

Glaucoma screening skills among general ophthalmologists - How general should it be?

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Purpose: To compare the glaucoma assessment skills among general ophthalmologists in their referral patients over 5 years. **Methods:** This was a retrospective auditing of the electronic medical record database. Details of consecutive new glaucoma patients seen in the glaucoma services of a tertiary eye care institute in 2013 and 2018 were collected. Details of each patient included the clinical presentation, baseline intra-ocular pressure (IOP), type and severity of glaucoma, referral details, gonioscopy, HVF (Humphrey visual field) data, and the number of medications. Statistical tests used were the Chi-square test and T test using SPSS version 22. **Results:** Of 28,886 medical records screened, 211 and 568 new glaucoma patients were retrieved in 2013 and 2018, respectively. The patients presenting in 2018 were younger (58.1 ± 15.4 years) at presentation than in 2013 (65.6 ± 15.2 years), $P < 0.01$, and also had higher baseline IOP (IOP ≥ 40 mm Hg was found in 9.5% in 2018 versus 2.4% in 2013; $P < 0.01$). The percentage of eyes with presenting visual acuity worse than 20/400 or 20/600 was higher in the patients presenting in 2018 (22.2% vs. 15.1%; $P = 0.03$). Although primary glaucoma predominated in both periods, the number of eyes referred to as disc suspects showed an increase in 2018 (4.7% to 14.4%; $P < 0.01$). Among 195 and 517 referrals in 2013 and 2018, respectively, the documentation of clinical findings were dismally poor in both the groups in terms of absent gonioscopy (99% vs. 98.2%, $P = 0.4$), absent disc details (89.6% vs. 91%, $P = 0.5$), or absent visual field analysis (79.1% vs. 74.8%, $P = 0.2$). However, the missing IOP values were significantly better in the latter year (77.3% vs. 57.2%; $P < 0.01$). **Conclusion:** The increase in the number of new glaucoma patients and referrals did not show a corresponding improvement in documentation of findings except for IOP recording among general ophthalmologists. Hence, we need to re-emphasize the training of general ophthalmologists on basic glaucoma evaluation to improve their referral ability.

Key words: General ophthalmologist, glaucoma referrals, glaucoma screening

Glaucoma remains the second most common cause of blindness worldwide.^[1-3] Earlier studies had revealed that there were an estimated 12 million people affected by glaucoma in India, which was expected to be 16 million by 2020.^[2] Disappointingly, a large portion of the glaucoma patients in India are undiagnosed,^[4] missed,^[4] or even over-diagnosed^[4] and over-treated as well. In India, eye care is provided by a diverse group of multiple Centers of Excellence (Government and private Institutions), medical colleges (Government and private) and hospitals in cities and towns, district hospitals in sub-urban areas, and health centers in rural villages. There are plenty of private ophthalmologists practicing in different parts of the country. Optometrists in isolation mainly focus on the correction of refractive errors. The role of general practitioners in ophthalmology is very limited. Because the availability of a trained glaucoma specialist is scarce, proper screening and appropriate referral by the general ophthalmologist are extremely crucial. There has been no evidence in the literature that proves that the diagnostic acumen is improving among general ophthalmologists to detect glaucoma. Hence, the purpose of the study was to find out if there is any improvement

in basic glaucoma screening by the general ophthalmologist over the years.

Methods

This was a retrospective, uni-center, and non-interventional study. After getting approval from the institutional review board, a retrospective chart review of electronic medical record data of all new patients who visited the glaucoma clinic of a tertiary eye care center in eastern India in 2013 and 2018 was performed. Most of them were referred by general ophthalmologists practicing in different districts of the state. Demographic data, referral details, current intra-ocular pressure (IOP) measurements, gonioscopy details, optic disc cupping data, Humphrey visual field (HVF) data, and types of glaucoma diagnoses were retrieved.

Excluded from the analysis were other new patients seen in glaucoma service with non-glaucoma diagnoses such as

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cataracts, refractive error, and so on. Also, patients whose referral details are grossly incomplete or inaccurate were excluded.

