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Prevalence and Risk Factors of Primary Glaucoma in Diabetics: A Hospital based Cross Sectional Study

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Abstract: ***Glaucoma is more prevalent in diabetic than in non - diabetic population. This study aims to find out the prevalence, risk factors and demography of primary glaucoma in diabetic patients in a tertiary care centre. A total of 700 diabetic patients were chosen and prevalence rate of primary glaucoma in diabetics was determined as the percentage of total patients examined.***

Keywords: Primary open angle glaucoma (POAG), Primary angle closure glaucoma (PACG), Prevalence, STDR (sight threatening diabetic retinopathy), Intraocular pressure (IOP)

1. Introduction

The World Health Organisation has classified glaucoma and diabetic retinopathy as a priority eye diseases. [(1)] Based on the accelerated "Vision 20 - 20 initiatives" the contribution of glaucoma and diabetic retinopathy to global blindness is significant and continues to increase. Glaucoma is a category of disorders that cause visual loss due to damage to the optic nerve. It is the primary cause of irreversible blindness around the globe. The most frequent types of glaucoma are open - angle and angle - closure glaucoma. Both can be separated into primary and secondary causes, as well as acute, subacute, and chronic stages of progression.

Patients with diabetes have a higher risk of developing glaucoma than those who do not have diabetes. In diabetes individuals, IOP is found to be higher than in non - diabetics, and this impact is linked to a rise in fasting blood glucose [2, 3]According to World Health Organisation (WHO), diabetes is a group of chronic metabolic diseases characterized by hyperglycaemia resulting from defects in insulin secretion, insulinaction, or both. ADA diagnostic criteria of diabetes include fasting blood sugar >126 mg/dl, post prandial blood sugar of >200 mg/dl and HbA1c of >6.5.

Epidemiology

1. Prevalence of Diabetes Mellitus - Globally, an estimated 6.28 % of individuals are affected by diabetes mellitus type 2. The overall prevalence of diabetes in India is 7.3%.2) Prevalence of primary open angle glaucoma - The prevalence of primary open angle glaucoma ranged from 1.84% to 7.8% 3) Risk factors for primary glaucoma - diabetes mellitus, Higher intraocular pressure, advanced age, family history, and African heritage.

2. Materials and Methodology

The study was conducted from January 2021 to December 2021 in GMC Akola, a Tertiary care centre for ophthalmology. The study was an observational; cross - sectional study of all diagnosed cases of Diabetes attending Ophthalmology OPD. Some patients were excluded who were non compliant, not willing to participate, patients with secondary glaucoma due to Uveitis, retinal vein occlusion, trauma etc. Universal sampling method was used. Data was collected using a structured questionnaire. The first section of the questionnaire captured demographics data and was administered through an interview with the participant. The second section captured the findings of the ophthalmic examination. Continuous variables were presented as Mean +/ - SD. Categorical variables were expressed in frequency and percentages. Categorical variables were compared by performing chi2 - square test. For small numbers, Fisher exact test was used wherever applicable. Multiple logistic regression analysis was performed to determine independent predictors of diabetic retinopathy.

3. Observation

Cross sectional study consist of 700 diabetic patients in which demography, risk factors for primary glaucoma, and prevalence of primary glaucoma was studied. The study population consists of 423 (60.4%) males and 277 (39.6%) females in the age range from 13 - 90 years with mean age of 52.4±9 years. The majority of the diabetics were above 50 years age (76%).

Overall proportion of POAG cases observed was 6.4 % (45 out 700), PACG observed 1.7% remaining 91.9 % were normal. Among the males 8.2% (35 out of 423) and females 3.6% (10 out 277) POAG cases were diagnosed.

The proportion of POAG cases diagnosed between males and females was statistically significant ($p<0.05$), and prevalence of PACG among male 1.6%, whereas in females it is 1.8%. The proportion of PACG cases diagnosed between males and females was not statistically significant ($p>0.05$).

The mean age of the POAG patients was 58.4±6.4 ranging from 38 years to 89 yrs.

The cases without POAG had an age of 52.4 +9 years. There was no statistically significant difference in the age composition of the two groups. ($p > 0.05$). The total number of POAG patients observed in <40years is 1 out of 63, 41 to

50 years is 7 out of 101, 51 to 60 years 14 out of 240, 61 - 70 years 16 out of 227 and >70 years 7 out of 69.

The total number of PACG patients observed in <40years is 1 out of 63, 41 to 50 years is 1 out of 101, 51 to 60 years 5 out of 240, 61 - 70 years 3 out of 227 and >70 years 2 out of 69.67% of POAG cases were in above 50 years age group.

The Mean IOP values of Normal were 15.28 ± 2.7. The mean IOP values of PAOG were 25.68 ± 2.8. The mean IOP values of PACG were 24.4 ± 2.2. The difference observed in mean IOP values among the group was statistically significant ($p<0.05$). The POAG and PACG patients had statistically significant higher IOP than Normal.

It was observed that prevalence of POAG increases with increase in duration DM, Out of total 45 POAG cases 32 cases have positive family history of glaucoma, 'p' value is 0.0001 i. e family history of glaucoma was statistically significant with POAG.

