

Association of diabetes and hypertension with primary open angle glaucoma

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Abstract

The present study was conducted to find the association of hypertension and diabetes with primary open angle glaucoma. Individuals with risk factors could undergo annual screening helping in early detection and intervention and thereby preventing avoidable blindness in them.

Materials and method: A case-control study of 150 subjects aged above 40 years who visited ophthalmology department were evaluated for presence of diabetes and hypertension. Out of 150 subjects 75 were cases with POAG and 75 were controls without POAG. Glaucoma was diagnosed by visual field loss, characteristic optic disc changes, and elevated intraocular pressure of more than 21mm of Hg adjusted to central corneal thickness. The diagnosis of POAG was made after exclusion of other types of glaucoma, like congenital, developmental and secondary glaucoma. A detailed history was taken about the duration of hypertension and diabetes.

Results: There were 39 (52.0%) females, 36 (48%) males among cases and 46(61.3%) females, 29(38.7%) males among controls. Mean age of cases were 63.63 (SD 8.24), of controls 58.79 (SD 10.9). Among cases 50(66.7%) subjects had hypertension and 25(33.3%) did not. Among controls 36(48%) subjects had hypertension and 39(52%) did not. There was a statistically significant association between hypertension and POAG (p value 0.02) and odds ratio 2.2(1.1-4.2) with a CI of 95%. Among cases 53(70.7%) subjects had diabetes and 22(29.3%) did not. Among controls 40 (53.3%) subjects had diabetes and 35 (46.7%) did not. There was a statistically significant association between diabetes and POAG (p value 0.03) and odds ratio 2.1(1.1-4.1) with CI of 95%.

Keywords: Hypertension, Diabetes, Primary open angle glaucoma, Preventable Blindness

Introduction

Glaucoma is a chronic progressive optic neuropathy caused by a group of ocular conditions which leads to raised intraocular pressure causing damage of optic nerve with loss of visual function.⁽¹⁾ It is the second leading cause of irreversible blindness after cataract worldwide.⁽²⁾ The only modifiable factor in the disease complex remains the intra ocular pressure, which when controlled could prevent this irreversible visual loss. Primary open angle glaucoma (POAG) is the most common type of glaucoma among other types.⁽³⁾

The prevalence of diabetes among all age groups worldwide was estimated to be 2.8% in 2000 and 4.4% in 2030.⁽⁴⁾ Some studies found that Diabetes mellitus is a significant risk factor for POAG.⁽⁵⁻⁹⁾ Micro vascular changes seen in diabetes makes the optic nerve more prone to develop damage due to intraocular pressure and also affect the vascular auto regulation of the retina and optic nerve. This leads to decrease in blood supply and results in glaucomatous optic neuropathy. A longer duration of diabetes mellitus was associated with higher prevalence of primary open angle glaucoma.⁽⁵⁾

According to different studies hypertension is considered to be a risk factor for primary open angle glaucoma.^(10,11) Diastolic ocular perfusion pressure appears to be the blood pressure variable related to glaucoma.⁽¹²⁾ On the contrary some studies says that primary open angle glaucoma is more prevalent in persons with low ocular perfusion pressure.⁽¹³⁾ Several

other studies show no significant association between these risk factors and POAG.

The present study was therefore conducted to find an association of hypertension and diabetes with primary open angle glaucoma. The individuals with risk factors could undergo annual screening which would help in early detection leading to earlier intervention and thereby prevention of an avoidable cause of blindness.

Aim of the study

1. To find association of hypertension and diabetes with primary open angle glaucoma
2. To find the association between the duration of diabetes and hypertension with POAG.

Materials and Methods

Study design: An institution based case-control study.
Study setting: The study was conducted at the department of ophthalmology Dr Somervell Memorial CSI Medical College, Karakonam, Trivandrum.

Study period: 18 months

Sample size

Sample size is calculated using the formula

$$\eta = \left[\frac{r + 1}{r} \right] \frac{(\bar{p}) \times (1 - \bar{p}) (Z_{\alpha} + Z_{\beta})^2}{(p_1 - p_2)^2}$$

r- ratio of control to cases

$(\bar{p}) \times (1 - \bar{p}) =$ A measure of variability

Z. Alpha Z. beta represents level of significance and p

P1-P2: Effect size (difference in proportions)

$$\bar{p} = (p_1 + p_2) / 2$$

Study variables: Independent variables- Diabetes mellitus, age, gender, duration of diabetes mellitus, family history of primary open angle glaucoma, myopia, hypertension. Study subjects: Inclusion criteria-Cases and controls will be taken in the ratio of 1:1. Cases: All patients of age >40 years regardless of sex, diagnosed as primary open angle glaucoma by a rise in intra ocular pressure and characteristic changes in the optic nerve head will be included in the study. Controls: Individuals of age >40 years not having primary open angle glaucoma seeking care from ophthalmology outpatient department.