Final diagnoses of different types of glaucoma that were referred to were made per guidelines from the International Society of Geographical and Epidemiologic Ophthalmology classification.^[5] Ocular hypertension (OHT) was defined as an IOP of ≥ 21 mm Hg with the disc and visual field within the normal limit, drainage angles open, and in the absence of any ocular or systemic causes of raised IOP.^[6] Primary open-angle glaucoma (POAG) was defined as an IOP of ≥ 21 mm Hg with typical disc and the corresponding field changes—drainage angles being open.^[7] Normal-tension glaucoma (NTG) was defined as similar clinical features to that of POAG but with the IOP being ≤ 21 mm Hg.^[6] Primary angle-closure glaucoma (PACG) was defined as having the presence of documented optic nerve damage and visual field loss with angles showing iridotrabecular contacts and signs of goniosynechias.^[8]

The management of POAG, POAG suspect, and PACG was performed according to the preferred practice patterns in glaucoma, published by the American Academy of Ophthalmology.^[6-8]

Severe glaucoma in our study was defined as eyes with optic disc cupping ≥ 0.8 with neuroretinal rim thinning, excavation, or notch with retinal nerve fiber layer defects, with or without the corresponding visual field defects.

Statistics methods: EMR data were entered into Microsoft Excel (Redmond, WA). Descriptive statistics included mean and standard deviation. Categorical variables were summarized as percentages. Statistical tests used were the Chi-square test and T test. Statistical analysis was performed using SPSS version 22 (SPSS Inc., Chicago, IL). $P < 0.05$ was considered statistically significant.

Results

The demographic and referral details of the patients are given in Table 1. Overall, the patients from 2013 were older (65.6 ± 15.2 years) than those in 2018 (58.1 ± 15.4 years). This was statistically significant ($p < 0.01$). Most patients were males (60.4% in 2013 and 60.7% in 2018) with no significant difference in the gender distributions ($P = 0.9$). Of all patients seen, 92.4% in 2013 and 91% in 2018 (mentioned as “referral” in the article) were referred to the tertiary care hospital from other general ophthalmologists across the state for different glaucoma or non-glaucoma-related eye problems and finally routed to the glaucoma service of the institute. The rest (mentioned as “routine” in the article) came to the institute of their own without any previous eye consult. It is apparent that most of the patients were initially referred with non-specific diagnoses such as cataracts, glaucoma, raised IOP, and disc suspect. The trend showed a decreasing trend (86.26% in 2013 vs. 66.73% in 2018; $P < 0.01$).

Of the specific diagnoses, significantly more patients were locally diagnosed with having either primary (14.2% in 2013 vs. 25% in 2018; $P < 0.01$) or secondary glaucomas (0% in 2013 vs. 3.7% in 2018; $P < 0.01$) in 2018, compared to 2013. Interestingly, only four and ten patients were diagnosed to have chronic congestive glaucoma in 2013 and 2018 (difference

statistically not different; $P = 0.9$). The rest all patients did not have data on gonioscopy or were labeled as the open angle in a few. A significantly high number of patients did not have documentation of IOPs, gonioscopy, disc evaluation, and HVF analysis in both the years [Table 1]. Although the IOP documentation showed an improvement down the years (missing values = 77.3% vs. 57.2%; $P < 0.01$), other clinical parameters failed to show any statistically significant change.

