com

### Abstract

**Background:** Diabetes is considered as a risk factor for glaucoma as they both shares the common pathogenesis.


**Aims and objective:** The present study was done to find out the prevalence of glaucoma in patients with type 2 diabetes mellitus (DM).

**Materials and Methods:** The present hospital based prospective study included 100 patients of type 2 diabetes, between July 2014 to August 2015, presenting to the outpatient department of Department of Medicine and Ophthalmology, G R Medical College, Gwalior (MP). Diagnosis of glaucoma was done as per raised intra ocular pressure (IOP) and gonioscopy. Patients were classified into primary open-angle glaucoma (POAG), primary angle closure suspects (PACS), primary angle closure (PAC), primary angle closure glaucoma (PACG), ocular hypertension (OHT), normal-tension glaucoma (NTG) and secondary glaucoma.

**Results:** Mean age in present study was 57.39±9.08 years. Mean duration of diabetes was 6.26±3.91 years. Prevalence of glaucoma was 15%. Most of the patients (80%) were having IOP between 16-20 mmHg. 96% of the patients belong to Grade 4 (96%) as per Gonioscopic Shaffer's grading system.

**Conclusion:** Patients with type 2 diabetes (T2DM) are at high risk of developing glaucoma.

**Keywords:** Diabetes mellitus, Glaucoma, Visual impairment

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### Introduction

Glaucoma is a gradually advancing optic neuropathy which may lead to permanent blindness affecting 66.8 million people worldwide in year 2000.<sup>1</sup> In India, prevalence of glaucoma range from 4.96% to 14.6%.<sup>2</sup>

The World Health Organization (WHO) has reported glaucoma and diabetic retinopathy as important eye disease whose treatment has to be done as soon as possible.<sup>3</sup> According to VISION 2020 initiative, cataract is considered as leading cause of visual impairment, but glaucoma is also significantly contributing to global blindness percentage.<sup>2</sup>

Glaucoma may lead to vision loss as it is a kind of progressive optic neuropathy. Glaucoma is also one of the main reasons behind the permanent blindness throughout the world. Data revealed that there are around 66.8 million people throughout the world who had suffered with glaucoma.<sup>1</sup> Diabetes mellitus may also result in increased central corneal thickness leading to increased intra ocular pressure (IOP). Studies have also shown association between primary open-angle glaucoma (POAG) and DM.<sup>1</sup>

The present study was aimed to study the prevalence of glaucoma in patients with type 2 diabetes.

### Materials and Methods

The present hospital based prospective study included 100 type 2 diabetes patients in the Department of Ophthalmology and Department of Medicine, JA Groups of Hospitals, G R Medical College, Gwalior between July 2014 to August 2015.

A Written informed consent from all the patients and Ethical Committee approval was obtained before starting the study.

All type 2 diabetic (T2DM) patients above the age of 40 years, with history of episodes of sudden blurring of vision associated with redness, watering, ocular pain, colored halos and patients with any other ocular complaints were included in the present study.

Patients with any surface disorder (macular-leucomatous corneal opacity etc.); patients with history of ocular trauma, ocular infection (keratitis, uveitis and choroiditis), ocular malignancies and patients with secondary glaucoma were excluded from the study.

Detailed history and external eye examination was performed as an initial evaluation of all the patients.

Diagnosis of glaucoma was done as per raised intra ocular pressure (IOP) level, evidence of glaucomatous optic disc damage and angle closure glaucoma. Diagnosis by gonioscopy and IOP was done in every case except the cases having active infections and corneal surface diseases.

Gonioscopy was graded as per Gonioscopic Shaffer's grading system as Grade 4 (angle width of 45-

35), Grade 3 (angle width of 35-20), Grade 2 (angle width of 20), Grade 1 (angle width of <10) and Grade 0 (angle width of zero).

All the patients were classified into primary open-angle glaucoma (POAG), primary angle closure suspects (PACS), primary angle closure (PAC), primary angle closure glaucoma (PACG), ocular hypertension (OHT), normal-tension glaucoma (NTG) and secondary glaucoma.

All the data were analysed using IBM SPSS-ver.20 software. Analysis was performed using chi-square test and independent sample student t test. P values <0.05 was considered to be significant.

## Results

Mean age in present study was 57.39±9.08 years. Most of the patients belong (41%) to age group of 50 to 59 years followed by 28% patients in 60-69 years of age. Seventeen percent patients belong to age group of

40-49 years and there were 14% patients in age group of more than 69 years.

There were equal no of males (50%) and females (50%). In present study, 52% were from rural area whereas, 48% were from the urban area.

In present study, most of the patients (53%) were having diabetes of duration >5 years and 47% patients who had diabetes duration of ≤5 years.

