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Original Research Article

An Observational Study of the Prevalence and Risk Factors for Primary Open Angle Glaucoma in Diabetic Patients in a Tertiary Care Facility

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Abstract

Aim: Prevalence and risk factors associated with primary open angle glaucoma in diabetic patients. **Methods:** This Cross sectional study was done at Regional Institute of Ophthalmology (RIO), Indira Gandhi Institute of Medical Sciences, Sheikhpura, Patna, Bihar, India for 1 year. All documented diabetic cases attending Department of Regional Institute of Ophthalmology giving consent for work up for the study, IOP > 21 mmHg (by Applanation tonometry) with visual field defects, IOP > 21 mmHg (by Applanation tonometry) with optic nerve head changes,Optic nerve head changes with visual field defects and Normal IOP with no visual field defects or optic nerve head changes, with asymmetry of IOP in both eyes of > 5 mmHg were included in this study. **Results:** The results of the study show clear cut evidence of increased incidence of POAG in diabetic patients, which was 7%. The distribution of age in the study population ranges from 37 to 68 years. The mean age of study participants was 49.58 years and a SD of 8.16 years. There is a significant association between age and POAG. No significant association was found between gender and POAG. No significant association was found between duration of DM and prevalence of POAG. POAG was found to be more in patients with a family history of glaucoma. **Conclusion:** Patients with diabetes are at increased risk of open-angle glaucoma, Glaucoma family history and retinopathy are the main risk factors for open-angle glaucoma in the early years of diabetes.

Keywords: glaucoma, diabetes, risk

Introduction

Glaucoma is a group of progressive diseases where optic nerve damage leads to vision loss. It is considered the leading cause of irreversible blindness worldwide. Open- angle glaucoma and closed-angle glaucoma are the most common forms. Both could be further divided into primary and secondary according to cause and acute, subacute and chronic according to progression. The group of conditions impacts the patient's quality of life, physical ability and emotional wellbeing. [1,2] Primary open-angle glaucoma is a bilateral chronic progressive disease that is

often asymmetrical. The conditions are characterised by optic disc or retinal nerve fibre layer structural abnormality and open anterior chamber in the absence of known causes. The disease affects the adult population and could present with or without corresponding visual loss. Risk factors associated with the condition include higher intraocular pressure, older age, family history and African descent, among others. While traditionally raised IOP thought to be the leading cause for the optic neuropathy. Up to 40% of cases with open-angle glaucoma has normal to low intraocular pressure.[3]

Early detection is essential and has a direct impact on the outcomes. Treatment modalities both in early and late disease stages help to prevent progression; the visual impairment caused is considered irreversible.[4] Secondary open-angle glaucoma is predominantly iatrogenic. Causes include corticosteroids eye drops, ocular surgery and laser. On the other hand Angle-closure glaucoma is a group of diseases where there is acute or chronic progressive closure of the anterior chamber angle. Risk factors associated with ACG include female gender, hypermetropia, ethnicity, age and second eye having angle closure. Short axial length, shallow anterior chamber and small corneal diameter are other hereditary anatomical risk factors. Eye conditions that can cause ACG include the thick cataractous lens, ectopic lens, neovascularisation and tumours. Iatrogenic Secondary ACG causes include eye surgery-induced or drug- induced. Common topical and systemic drugs include phenylephrine, atropine, tricyclic antidepressants, topiramate and sulphonamides. In Angle-closure glaucoma, the narrowing or closure of the anterior chamber angle causes elevated IOP. The presentation is more acute and requires emergency interventions.

Association between glaucoma and diabetes were significant in two metanalyses studies. Patients with diabetes are more likely to develop glaucoma compared to those without diabetes diagnosis with (RR=1.48 (95% confidence interval (CI), 1.29-1.71) (OR=1.50, 95% confidence interval (CI) 1.16, 1.93). The risk was more for patients with more years since diagnosis. Increased IOP was noted in diabetic patients compared to non-diabetics, and that effect was associated with an increase in the fasting blood sugar.[5,6]

In the view of above observations the present study was conducted with the aim to assess the prevalence and risk factors for primary open angle glaucoma in diabetic patients in a tertiary care centre.

Material and Methods

This Cross sectional study was done the Department of Regional Institute of Ophthalmology (RIO), Indira Gandhi Institute of Medical Sciences, Sheikhpura, Patna, Bihar, India for 1 year.

Methodology

All documented diabetic cases attending Department of Regional Institute of Ophthalmology giving consent for work up for the study, IOP > 21 mmHg (by Applanation tonometry) with visual field defects, IOP > 21 mmHg (by Applanation tonometry) with optic nerve head changes,Optic nerve head changes with visual field defects and Normal IOP with no visual field defects or optic nerve head changes, with asymmetry of IOP in both eyes of > 5 mmHg were included in this study.

Patients were excluded if the media remained hazy, with non-visualization of the disc, If the patient was not co-operative with the visual field parameters, Closed angle on gonioscopy and drug induced (corticosteroids) were excluded from this study.

Parameters to be studied [If quantitative data mention the units of measurement]:

Refraction using Snellen’s chart, Intraocular pressure (IOP) (mmHg) using

Applanation Tonometry (AT), Perimetry (Visual field test) using Humphrey Field Analyser (HFA)

VCDR (Vertical Cup-Disk Ratio) using 90D lens, Gonioscopy using Goldmann 4 mirror glass gonio fundus lens Methodology 65, Fasting blood sugar levels (mg/dL) and Post-Prandial blood sugar levels (mg/dL).