Table 2 shows the final clinical characteristics. Although there were no differences in the percentages of eyes which presented with an IOP of ≤ 20 mm Hg or ≤ 40 mm Hg, a significantly more number of eyes presented with an IOP of > 40 mm Hg in the latter year (2.4% in 2013 vs 9.5% in 2018; $P < 0.01$). The final diagnoses reveal a rising trend in both primary glaucoma (47.9% in 2013 vs. 60.9%, $P < 0.01$) in 2018 and secondary glaucoma (8.3% in 2013 vs. 11.8% in 2018; $P = 0.2$), with a decreasing incidence of making non-specific diagnoses (43.8% in 2013 vs. 27.3% in 2018; $P < 0.01$). There was no difference in the incidence of different sub-types of primary glaucoma in the two time periods. Also in 2018, patients showed a poorer visual acuity at presentation. More patients belonged to the World Health Organization (WHO) definitions of legal blindness (logMAR VA worse than 1.3) in the latter period – 15.1% in 2013 vs. 22.2% in 2018; $P = 0.03$.

The anti-glaucoma medication (AGM) use and the need for glaucoma filtering surgeries are described in detail in Fig. 1. Although almost all referred patients were using one or more AGM, approximately one third of patients in either group (30.8% in 2013 vs. 35.2% in 2018) were weaned from medication use. A higher percentage of patients needed ≥ 4 medications in 2018 (6.9%) than in 2013 (3.8%), although statistically not significant ($p = 0.1$). A higher number of patients in 2013 needed one or more glaucoma filtering surgeries than in 2018 to control the glaucoma progression (7.58% vs. 4.23%), but this was not statistically significant ($p = 0.06$).

Approximately 44% in 2013 and 43.8% in 2018 had severe glaucoma (as defined earlier), out of which $> 80\%$ had no baseline disc documentation. About 64% had no HVF analysis report documented. Surprisingly, most (99%) of the patients in the two time periods did not undergo gonioscopy or had documented gonioscopy findings in the referral letters. The details are given in Fig. 2. These missing parameters did not show any significant improvement from 2013 to 2018.

Discussion

India was predicted to become the second largest prevalent zone of glaucoma by 2020.^[2] Globally, the total number of glaucoma patients is estimated to increase by a massive 74% from 2013 to 2040.^[9] To effectively manage this mammoth health problem and reduce preventable blindness, early diagnosis and treatment are crucial. Early diagnosis of glaucoma remains a difficult task owing to the asymptomatic nature of the disease and the lack of effective population screening tools. It is reported from Chennai Glaucoma Study that 50–90% of the glaucoma cases from both urban and rural India are undiagnosed and a vast majority of them are diagnosed late in the disease.^[10] The lack of awareness about glaucoma in the general population has been attributed as the main cause for the late presentation of the disease as well as a higher risk of blindness.^[11] Awareness is estimated to range from 0.32% among the rural population in

Table 1: Baseline Characteristics and Referral Details

Parameters	2013 (n=211)	2018 (n=568)	Significance of the difference
Age (year)	65.6 ± 15.2	58.1 +/- 15.4	<i>P</i> <0.01
Mean+/- standard deviation			
Gender (Male:Female)	127:84	345:223	<i>P</i> =0.9
Routine	16 (7.58%):	51 (8.98%):	<i>P</i> =0.5
Referral	195 (92.41%)	517 (91.02%)	
Documentation of Diagnosis (%)			
Primary Glaucoma	13.7	29.6	<i>P</i> <0.01
Secondary Glaucoma	0	3.7	<i>P</i> <0.01
Non-specific glaucoma diagnoses etc.	86.3	66.7	<i>P</i> <0.01
Non-specific glaucoma diagnoses			
Cataract	3	14	
Glaucoma	110	141	
Refractive error	27	71	
Raised IOP	20	46	
Disc suspect	6	82	
TGOA	0	9	
Optic atrophy	10	13	
Glaucoma suspect	4	0	
Absolute glaucoma	2	3	
Total Diagnosis	182	379	<i>P</i> <0.01
%	86.3	66.7	
Sub-Diagnosis of Primary Glaucoma (%)			
POAG	53.3	41.5	<i>P</i> =0.2
PACG	1.9	1.76	<i>P</i> =0.9
NTG	13.3	0.7	<i>P</i> <0.01
JOAG	6.7	2.1	<i>P</i> =0.2
Documentation of IOPs in different strata (%)			
Not done/Absent Data	99	98.2	<i>P</i> =0.4
Gonio done/data available	1	1.8	<i>P</i> =0.4
Documentation of Disc changes (%)			
Absent disc finding	89.6	91	<i>P</i> =0.5
≤0.7 cupping	2.4	4.7	<i>P</i> =0.1
≥0.8 cupping	8	4.2	<i>P</i> =0.03
Documentation of HVF analysis (%)			
HVF not done/Absent Data	79.1	74.8	<i>P</i> =0.2
HVF done/Data available	20.9	25.2	<i>P</i> =0.2
Documentation of Disc Imaging e.g. OCT (%)			
Imaging not done/Absent Data	90.5	91.7	<i>P</i> =0.5
Imaging done/data available	9.5	8.3	<i>P</i> =0.6