In present study, mean HbA1c, haemoglobin, urea, creatinine, total cholesterol (TC), triglyceride (TG), low density lipoprotein (LDL) and high density lipoprotein (HDL) were 7.13±1.20%, 10.26±1.87 mg/dl, 49.15±21.27 mg/dl, 1.28±0.53 μmol/L, 235.51±61.49mg/dl, 148.40±35.92 mg/dl, 127.43±26.52mg/dl and 37.74±7.0mg/dl respectively.

Mean IOP was 18.40±3.74 mmHg. Most of the patients (80%) were having IOP between 16-20 mmHg followed by 10% patients who had IOP between 22-26 mmHg. Four percent patients had IOP between 10-14 mmHg and 6% were having IOP more than 26 mmHg. Ocular hypertension was present in 3% of patients.

**Table 1: Prevalence of Glaucoma according to patient's characteristics**

Characteristics		Total patients	Prevalence*	P value
Age (years)	40-49	17	2 (11.77)	<0.05
	50-59	41	4 (9.76)	
	60-69	28	5 (17.86)	
	>69	14	4 (28.57)	
Gender	Male	50	7 (14)	NS
	Female	50	8 (16)	
Residence	Rural	52	8 (15.38)	NS
	Urban	48	7 (14.58)	
HbA1c (%)	<7	50	7 (14)	<0.05
	7-9	43	6 (13.95)	
	>9	7	2 (28.57)	

\*Data is expressed no of patients (prevalence), asHbA1c; glycated haemoglobin

Out of 100 patients, 15 patients were having glaucoma indicating a prevalence of 15% in present study.

Out of 15 glaucoma patients, 11 (73.33%) had POAG while 4 had PACG (26.66%). Out of 11 POAG patients, 06 (85.71%) were males and 05 (62.50%) were females whereas out of 4 PACG patients, 01 (14.29%) was male and 03 (37.50%) were females (p>0.05).

Distribution of Gonioscopic findings showed that majority of the patients belonged to Grade 4 (96%) followed by 2% patients in each Grade 2 and Grade 3.

Glaucomatous changes in the patients revealed that 8 (53.33%) patients were having early changes, 5 (33.33%) patients were having advanced changes and 2 (11.33%) patients were having optic atrophy.

## Discussion

DM is reported to be a possible risk factor for glaucoma.<sup>4</sup> In a meta-analysis of different cohort studies Zhou et al reported that diabetics has an approximately 1.4-fold increased risk of developing POAG.<sup>4</sup>

Dharmadhikari et al did a study to evaluate different factors responsible for the development of glaucoma in 841 T2DM patients and found a mean age of 58.3 ± 10.7 years which was almost similar to the findings of our study.<sup>2</sup>

The present study had found that most of the patients belong to age group of 50-59 years. Similar results were reported by Biswas et al.<sup>5</sup>

The prevalence of glaucoma in present study was 15%. Wide variations in the prevalence of glaucoma have been reported among the diabetics. Dharmadhikari et al reported almost similar prevalence (15.6%) of glaucoma among diabetics (95% CI: 13.1-18.0).<sup>2</sup> Deepthi et al also reported 10.2% glaucoma prevalence in diabetes patients.<sup>1</sup> In present study the prevalence of glaucoma was comparable between males and females

( $P > 0.05$ ). Also the chances of developing glaucoma among diabetics increased with increasing age.

Mean IOP reported by Biswas et al was  $14.8 \pm 2.9$  mmHg which was lower compared to the present study.<sup>5</sup>

In present study, 73.33% had POAG while 26.66% had PACG. Dharmadhikari et al reported in their study that 50.4% diabetics had POAG whereas, 31.3% were with PACG.<sup>2</sup> Their data was almost similar to present study.

In present study most common glaucoma was POAG. From present study data it appears that there is a direct connection between DM and POAG. Different hypothesized biological link had been reported which confirm this relation. First is, there are many evidence that chronic hyperglycemia along with lipid anomalies, may enhance the neuronal injury risk.<sup>6</sup>

Second is, different studies have found that eye of a diabetic patients loose the power to auto-regulate flow of blood resulting in decreased flow in retina. This may result in to hypoxia and expression of hypoxia inducible factor-1 (HIF-1a) is also increased especially in glaucomatous eyes.<sup>4,7</sup> Third important explanation is change in connective tissue of optic nerve head. It reduce abundance at the trabecular meshwork and the lamina cribrosa, leading in increased IOP and increasing work load of optic nerve head. Reports have shown that diabetes mellitus can worsen this remodeling and exaggerate these biomechanical changes.<sup>4</sup>

## Conclusion

Early detection and treatment of glaucoma can prevent patient from blindness. The findings of the present study suggest the screening for glaucoma in type 2 diabetic patients. However further larger studies are required.

**Conflict of Interest: None**

**Source of Support: Nil**

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