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Assessment of Risk Factors and Visual Impairment in Patients with Primary Open-Angle Glaucoma: A Cross-Sectional Study

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Abstract
Background
Primary Open-Angle Glaucoma (POAG) is a chronic progressive optic neuropathy characterized by retinal ganglion cell loss, optic nerve head damage, and corresponding visual field defects. It is one of the leading causes of irreversible blindness worldwide. Identification of risk factors and assessment of visual impairment are essential for early diagnosis and prevention of disease progression.
Aim
To assess the risk factors associated with Primary Open-Angle Glaucoma and evaluate the extent of visual impairment among patients attending a tertiary eye care center.
Materials and Methods
A hospital-based cross-sectional study was conducted among 180 patients diagnosed with Primary Open-Angle Glaucoma attending the Ophthalmology Department of a tertiary eye care center over a period of one year. Detailed demographic data, ocular and systemic risk factors, visual acuity, intraocular pressure (IOP), cup-disc ratio, gonioscopy findings, and visual field analysis were recorded. Statistical analysis was performed using SPSS version 26.0. A p-value <0.05 was considered statistically significant.
Results
Among 180 patients, the majority belonged to the age group of 51–70 years (61.1%). Males constituted 58.9% of cases. Positive family history was present in 32.2%, hypertension in 48.9%, diabetes mellitus in 36.1%, and myopia in 22.8% of patients. Moderate-to-severe visual impairment was observed in 38.3% of patients. Higher intraocular pressure, advanced age, positive family history, and longer disease duration were significantly associated with visual impairment ($p<0.05$).
Conclusion
Advanced age, elevated intraocular pressure, family history, hypertension, and diabetes mellitus were significant risk factors associated with POAG. Early screening and timely treatment are essential to prevent visual disability and blindness.
Keywords: *Primary Open-Angle Glaucoma, Visual Impairment, Risk Factors, Intraocular Pressure, Visual Field Defects, Blindness*

I. Introduction

Glaucoma represents a group of optic neuropathies characterized by progressive degeneration of retinal ganglion cells and optic nerve damage leading to irreversible visual loss. Among various forms of glaucoma, Primary Open-Angle Glaucoma (POAG) is the most common type worldwide.

The World Health Organization estimates glaucoma as the second leading cause of blindness globally and the leading cause of irreversible blindness. The prevalence of POAG increases with advancing age and is expected to rise substantially due to increasing life expectancy and population aging.

Several risk factors have been implicated in the development and progression of POAG, including elevated intraocular pressure (IOP), advanced age, family history, African and Asian ethnicity, diabetes mellitus, hypertension, myopia, and vascular dysregulation. Although elevated IOP remains the most important modifiable risk factor, a significant proportion of patients develop glaucomatous damage despite normal pressure levels.

Visual impairment caused by glaucoma often remains asymptomatic until advanced stages, making early detection crucial. Assessment of associated risk factors and visual impairment patterns can facilitate timely diagnosis and management.

Therefore, this study was undertaken to evaluate the risk factors and extent of visual impairment among patients with Primary Open-Angle Glaucoma attending a tertiary eye care center.

II. Objectives

Primary Objective

To assess risk factors associated with Primary Open-Angle Glaucoma.

Secondary Objectives

1. To evaluate demographic characteristics of POAG patients.
2. To assess the degree of visual impairment among POAG patients.
3. To determine the association between risk factors and visual impairment.
4. To evaluate clinical characteristics including IOP, cup-disc ratio, and visual field defects.

III. Materials and Methods

Study Design

Hospital-based cross-sectional study.

Study Setting

Department of Ophthalmology, Tertiary Eye Care Teaching Hospital.

Study Duration

12 months.

Sample Size

180 patients diagnosed with Primary Open-Angle Glaucoma.

Inclusion Criteria

- Age ≥40 years.
- Diagnosed cases of Primary Open-Angle Glaucoma.
- Open angles on gonioscopy.
- Willingness to participate.

Exclusion Criteria

- Secondary glaucoma.
- Angle-closure glaucoma.
- Ocular trauma.
- Previous glaucoma surgery.
- Media opacity preventing optic nerve assessment.