POAG—primary open angle glaucoma; PACG—primary angle closure glaucoma; NTG—normal tension glaucoma, JOAG—juvenile open angle glaucoma; HVF—humphrey visual field; OCT—ocular coherence tomography

southern India^[12] and 8.3% in the rural population in northern India^[13] to 13.5% in the urban population in southern India.^[14] This contrasts with a slightly better 27% awareness among patients who visit the eye clinic of a city hospital in central India,^[15] although this again is not optimal for robust eye health. The absence of disease knowledge is not limited to developing countries such as India. As high as one-quarter of patients in USA was reported not following verbal or written commands from health care staff in the hospital environment, referred to as poor health literacy.^[16] To counterbalance the

poor awareness of this important disease in the community, we could have benefitted from a sound screening program. Developing countries lack the required infrastructure to detect, treat, and follow up the test positives from various screening tests.^[17] Currently, the best approach to managing glaucoma in developing countries is case detection.^[18] In the ideal circumstance, every new patient visiting an eye clinic must undergo a comprehensive eye examination, irrespective of the presenting complaints. This includes vision measurement, refraction and assessment of the pupil reflex, biomicroscopy,

Table 2: Final diagnoses and clinical characteristics

	2013 (n=211)	2018 (n=568)	Significance of the difference
Diagnosis			
Primary Glaucoma (%)	47.9	60.9	<i>P</i> <0.01
Secondary Glaucoma (%)	8.3	11.8	<i>P</i> =0.2
Misc, e.g., disc suspect, absolute glaucoma, etc., (%)	43.8	27.3	<i>P</i> <0.01
Sub-Diagnosis of Primary Glaucoma (%)			
POAG	40.8	32.9	<i>P</i> =0.09
PACG	54	59	<i>P</i> =0.3
NTG	7.2	8.4	<i>P</i> =0.7
JOAG	3.9	5.3	<i>P</i> =0.5
Baseline IOPs in different strata (%) in mm Hg			
0 < IOP ≤20	72	64.6	<i>P</i> =0.05
20 < IOP ≤40	25.6	25.9	<i>P</i> =0.9
IOP >40	2.4	9.5	<i>P</i> <0.01
Visual Acuity (LogMAR) in different strata (%)			
VA up to 20/200 (logMAR 0 to ≤1)	82.9	75.2	<i>P</i> =0.02
VA worse than 20/200 to 20/400 (CF 3 m), i.e., logMAR >1 to ≤1.3	0.9	2.6	<i>P</i> =0.1
VA worse than CF3 m, i.e., logMAR >1.3	15.1	22.2	<i>P</i> <0.01