Procedure

After acceptance of the thesis by the ethics committee, an informed consent will be obtained from all diabetic patients coming to the Ophthalmology OPD. A detailed ocular and medical history will be taken. A detailed general physical examination will be performed. Single reading blood pressure will be examined in each patient using a sphygmomanometer. Visual acuity for distance and near, Best Corrected Visual Acuity (BCVA) and IOP (using Applanation Tonometer) will be recorded in every case. An elaborate slit lamp examination of the anterior segment will also be performed. Angle of anterior chamber will be assessed by Goldmann 4 mirror glass gonio fundus Volk lens. Perimetry will be assessed by Humphrey Visual Field Analyser (HFA) II.- i series (manufactured by Carl Zeiss, Germany) Detailed fundoscopy including VCDR (Vertical Cup- Disk Ratio) using indirect ophthalmoscopy and slit lamp bio microscopy using 90D/78D Volk lens shall be performed in each case. All cases shall be examined for the presence or absence of glaucoma.

Blood sample of not less than 5 ml needs to be collected under asepsis from anterior cubital vein using a sterile disposable syringe.

Laboratory investigations: For assessment of fasting blood sugar values, glucose oxidase/peroxidase method is employed. Serum or plasma, free of haemolysis, may be used, mixed with Reagent that is ready to use, and analysed using AU 480 automated analyser.

Statistical analysis

The data will be collected and entered into Microsoft Excel, significant level decided before starting of study: $p \leq 0.05$,Statistical tests to be used for data analysis: Chi square test, Student t test, Correlation and Software(s) to be used for the statistical analysis: SPSS Version 21.0

Results

Prevalence of POAG in diabetic population

The results of the study show clear cut evidence of increased incidence of POAG in diabetic patients, which was 7%

Table 1: Prevalence of POAG in diabetic population

POAG	Number of patients	%
Absent	93	93
Present	7	7
Total	100	100

The distribution of age in the study population ranges from 37 to 68 years. The mean age of study participants was 49.58 years and a SD of 8.16 years.

Table 2: The mean age of study participants

Age characteristics (Years)	Values (N = 100)
Minimum	37
Maximum	68
Mean	49.58
Standard deviation	8.16

Table 3: Age and gender distribution in the study population

Age in years	Male=65		Female=35	
	Number of patients	%	Number of patients	%
Below 50	18	27.69	10	28.57
50-60	32	49.23	18	51.43
60-70	14	21.54	6	17.14
Above 70	1	1.54	1	2.86
Total	65	100	35	100

Table 4: Duration of DM

Duration	Number of patients	%
<5 years	52	52
5-10 years	45	45
>10 years	3	3
Total	100	100

There is a significant association between age and POAG. No significant association was found between gender and POAG. No significant association was found between duration of DM and prevalence of POAG.

POAG was found to be more in patients with a family history of glaucoma.

Discussion

The discussion of an association between Diabetes and POAG is not new. In 1971 Becker stated "Diabetes Mellitus occurs more often in patients with Primary Open Angle Glaucoma than in non-glaucomatous populations.[7] Similarly, Glaucoma is more prevalent in diabetic than in non-diabetic population". Considerable controversy exists in literature.

While several studies show an association between the two diseases, several others fail to show any significant association. Most of these studies were comparatively small, used differing definitions of glaucoma and were clinical, rather than community based. A prevalence of 3.11 from Rotterdam, 1.84 from Wisconsin and 2.12 from Australia have been reported. Armstrong *et al*[8] have reported a prevalence of POAG of 4.1 % in diabetic patients.

A community-based study conducted in Vellore, South India showed a prevalence of POAG of 1.7%.[9] Our study shows a clear evidence of an excess of POAG in diabetic population, which is 7%. In this study it is found that there is no significant association between duration of DM and prevalence of POAG (p>0.05) while in few other studies showed a significant association between these two.

Present study shows there is no significant association between gender and POAG (p>0.05) while few other studies show slight male predominance. On the contrary, there are studies also showing female predominance.

Mean age of our study participants were 49.58 years and a SD of 8.16 years. In this study it is found that there is a significant association while comparing age and Discussion 84 POAG (P<0.05). Study conducted by Kahn HA *et al* in 1980 studied 255 patients, 156 F/99 M, in age 30 to 92 years, showed mean age of 70.9 years, which also had similar outcomes. In this study it is found that there is significant association between diabetic retinopathy and POAG (P<0.05).

POAG was found to be more in patients with a family history of glaucoma which supports the family history as a risk factor Baltimore Eye Study which found that family history was a significant risk factor of POAG and the findings were noted in the literature since 1977.[10,11]

This suggests that at the time of annual screening of all diabetic patients for retinopathy, POAG screening is a very effective proposition provided a clear clinical benefit could be elicited. A screening test should ideally be relatively less expensive, simple, and quick to perform and if possible be capable of being administered by a non-specialist.

Conclusion

Patients with diabetes are at a higher risk of developing open-angle glaucoma. Glaucoma family history and retinopathy are the primary risk factors for developing open-angle glaucoma in the early stages of diabetes. The gender of the patients, the length of diabetes, and the medicine used to treat diabetes were shown to be unrelated to glaucoma.

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