Data Collection

Detailed history was obtained regarding:

- Age
- Gender
- Family history of glaucoma
- Diabetes mellitus
- Hypertension
- Smoking history
- Refractive errors
- Duration of disease

Clinical Examination

- Best Corrected Visual Acuity (BCVA)
- Slit-lamp examination
- Goldmann Applanation Tonometry
- Gonioscopy
- Fundus examination
- Humphrey Visual Field Analysis

Visual Impairment Classification

According to WHO criteria:

- Mild visual impairment: VA <6/12 to 6/18
- Moderate visual impairment: <6/18 to 6/60
- Severe visual impairment: <6/60 to 3/60
- Blindness: <3/60

Statistical Analysis
Data were analyzed using SPSS version 26.0.

- Chi-square test
- Independent t-test
- Logistic regression analysis

p-value <0.05 considered statistically significant.

IV. Results

Table 1: Age Distribution

Age Group (Years)	Number (%)
40–50	32 (17.8)
51–60	58 (32.2)
61–70	52 (28.9)
>70	38 (21.1)

Mean age = 61.4 ± 10.2 years.

Table 2: Gender Distribution

Gender	Number (%)
Male	106 (58.9)
Female	74 (41.1)

Table 3: Distribution of Risk Factors

Risk Factor	Number (%)
Family History	58 (32.2)
Hypertension	88 (48.9)
Diabetes Mellitus	65 (36.1)
Myopia	41 (22.8)
Smoking	39 (21.7)

Table 4: Intraocular Pressure Distribution

IOP (mmHg)	Number (%)
≤21	54 (30.0)
22–30	86 (47.8)
>30	40 (22.2)

Mean IOP = 25.6 ± 5.8 mmHg.

Table 5: Cup-Disc Ratio

Cup-Disc Ratio	Number (%)
0.4–0.6	56 (31.1)
0.7–0.8	82 (45.6)
>0.8	42 (23.3)

Table 6: Visual Impairment Status

Visual Status	Number (%)
Normal Vision	58 (32.2)
Mild Impairment	53 (29.5)
Moderate Impairment	42 (23.3)
Severe Impairment	19 (10.6)
Blindness	8 (4.4)

Table 7: Visual Field Defects

Visual Field Defect	Number (%)
Early Defect	52 (28.9)
Moderate Defect	76 (42.2)
Advanced Defect	52 (28.9)

Table 8: Factors Associated with Visual Impairment

Factor	Odds Ratio	p-value
Age >60 years	2.4	0.003
Family History	1.9	0.021
IOP >30 mmHg	3.2	0.001
Diabetes Mellitus	1.7	0.034
Disease Duration >5 years	2.8	0.002

V. Discussion

The present study demonstrated that POAG predominantly affected older adults, with the majority of patients aged above 50 years. Similar findings have been reported in epidemiological studies indicating age as one of the strongest risk factors for glaucoma.

Males constituted a higher proportion of cases compared to females. Positive family history was observed in nearly one-third of patients, highlighting the genetic predisposition associated with POAG.

Elevated intraocular pressure remained the most significant modifiable risk factor. Patients with IOP greater than 30 mmHg showed significantly higher odds of visual impairment compared to those with lower pressures.

Systemic comorbidities such as hypertension and diabetes mellitus were frequently observed among POAG patients. Several studies have suggested vascular dysregulation and impaired optic nerve perfusion as potential mechanisms linking these conditions with glaucoma progression.

Visual impairment was present in more than one-third of patients, reflecting delayed presentation and inadequate awareness regarding glaucoma screening. Advanced visual field defects were significantly associated with larger cup-disc ratios and prolonged disease duration.

The findings emphasize the importance of regular eye examinations, especially among elderly individuals and those with positive family history.

VI. Conclusion

Primary Open-Angle Glaucoma is a major cause of irreversible visual impairment among older adults. Advanced age, elevated intraocular pressure, family history, diabetes mellitus, hypertension, and longer disease duration were significant risk factors associated with visual loss.

Early detection through regular screening and prompt initiation of treatment can substantially reduce the burden of glaucoma-related blindness.

Limitations

1. Single-center study.
2. Cross-sectional design limits causal inference.
3. Hospital-based population may not represent the community.
4. Follow-up outcomes were not evaluated.

Recommendations

1. Community-based glaucoma screening programs.
2. Annual eye examinations for high-risk individuals.
3. Awareness campaigns regarding glaucoma.
4. Early referral and treatment to prevent irreversible blindness.

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