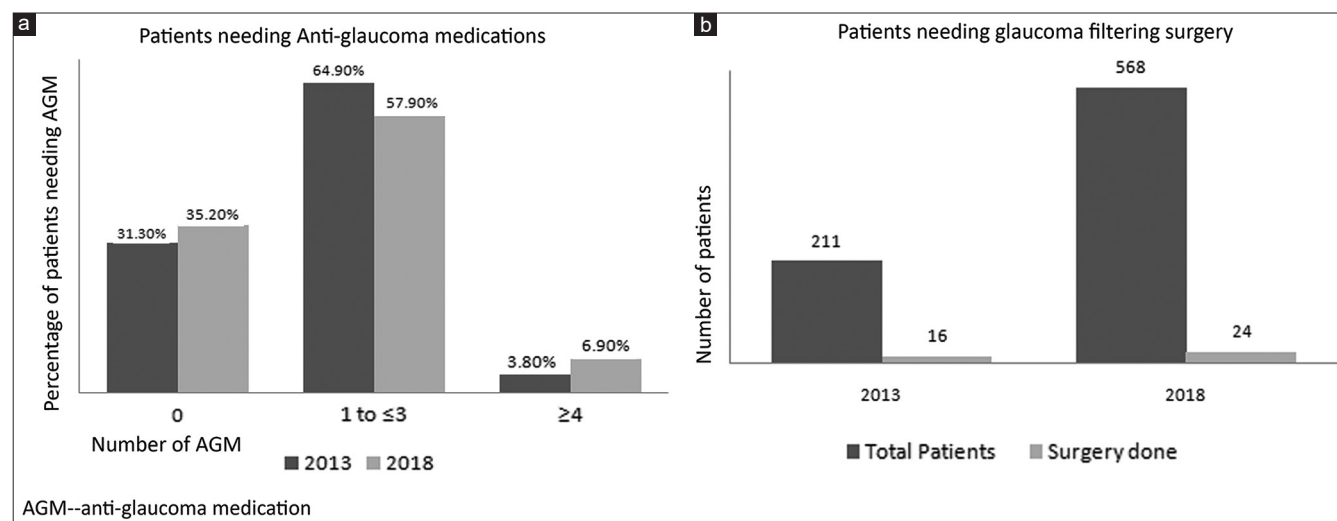


Figure 1: (a) description of eyes needing no or different numbers of anti-glaucoma medications (b) description of eyes which were managed by anti-glaucoma medications alone or needed glaucoma filtering surgery

tonometry (preferably applanation), gonioscopy wherever indicated, and a dilated fundus examination with emphasis on the disc and posterior pole. This would enable the detection of the true burden of the disease problem. A significantly higher number of patients in 2018 in our study presented with higher IOP and a worse visual acuity, compared to 2013. This indicates the overall rise in the disease load and consequently late and advanced presentation. Approximately 40% of the patients in either year had advanced disease at presentation. To ensure that this burden does not add to a load of irreversible blindness, it is essential to deliver comprehensive ophthalmic examinations to every patient at the earliest.

The minimum basic clinical tests performed or advised for glaucoma diagnoses were significantly less in patients who have been referred for glaucoma. This reflects the lack of awareness among general ophthalmologists about the need for routine glaucoma tests before diagnosis or treatment of

glaucoma in any patient. In a survey conducted during the Glaucoma Society of India meeting,^[19] the percentages of the attendees (fellowship-trained glaucoma specialists and general ophthalmologists practicing glaucoma) performing standard applanation tonometry or indentation gonioscopy routinely in all glaucoma patients were 72% and 82.6%, respectively. It is therefore obvious that these clinical tests are further less performed for “other routine” patients with an eye problems. What is more worrisome is that the missing clinical tests did not show any improvement in a tier-2 capital city such as ours in 5 years.

It was also observed that most of the referral patients were initially labeled to have non-specific diagnoses such as disc suspect/raised IOP. A complete glaucoma diagnosis was missing in the majority. Luckily, this trend showed an improvement over the years. A significantly fewer number of patients in 2018 had an incomplete diagnosis than in 2013.