Out of total 700 diabetic study population 420 cases have family history DM, out of them only 37 have POAG. Out of 700 study population 280 cases have no family history of DM and out fo them 7 cases have POAG. Family history of DM was statistically significant with POAG ('p' value =0.003)
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Out of total 700 diabetic study population 100 cases have history of smoking, out of them only 5 have POAG. Out of 700 study population 600 cases have no history of smoking and out of them 39 cases have POAG. History of smoking was not statistically significant with POAG ('p' value >0.05)

Out of total 700 diabetic study population 113 cases have Hypertension, out of them only 15 have POAG. Out of 700 study population 587 cases have not have Hypertension and out of them 30 cases have POAG. Hypertension was statistically significant with POAG ('p' value =0.005)

The mean blood glucose level (FBS) was 149.5 among POAG and 133.6 among other patients. The mean difference observed was statistically significant ($p<0.05$). The PPBS level among POAG was 240.8 and among others was 174.9. The difference observed was statistically significant ($p<0.05$). The mean blood glucose level is higher in diabetics with POAG than others.

The proportion of Diabetic retinopathy among diabetic patients in the study population was 17.57% (123 out 700). Among the males 17.73% (75 out of 423) and females 17.32% (48 out 277) cases were observed. The proportion of Diabetic retinopathy observed between males and females was not statistically significant ($p>0.05$).

The proportion of STDR (sight threatening diabetic retinopathy) among POAG patients in the study population was 15.5% (7out 45). Among the males 17.14% (6 out of 35) and females 10% (1 out 10) cases were observed. The proportion of STDR among POAG patients observed between males and females was not statistically significant ($p>0.05$).

Out of 700 diabetic patients, 45 subjects (6.4%) were having primary open angle glaucoma (POAG) [only glaucoma (5.4%) and glaucoma plus sight - threatening diabetic retinopathy (STDR) (1%].

The vision (in the better eye) was analysed among three groups (no POAG or STDR; only POAG; and POAG plus STDR) and it was observed that no perception of light (PL) was noticed in 2.6% subjects in the "only POAG" group. The vision of <3/60 to PL was observed among 3.9%, 5.2% and 14.2% of subjects in the "no POAG or STDR" and "only POAG" and POAG plus STDR groups respectively.

The vision (in the worst eye) was analysed among three groups (no POAG or STDR; only POAG; and POAG plus STDR) and it was observed that no perception of light (PL) was noticed in 1.2% and 5.2% of subjects in the "no POAG or STDR", "only POAG" and "POAG plus STDR" groups respectively. The vision of <3/60 to PL was observed among 15.7%, 13.1%, and 28.7% of subjects in the the "no POAG or STDR", "only POAG" and "POAG plus STDR" groups respectively.

4. Discussion

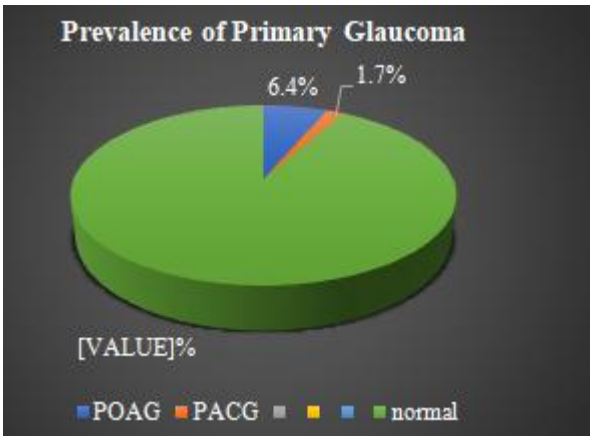
The present study was carried out in the set - up of a tertiary care centre. The patients were selected from ophthalmology OPD of the hospital. Prevalence: In this study, we discovered that 6.4 percent of diabetics have POAG. In this study, males (8.2 percent) had higher levels of POAG than females (3.6 percent); which was coherent with a study conducted by Leske et al. [4]. Gender distribution: In this study prevalence of POAG was significantly higher in male diabetics than female diabetics. Which is coherent with study conducted in Oman, in that study also the prevalence of glaucoma was significantly higher among male diabetics compared to female diabetics. [5] In some studies Among African females, a strong association of diabetes and glaucoma was observed. [6] Pasquale *et al*. also noted a higher risk of glaucoma among diabetic American females. [7]Age: In this study, the mean age of patients with POAG and those without POAG was found to be 58.4±6.4 and 52.4±9 years, respectively, which was similar to earlier population - based studies conducted in India. According to the Mitchell et al. study, where the mean age of the study group was 66.2±9.8 years and that of POAG was 75.9±8.6 years [8], age appears to be an independent risk factor for the development of POAG. In this study, the average age of POAG patients was higher than that of non - glaucomatous diabetic individuals. In this study, the vision (in the better eye) was analysed among three groups (no POAG or STDR; only POAG; and POAG plus STDR) and it was observed that no perception of light (PL) was noticed in 2.6% subjects in the "only POAG" group. The vision of <3/60 to PL was observed among 3.9%, 5.2% and 14.2% of subjects in the "no POAG or STDR" and "only POAG" and POAG plus STDR groups respectively. Which was coherent with the

study done in North India (Wahegurupal Singh, 2022) [9] In this study variables significantly associated with the increased prevalence of glaucoma among diabetic subjects included family history of diabetes mellitus (DM) and the mean blood glucose level is higher in diabetics with POAG, being hypertensive, family history of glaucoma, and >10 years duration of DM ($p<0.05$). Which was coherent with the study done in North India (Wahegurupal Singh, 2022) [9]

5. Conclusion

There is an excess of POAG in diabetic population, which is 6.4% (as compared to 2.1% in normal population), thereby showing an association between primary open angle glaucoma and diabetes.

There is increased risk of POAG in patients having risk factors like family history of glaucoma, family history of diabetes mellitus, Longer duration of DM. And POAG cases have higher level of mean glucose level than other diabetic patients, without having glaucoma.



Graph: Prevalence of primary glaucoma in diabetic patients

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