Exclusion criteria: Patients who had recent ocular surgeries, Patients with corneal scarring/corneal opacities, Patients with acute eye infections, Patients with other types of glaucoma, like congenital, developmental and secondary glaucoma.

All recruited participants will undergo complete ophthalmic examination like visual acuity checking using Snellen’s chart, cycloplegic refraction, slit-lamp biomicroscopy, and tonometry: by slit lamp mounted Goldmann Applanation tonometer (intra ocular pressure of >21mmHg is diagnostic). Gonioscopy was done to examine angle structures.

Glaucoma was diagnosed by visual field loss, characteristic optic disc changes, and elevated intraocular pressure of more than 21mm of Hg adjusted to central corneal thickness. A detailed history was taken about the duration of hypertension and diabetes.

Ethical considerations: Institutional ethical committee clearance was obtained before commencement of the study. Written informed consent from all study participants was obtained. Privacy and confidentiality was maintained during all stages of the study.

Analysis plan: Data collected and entered using Microsoft Excel software and analysed using the SPSS

software. Associations were computed using Pearson’s chi-square test.

Results

There are 39 (52.0%) females, 36 (48%) males among cases and 46(61.3%) females, 29 (38.7%) males among controls. Mean age of cases were 63.63 (SD 8.24) years, of controls 58.79 (SD 10.9) years.

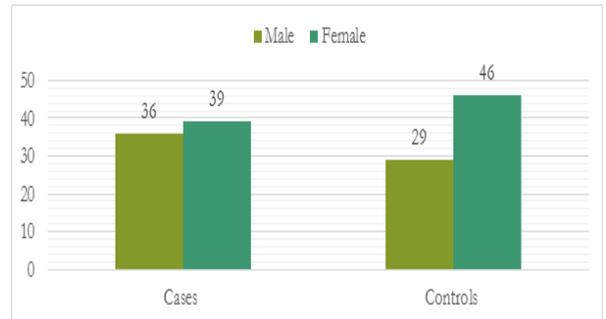


Fig. 1: Gender distribution of cases & controls (n)

Among cases 50(66.7%) subjects had hypertension and 25(33.3%) did not. Among controls 36(48%) subjects had hypertension and 39(52%) did not. There is a statistically significant association between hypertension and POAG (p value 0.02) and odds ratio (95% CI) - 2.2(1.1-4.2).

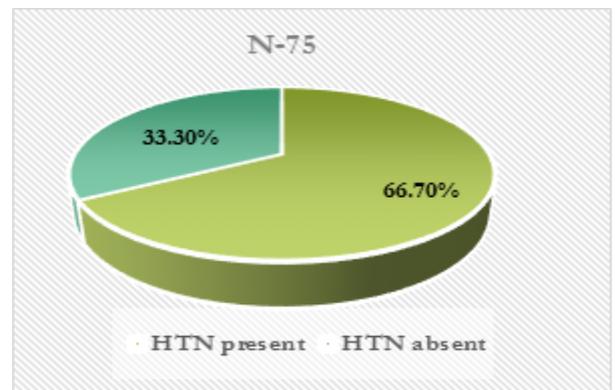


Fig. 2: Cases

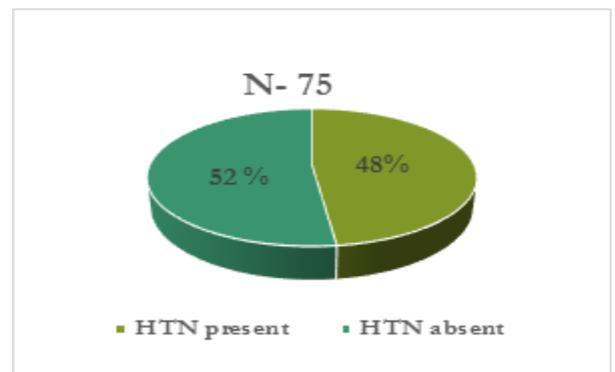


Fig.3: Controls

A statistically significant association between duration of hypertension among cases and controls with hypertension could not be found (p value 0.215).

Among cases 53(70.7%) subjects had diabetes and 22(29.3%) did not. Among controls 40 (53.3%) subjects had diabetes and 35 (46.7%) did not. There is a statistically significant association between diabetes and POAG (p value 0.03) and odds ratio 2.1(1.1-4.1) with CI of 95%. A statistically significant association between duration of diabetes among cases and controls with diabetes could not be found (p value 0.215).

