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Original Research Article

A Hospital Based Observational Study Assessing Risk Factors Associated with Primary Open Angle Glaucoma in Diabetic Patients

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Abstract

Aim: Prevalence and risk factors associated with primary open angle glaucoma in diabetic patients in a tertiary care centre.

Methods: This cross-sectional study was done the Department of Ophthalmology, SKMCH, Muzaffarpur, Bihar, India for the period of 1 year. All documented diabetic cases attending Department of Ophthalmology giving consent for work up for the study, IOP > 21 mmHg (by Schiotz tonometry) with visual field defects, IOP > 21 mmHg (by Schiotz 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 8%. The distribution of age in the study population ranges from 35 to 71 years. The mean age of study participants was 52.69 years and a SD of 10.69 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. Gender of patients, duration of diabetes and medication used for control of diabetes were found to be insignificantly related to glaucoma.

Keywords: Diabetes, Open-Angle Glaucoma, Risk Factors.

Introduction

Diabetes mellitus is a serious public health concern that has become more frequent as a result of changes and trends in nutrition, lifestyle, and, as a result, the prevalence of obesity. [1] Since 1980, the global prevalence of diabetes has nearly doubled, with an estimated 422 million people afflicted in 2014. As a result, worldwide health care expenditures for diabetes are predicted to reach 490 billion US dollars by 2030, accounting for an estimated 12% of overall health care expenses. [2,3]

Diabetes imposes a significant strain on the health-care system in a variety of ways. Diabetic patients require more outpatient visits and continuous drugs, and they are more likely to develop a range of systemic microvascular problems that result in end organ damage and related consequences, including kidney disease, cardiovascular disease, amputations, eyesight loss, and early death. [3] Diabetic retinopathy (DR) vision loss, in particular, is one of the most severe effects on quality of life and is the main cause of blindness among working-age and economically active individuals. [4-6]

An older assessment of diabetes patients in the United States found that as many as 24.8% had self-rated visual impairment. [7] The current incidence of DR is estimated to be 34.6% among all diabetic patients (including type 1 and type 2), and as a result, the ramifications of diabetic eye illness are far-reaching. [8] Diabetes has been linked to a range of potentially vision-threatening ocular disorders, including cataract, uveitis, and glaucoma, in addition to retinopathy. [9-12] Glaucoma is the main cause of permanent

blindness globally, defined as best-corrected central visual acuity of less than 3/60 or a visual field of less than 10° in the better seeing eye. [13] It is distinguished by pathognomonic optic nerve abnormalities that cause progressive vision field loss over time. [14] The most prevalent kind of glaucoma is primary open angle glaucoma (POAG), which is related with a variety of risk factors including family history, African heritage, and increased intraocular pressure (IOP). [15] Of these, IOP is the only modifiable and effective target of therapy, and as a result, the mainstay of current glaucoma treatment is IOP reduction through the use of medications, laser, or surgery.

Material and Methods

This observational study was done the Department of Ophthalmology,SKMCH, Muzaffarpur, Bihar, India, for the period of 1 year

All documented diabetic cases attending Department of Ophthalmology giving consent for work up for the study, IOP > 21 mmHg (by Schiotz tonometry) with visual field defects, IOP > 21 mmHg (by Schiotz 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 Schiotz Tonometry (NCT), 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 acceptation 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 Schiotz 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 Methods of Analysis

The data will be collected and entered into Microsoft Excel 2013,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 Software Trial 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 8%

Table 1: Prevalence of POAG in diabetic population

POAG	Number of patients	%
Absent	92	92
Present	8	8
Total	100	100

The distribution of age in the study population ranges from 35 to 71 years. The mean age of study participants was 52.69 years and a SD of 10.69 years.

Table 2: The mean age of study participants

Age characteristics (Years)	Values (N = 100)
Minimum	35
Maximum	71
Mean	52.69
Standard deviation	10.69

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	54	54
5-10 years	42	42
>10 years	4	4
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

Primary open-angle glaucoma is a bilateral, chronic, progressive, and frequently asymmetrical condition. In the absence of a recognized etiology, the disorders are distinguished by structural abnormalities of the optic disc or retinal nerve fibre layer, as well as an open anterior chamber. The illness affects adults and can manifest with or without concomitant vision loss. Higher intraocular pressure, older age, family history, and African heritage are all risk factors for the illness. Traditionally, elevated IOP was assumed to be the major cause of ocular neuropathy. Up to 40% of open-angle glaucoma patients have normal to low intraocular pressure. [16] Early detection is critical and directly affects results. Treatment options, both early and late in the disease's evolution, aid in preventing progression; the visual damage produced is deemed permanent. [17] Iatrogenic secondary open-angle glaucoma is the most common cause. Corticosteroid eye drops, ocular surgery, and laser are some of the causes.

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. [18] 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. [19] 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%. [20] My study shows clear evidence of an excess of POAG in diabetic population, which is 8%. 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.

My 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.

The distribution of age in the study population ranges from 35 to 71 years. The mean age of study participants was 52.69 years and a SD of 10.69 years. 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. [21,22]

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 who have diabetes have an increased chance of open-angle glaucoma. In the early years of diabetes, a family history of glaucoma and diabetic retinopathy are the primary risk factors for open-angle glaucoma. Glaucoma was shown to have no discernible links to the gender of patients, the length of time they had diabetes, or the diabetic medications they took to manage their condition.

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