

## A Prosepctive Study of Prevalence and Risk Factors In Primary Open Angle Glaucoma in Associated Hospital, Govt Medical College, Baramulla

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### Abstract:

**Introduction:** Visual impairment is a global public health problem and glaucoma is the leading cause of irreversible blindness worldwide. Primary angle-closure glaucoma (PACG) and primary angle closure (PAC) are more common in East Asian countries than in Western countries, and the former often results in bilateral blindness.

**Materials and Methods:** The present study was carried out during the period January 2018 to December 2018 at the Associated Hospital Govt Medical College, Baramulla in the Department of Ophthalmology. The study was a descriptive observational study. Written informed consent procedure was followed in all patients recruited into the study. The study group consisted of 950 patients aged 40 years and above, belonging to both sexes; these patients presented themselves for their geriatric ocular problems like Presbyopia, Refractive errors, Diminution of vision, Diabetes, Hypertension, Migraine, Cardiovascular disorders as referred from the department of Medicine for Ophthalmic evaluation.

**Results:** Out of 950 patients screened, open angle glaucoma was noted in 50 cases. This shows the prevalence of open angle glaucoma as 5%. Out of which, 33 were diagnosed to have primary open angle glaucoma (POAG), 13 were normal tension glaucoma (NTG) and 4 had ocular hypertension. There was a steady increase in the number of cases of glaucoma as age advances in those who show an ocular tension of 21 mmHg and above. Average IOP for both sexes in 50 cases of open angle Glaucoma is 23.22 mmHg. Thirty-one patients with POAG and NTG had early field defects. 25 patients showed established field defects and 30 patients showed advanced field defects at least in one eye. Advanced field defects were seen with an increase in CDR of 0.7 and above in 30 patients. A positive family history of open angle glaucoma was elicited in 15 cases of POAG in the first-degree relatives.

**Conclusion:** The prevalence of open angle glaucoma in this hospital-based study was 5%. Age, elevated intra-ocular tension, large cup/disc ratio, asymmetric cupping, myopia, disc haemorrhage, diabetes and positive family history are proven as risk factors in the current study. Elevated IOP is the most important risk factor for the development of glaucoma.

**Key Words:** Visual impairment, POAG, NTG, Glaucoma

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Date of Submission: 17-10-2019

Date of Acceptance: 02-11-2019

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### I. Introduction

Visual impairment is a global public health problem and glaucoma is the leading cause of irreversible blindness worldwide. Primary angle-closure glaucoma (PACG) and primary angle closure (PAC) are more common in East Asian countries than in Western countries, and the former often results in bilateral blindness.<sup>1</sup> It has been estimated that 3.9 million people with glaucoma will be blind due to primary angle closure glaucoma (PACG) by 2010. By 2020, this number is projected to increase to 5.3 million. Eighty-six percent of people with PACG are in Asia, with approximately 48.0% in China, 23.9% in India and 14.1% in Southeast Asia.<sup>2,3</sup> The prevalence of glaucoma depends on many factors, including ethnicity, age, gender, and geographic region. In the developing world, more than 80% of the people affected with glaucoma are unaware that they have the disease, and visual impairment from primary angle closure glaucoma is more severe than from primary open angle glaucoma. Identification of risk factors for primary angle closure glaucoma is essential for early detection and timely intervention to prevent visual impairment. The prevalence rate of angle closure glaucoma among different population is as follows 1.0% in Singapore, and 0.5% to 1.08% in India.<sup>4,5</sup> Primary Open angle

glaucoma is more common than primary angle closure glaucoma. To plan the prevention of blindness strategies, it is of paramount significance to have population based prevalence statistics of the causative factors.<sup>6,7</sup> Risk refers to the probability of developing POAG in a specified period of time. Assessing risk is different from the ability to separate or distinguish glaucomatous from normal eyes by the relative prevalence of certain parameter. Since glaucoma is a multi-factorial disease, the consideration of a single parameter or a group of parameters taken one at a time, seems an overly simplistic approach. No parameter considered in isolation has proven to be a useful risk factor i.e.a predictor of the development of POAG.<sup>8,9</sup>