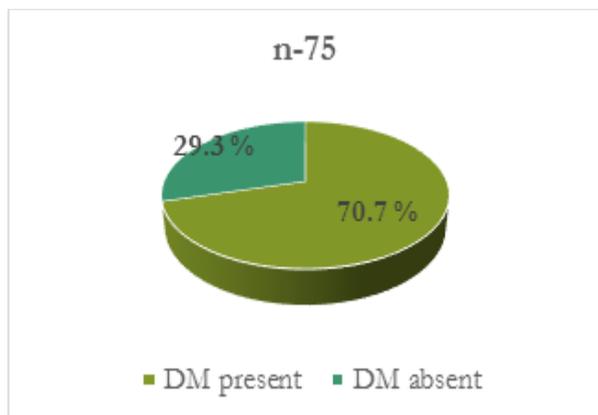


Fig. 4: Cases

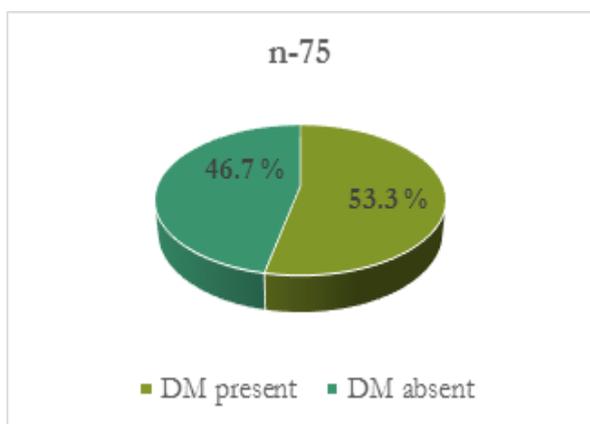


Fig. 5: Controls

Table 1

	Case n =75	Control n=75	OR (95% CI)	P value
DM + n (%)	53(70.7%)	40(53.3%)	2.108(1.1-4.1)	0.029
DM -	22(29.3%)	35(46.7%)		
HTN+	50(66.7%)	36(48%)	2.2(1.1-4.2)	0.02
HTN-	25(33.3%)	39(52%)		

Discussion

Although several risk factors for the development of POAG have been evaluated, this is a field of ongoing investigation. Diabetes mellitus and Hypertension are rapidly emerging public health problems worldwide, and they associate with primary open-angle glaucoma.

The current literature does not provide a definitive link between Diabetes mellitus and hypertension with POAG. Hence, the purpose of this study is to find relationship between Diabetes mellitus and hypertension with POAG.

In the present study of 150 patients aged above 40 years, there was more than two-fold increased risk of POAG among patients with hypertension and diabetes.

Mean age of cases were 63.63 (SD 8.24) years, of controls 58.79 (SD 10.9) years. There are 52.0% females, 48% males among cases and 61.3% females, 38.7% males among controls.

There is a statistically significant association between hypertension and POAG (p value 0.02) and odds ratio (95% CI) 2.2(1.1-4.2) in our study; similar to blue mountain eye study⁽¹⁰⁾ and Baltimore eye survey.⁽¹⁴⁾ The Baltimore Eye Survey identified high IOP and systemic hypertension as potential risk factors in the development of glaucomatous optic nerve damage. There was an association of IOP with systolic and diastolic blood pressures, in beaver dam study.⁽¹⁵⁾ However, on the contrary Bonomi L et al in their study says that POAG is more prevalent among patients with lower perfusion pressures.⁽¹³⁾ Although hypertension was common in the Barbados Eye Study participants, it was unrelated to the prevalence of POAG.⁽¹⁶⁾

There is a statistically significant association between diabetes and POAG (p value 0.03) with odds ratio 2.1(1.1-4.1) similar to Los Angeles Latino Eye Study and Beaver Dam Eye Study.

Beaver Dam Eye Study concluded that the presence of open angle glaucoma is increased in people with older-onset diabetes.⁽⁹⁾ But The Baltimore Eye Survey failed to demonstrate a role for diabetes with POAG.⁽¹⁴⁾

A statistically significant association between duration of hypertension and diabetes with POAG could not be found in the present study. On the contrary, longstanding diabetes may be associated with increased risk for glaucoma, according to a meta-analysis.⁽¹⁷⁾ A longer duration of diabetes could impose prolonged damage to the glial and neuronal functions, leading to higher glaucoma risk.

Conclusion

The present study shows there a significant association between Hypertension and Diabetes with POAG. Early identification of these risk factors is important for proper decision-making by the health care professional and follow up by the patient. It is important to incorporate health programmes to make people aware of these factors that can be modifiable by healthy life styles that can have a high impact on the quality of life of an individual.

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