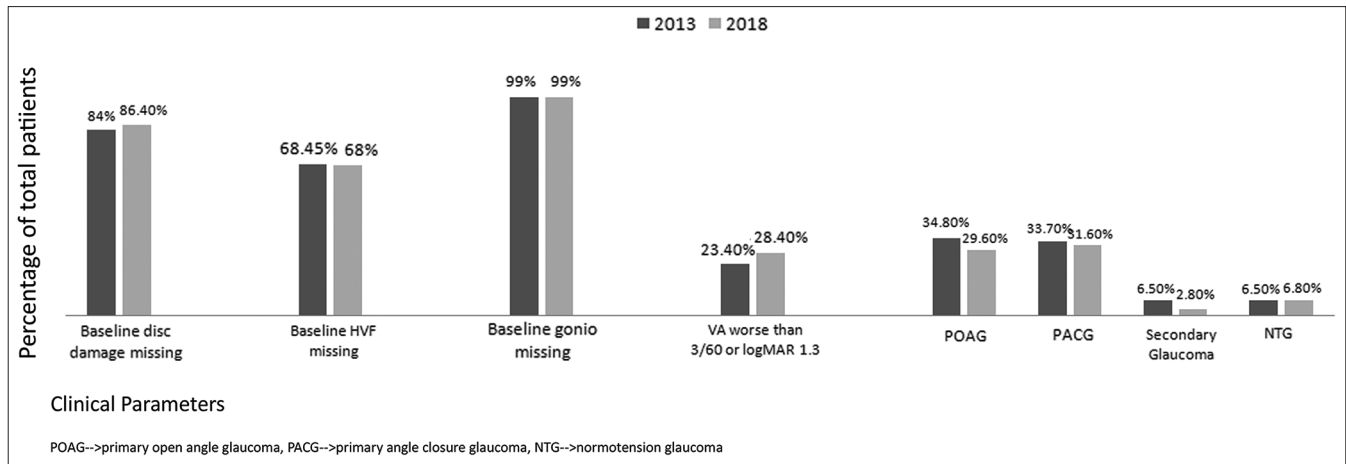


Figure 2: Clinical features of advanced glaucoma

Almost one third of the patients in both periods, who were already under one or more anti-glaucoma medications, were weaned from them. This indicates a component of over-treatment and over-diagnosis—which are already reported in European countries.^[20,21]

What could have gone wrong here? Professor Ravi Thomas had pointed out some possible explanations in his research such as preferential interest among general ophthalmologists for doing routine cataract and refractive surgeries (an easy and safe way to generate revenue) and a grossly inadequate residency program that teaches most of the would-be ophthalmologists nothing other than routine torch-light examination.^[18] The need of the hour, hence, is the comprehensive training of the doctors and other health care staff, as advocated by a WHO panel.^[22] There is some positive news about the efficacy of such glaucoma training programs for health care providers. These include improved patient satisfaction in staff communication,^[23] improvements in medication adherence,^[24] and better communication among doctors and patients.^[25]

The limitation of our study is its retrospective nature and inability to trace and reach out to the referring doctors about the problems in referring the patients. We agree that an interview with the primary physician would have given some input into how the problems could have been resolved—be it time constraint or the lack of investigative tools such as gonioscopy, the visual field testing for glaucoma diagnosis. Sadly, the contact details of the referral doctor are often missing in referral letters. We also did not evaluate the qualifications of the referring doctor which could have given us an insight into possible reasons for missing details. The high percentage of missing IOP values in referral letters in both the years can somewhat be related to a lack of registering the detail by the primary doctor or the patients themselves. We regret that these finer details are difficult to elucidate in every case referred to us. We chose 5 years gap without evaluating the effect of any particular interventions/training programs targeted at improving the ophthalmic examination skills of general ophthalmologists in the state. This is a hospital-based study in eastern India; therefore, the results cannot be directly extrapolated to general ophthalmologists from other areas/countries. The results of this study should be treated as an internal audit and a method of self-assessment for general

ophthalmologists in this part of the country, who are interested in diagnosing and treating glaucoma.

Conclusion

Our study reveals serious lacunae in basic ophthalmic skills required for glaucoma screening and referring ability among local practitioners with no significant improvement in 5 years. Hence, it is recommended to have more doctor-oriented education programs to improve learning at the ground level.

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Conflicts of interest

There are no conflicts of interest.

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