The general risk factors are and age family history, the ocular risk factors are intra-ocular risk factors, and intra-ocular risk factors are intra-ocular pressure, optic nerve head features, including disc haemorrhages and myopia. The systemic risk factors are diabetes mellitus, blood pressure (hypertension), migraine, and thyroid disorders. The presumed risk factors are myopia, disc haemorrhages, large cup/discratio, asymmetric cupping and diabetes. The potential risk factors are male sex and systemic hypertension.<sup>10</sup>

## II. Materials And Methods

The present study was carried out during the period January 2018 to December 2018 at the Associated Hospital Govt Medical College, Baramulla in the Department of Ophthalmology. The study was a descriptive observational study. Written informed consent procedure was followed in all patients recruited into the study. The study group consisted of 950 patients aged 40 years and above, belonging to both sexes; these patients presented themselves for their geriatric ocular problems like Presbyopia, Refractive errors, Diminution of vision, Diabetes, Hypertension, Migraine, Cardiovascular disorders as referred from the department of Medicine for Ophthalmic evaluation. They were screened for glaucoma, and in those with established primary open angle glaucoma (POAG), normal tension glaucoma (NTG) and ocular hypertension (OHT), further study was undertaken for the probable risk factors causing them. The "risk factors" studied were categorized as known risk factors like elevated IOP, Age and Family history of glaucoma, and Presumed Risk factors like large cup/discratio, asymmetric cupping, vertically oval cup, notching of the cup, irregularities of the neuroretinal rim, pallor, etc. The other non-ocular presumed risk factors studied were Diabetes, Hypertension, and Cardiovascular disorders, migraine, etc. Other early risk factors like nerve damage causing field changes were also noted. Cases with Primary angle-closure glaucoma and secondary glaucoma as were excluded from the study. In order to ascertain the risk factors for glaucoma, specific examination included family history of glaucoma, age of onset, tonometry, diurnal variations of IOP, ocular fundal examination for optic disc evaluation for enlargement and asymmetry of cupping, vertically oval cup, disc haemorrhages, pallor, polar notching, nasalisation of vessels. Automated perimetric evaluation of the visual fields was undertaken in all relevant cases.

**Anterior Segment Evaluation:** Anterior chamber depth was estimated by the Van Herick's method to rule out shallow anterior chamber and scrutinised for evidence of any flare, ectropion uveae, synechiae, etc. to rule out secondary causes of glaucoma.

**Gonioscopy:** Goldmann 3-mirror contact lens was used for gonioscopy to study the angular width of the angular recess, configuration of the peripheral iris, insertion of the iris root, visibility of angle structures, peripheral anterior synechiae if any, pigmentation, pseudo-exfoliation, etc. Particular attention was paid to search for secondary open-angle glaucoma (pigment dispersion, trauma, etc.)

**Visual Acuity and Refraction:** Assessment of Central Visual Acuity for both distance and near was done, both un-corrected and best-corrected visual acuity. Every patient diagnosed as glaucomatous was examined in the dark room for clarity of ocular media, and retinoscopy was done using a streak retinoscope to rule out any refractive error. Attention was paid to the association of Myopia or Hypermetropia if any. Correction of refractive error was done for facilitation of accurate perimetry.

**Intraocular Pressure:** Intra-ocular pressure in all the cases diagnosed as POAG, NTG or OHT was measured with the Goldmann type of applanation tonometer attached to the slit-lamp bio-microscope. Tonometry was done on both eyes before performing gonioscopy or dilatation of the pupil. Time of IOP measurement was also noted.

**Optic Disc Evaluation:** The disc (ONH) was evaluated by direct, indirect ophthalmoscopy and slit-lamp bio-microscopy. Indirect ophthalmoscopy with +20D condensing lens, and biomicroscopic stereoscopic examination of the posterior pole was done using +78D and +90D condensing lens and with the Goldmann three-mirror contact lens while performing gonioscopy. Visual field examination and analysis was carried out only on the 50 patients diagnosed as POAG, NTG or OHT.

**Operational definitions:** IOP  $\geq$  21 mmHg is considered as abnormal. Cup/disc ratio of  $>0.4$  was considered as abnormal. Asymmetry of cup/disc was considered if the difference between the eyes was  $>0.2$ . A difference of IOP  $> 5$  mmHg in two eyes was considered abnormal.

**Evaluation of Glaucomatous Visual Field Defects:** Using the automated perimeter (Humphrey Visual Field Analysis), the damage to the optic nerve head and the NFL in glaucoma were assessed in all these 50 cases. Only

in those cases (eyes) where the vision was extremely poor (where patient could not fixate) perimetry was abandoned.

**Statistics:**All continuous variables are expressed as percentages and mean with standard deviation.

### III. Results

Out of 950 patients screened, open angle glaucoma was noted in 50 cases. This lead to prevalence of glaucoma as 5%. The prevalence of primary open angle glaucoma, normal tension glaucoma and ocular hypertension is given in table 1.

S.No	Parameters	Total Number of detected	Prevalence in 950 cases screened	Proportion of cases in 50 cases of glaucoma
1	POAG	33	3.3%	66%
2	NTG	13	1.3%	26%
3	OHT	4	0.4%	8%
4	Total	50	5.0%	100

**Table 1: Prevalence of Open Angle Glaucoma (n = 950), POAG - Primary Open Angle Glaucoma, NTG-Normal Tension Glaucoma, OHT-Ocular Hypertension**  
 Out of 50 cases (38 males and 12 females) of glaucoma, 13 patients were in the age group of 50 to 59 years. Eleven patients each were noted in age groups 40-49, 60-69 and 70 years and above. The mean age of POAG, NTG and OHT was between 50 to 60 years (54.7).

In the present study, nearly 56% of the eyes had fairly good visual acuity (table 2). 31% of eyes had fairly good vision that would not render them visually handicapped. Another 13% eyes were legally blind as they were in a very advanced state. 71% of the eyes had retained good visual acuity (best corrected vision) of up to 6/18 during this period of study.

Age Group In years	Up to 20 mm hg	21 mm hg and above		Total
	NTG	POAG	OHT	
40-49	5	6	2	13
50-59	5	8	1	14
60-69	2	9	1	12
70 and above	1	10	-	11
Total	13	33	4	50

**Table 2: Distribution of Glaucoma Cases-POAG, NTG, and OHT (n = 50 cases)**

#### C/D Asymmetry

Out of a total of 46 patients of POAG and NTG, 7 POAG patients of POAG and 2 NTG patients showed no C:D asymmetry. But the remaining patients (37 patients) showed C:D asymmetry, being both significantly high in both POAG with higher IOP compared to NTG patients with normal IOP.

Visual field analysis: Table 3 tabulates the type of field defect observed in patients with POAG and NTG. No statistical significance seen between type of field defect & type of glaucoma.

Type of Field defect	No of eyes		Total
	POAG	NTG	
Generalised depression	9	5	14
Peripheral constriction	8	6	14
Seidel's sign	3	0	3
Arcuate scotoma	16	9	25
Tubular scotoma	13	3	16
Temporal island	2	1	3
No field	11	0	11
Normal VF	4	2	6
Total	66	26	92

**Table 3:** Visual Field Changes in Primary Open Angle Glaucoma (POAG) and Normal Tension Glaucoma (NTG), n = 46, 92 eyes

Pressure Range IOP in mmHg	Visual Field Changes		
	Early	Established	Advanced
21-25	14 (22.4%)	8 (12.9%)	2 (3.2%)
26-30	5 (8.1%)	4 (6.5%)	4 (6.5%)
>31	1 (1.6%)	4 (6.5%)	20 (32.2%)
Total no of eyes	20 (32.2%)	16 (25.8%)	26 (50%)

**Table 4:** Correlation of Intra-ocular Pressure (IOP) & Field Changes in Primary Open Angle Glaucoma (POAG), n = 33

#### Correlation of CDR with field changes

Early field defects- 13 eyes up to 0.5 CDR. Established Field defects- 6 up to 0.5 CDR and 19 in CDR above this level. Advanced field defects are seen with an increase in CDR of 0.7 and above in 30 patients. Field defects advance rapidly with increase in CDR from 0.5 and above. Till then, up to 0.5 only early field changes like generalised depression and peripheral constriction and nasal steps are seen. Thus, there is a linear relationship between CDR and Field defects.

#### Family History and Glaucoma

Family History of Glaucoma was elicited in 15 cases of POAG in the first degree relatives.

#### Glaucoma and other associated Risk factors

Number of diabetes, hypertension and disc haemorrhages and myopia cases seen in the study tabulated in table 5.

	Diabetes mellitus	Hypertension	Diabetes and HT	Disc Haemorrhages	Myopia
	No of eyes	No of eyes	No of eyes	No of eyes	No of eyes
POAG	4	3	7	2	4
NTG	1	1	2	4	2
OHT	-	-	-	-	-

**Table 5:** Risk Factors Correlated with Glaucoma

### IV. Discussion

Several studies in India have put the prevalence rate to vary from 1.3 to 3.9%. In the present study, a total number of 950 patients (Hospital based population) over the age of 40 years belonging to both sexes were screened for glaucoma to study the risk factors for glaucoma. The prevalence of Open angle Glaucoma in the present study is 5%.<sup>11</sup> Compared to the Population-based studies of the white race, and the Asian studies, the present hospital-based study shows a higher prevalence. This is because the study population consists of patients over 40 years of age (both sexes) who were attending the Department of Ophthalmology for geriatric ocular problems like presbyopia, myopia, macular degeneration, diabetic retinopathy and hypertensive retinopathy. Some of them were referrals from the general practitioners, and a few more were from the Department of Medicine for their ocular examination for diabetes, hypertension and cardiovascular problems. The sample also includes the previously detected glaucoma cases, those who were already on treatment for glaucoma and individuals with a family history of glaucoma.

Identification of risk factors have prognostic or predictive significance for the development of POAG. 10 Risk factors need to be tested in prospective studies to evaluate their sensitivity and specificity.<sup>12</sup>

IOP is best considered both a risk factor and a cause of glaucoma. It is estimated (Melbourne Visual Impairment Project) that for every 1 mmHg the risk of developing glaucoma increased by 10%. Other clinical trials of POAG report that greater pressure lowering results in less progression, thus, establishing IOP as a definite risk factor. In the Baltimore Eye Survey, 10.3% of patients with IOP  $\geq 22$  mmHg had glaucoma (and 1.2% patients with less than 22 mmHg IOP). This yields a relative risk of 8.6 for higher IOP levels compared to lower levels of IOP. OHT, also designated glaucoma suspects and early open angle glaucoma without damage have potential consequences of developing POAG. The present study shows a prevalence of 0.4% of OHT compared to 3.3% POAG. NTG is a separate entity which in most ways mimics POAG except the IOP where it is either normal or less than 21 mmHg. In the present study, the prevalence of NTG has been 1.3%. However, these are certain characteristic features that separate NTG from POAG. In NTG – the neural rim is significantly thinner, especially inferiorly and infero-temporally. Cupping in NTG is more broadly sloping, resulting in less disc volume alterations.<sup>13</sup>

In the present study, evaluations were done paying particular attention to cup/disc ratio (C/D). With an increase in the C/D ratio, there is a corresponding increase in the visual field defects. Numerous studies have reported an increased incidence of glaucomatous visual field defects among those with large C/D ratios.

## V. Conclusion

The prevalence of Open Angle Glaucoma in this hospital-based study was 5%. Age, elevated intra-ocular tension, large cup/disc ratio, asymmetric cupping, myopia, disc haemorrhage, diabetes and positive family history are proven as risk factors in the current study. Elevated IOP is the most important risk factor for the development of glaucoma.

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Dr. Abdul Aziz Makayee. “A Prosepctive Study of Prevalence and Risk Factors In Primary Open Angle Glaucoma in Associated Hospital, Govt Medical College, Baramulla.” *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, vol. 18, no. 11, 2019, pp 19-23.