Glaucoma Screening Skills Among General Ophthalmologists– How General Should it Be?

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Abstract

Purpose: To compare the glaucoma assessment skills among general ophthalmologists in their referral patients over a span of 5 years.

Methods: Details of consecutive new glaucoma patients seen in the glaucoma services of a tertiary eye care institute in 2013 and 2018 were collected from the hospital database. Details of each patient were obtained from the electronic medical records which included the clinical presentation, baseline intraocular pressure (IOP), type and severity of glaucoma, referral details, gonioscopy, HVF (humphrey visual field) data and number of medications.

Results: Of 28,886 medical records screened, 211 & 568 new glaucoma patients were retrieved in 2013 & 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%); $p = 0.03$. Though primary glaucoma predominated in both periods, number of eyes referred to as disc suspects showed an increase in 2018 (4.7% to 14.4%; $p < 0.01$). Among 195 & 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 of IOP values was significantly better in the latter year (77.3% vs. 57.2%; $p < 0.01$)

Conclusion: The increase in number of new glaucoma patients and referrals did not show a corresponding improvement in documentation of findings except IOP recording among general ophthalmologists. Hence we need to re-emphasize on the training of general ophthalmologists on basic glaucoma evaluation to improve their referral ability.

Introduction:

Glaucoma remains the second most common cause of blindness worldwide ^{1,2,6}. Earlier studies had revealed that there were an estimated 12 million people affected by glaucoma in India which is expected to be 16 million by 2020.² Disappointingly, a large portion of the glaucoma patients in India are either undiagnosed,⁴ missed,⁴ or even over-diagnosed,⁴ and over-treated as well. Since the availability of a trained glaucoma specialist is scarce, proper screening and appropriate referral by the general ophthalmologist is extremely crucial. There has been no evidence in the literature that proves that the diagnostic acumen is really 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 down the years.

Materials & Methods:

After getting approval from the institutional review board, retrospective chart review of electronic medical record data of all new patients who visited the glaucoma clinic of a tertiary eye care centre in 2013 and 2018, were done. Demographic data, referral details, current intraocular pressure (IOP) measurement, gonioscopy details, optic disc cupping data, Humphrey visual field (HVF) data and type of glaucoma diagnoses were retrieved.

Excluded from the analysis were other new patients seen in glaucoma service with non-glaucoma diagnoses like cataract, refractive error etc. Also patients whose referral details are grossly incomplete or inaccurate are excluded.

Final diagnoses of different types of glaucoma that were referred were made in accordance to guidelines from the International Society of Geographical and Epidemiologic Ophthalmology classification ⁷.

The management of primary open angle glaucoma (POAG), primary open angle glaucoma suspect and primary angle closure glaucoma (PACG) were done according to the preferred practice patterns in glaucoma, published from American Academy of Ophthalmology ^{8,9,10}.

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

Statistics methods:

EMR data were entered into MS excel. Statistical tests used were chi-square test and T test. SPSS version 22 was used for analysis.

Results:

The demographic& referral details 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 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 came to the institute of their own for a second opinion. Most patients were initially referred with non-specific diagnoses like cataract, glaucoma, raised intraocular pressure, and disc suspect. The trend showed a decreasing trend (86.26% in 2013 vs. 66.73% in 2018; $p < 0.01$).

Table 1
Baseline Characteristics and Referral Details

		2013 (n=211)		2018 (n=568)		Significance of the difference				
Age (year)	Report Age					P<0.01				
	Year	Mean	N	Std. Deviation						
	2013.0	65.597	211	15.2401						
	2018.0	58.100	568	15.3796						
	Total	60.131	779	15.6904						
Gender (Male:Female)						P=0.9				
							2013		2018	
							M	127	345	
	F	84	223							
Routine or Referral						P=0.5				
							2013		2018	
							Routine (n, %)		51 (8.98)	
	Referral (n, %)	195 (92.41)		517 (91.02)						
Documentation of Diagnosis (%)										
Primary Glaucoma		13.7		29.6		P<0.01				
Secondary Glaucoma		0		3.7		P<0.01				
Non-specific glaucoma diagnoses etc.		86.3		66.7		P<0.01				
Non-specific glaucoma diagnoses				2013	2018	P<0.01				
		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 Diag		182	379					
		%		86.25592	66.72535					
Sub-Diagnosis of Primary Glaucoma (%)										
POAG		53.3		41.5		P=0.2				
PACG		1.9		1.76		P=0.9				
NTG		13.3		0.7		P<0.01				
JOAG		6.7		2.1		P=0.2				
Documentation of IOPs in different strata (%)										
Absent Data		77.3		57.2		P<0.01				
IOP≤20		3.8		13.7		P<0.01				
IOP>21		18.9		29		P<0.01				
Documentation of Gonioscopy (%)										
Not done/Absent Data		99		98.2		P=0.4				
Gonio done/data available		1		1.8		P=0.4				
Documentation of Disc changes (%)										
Absent disc finding		89.6		91		P=0.5				
≤0.7 cupping		2.4		4.7		P=0.1				
≥0.8 cupping		8		4.2		P=0.03				
Documentation of HVF analysis (%)										
HVF not done/Absent Data		79.1		74.8		P=0.2				
HVF done/Data available		20.9		25.2		P=0.2				
Documentation of Disc Imaging e.g. OCT (%)										
Imaging not done/Absent Data		90.5		91.7		P=0.5				
Imaging done/data available		9.5		8.3		P=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

Of the specific diagnoses, significantly more patients were locally diagnosed to 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 4 and 10 patients were diagnosed to have chronic congestive glaucoma in 2013 & 2018 (difference statistically not different; $p=0.9$). Rest all patients did not have data on gonioscopy or were labeled as open angle in a few. Significantly high number of patients did not have documentation of intraocular pressures, gonioscopy, disc evaluation and HVF analysis in both the years (Table no.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—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 (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 subtypes of primary glaucoma in the two time periods. Also in 2018, patients showed a poorer visual acuity at presentation. More patients belonged to the WHO definitions of legal blindness (logMAR VA worse than 1.3)—15.1% in 2013 vs. 22.2% in 2018; $p=0.03$.

Table 2

Final diagnoses and clinical characteristics

	2013 (n=211)	2018 (n=568)	Significance of the difference
Diagnosis			
Primary Glaucoma (%)	47.9	60.9	P<0.01
Secondary Glaucoma (%)	8.3	11.8	P=0.2
Misc e.g. disc suspect, absolute glaucoma etc. (%)	43.8	27.3	P<0.01
Sub-Diagnosis of Primary Glaucoma (%)			
POAG	40.8	32.9	P=0.09
PACG	54	59	P=0.3
NTG	7.2	8.4	P=0.7
JOAG	3.9	5.3	P=0.5
Baseline IOPs in different strata (%) in mm Hg			
0<IOP≤20	72	64.6	P=0.05

20<IOP≤40	25.6	25.9	P=0.9
IOP>40	2.4	9.5	P<0.01
Visual Acuity (LogMAR) in different strata (%)			
VA up to 20/200 (logMAR 0 to ≤1)	82.9	75.2	P=0.02
VA worse than 20/200 to 20/400 (CF 3m) i.e. logMAR >1 to ≤1.3	0.9	2.6	P=0.1
VA worse than CF3m i.e. logMAR >1.3	15.1	22.2	P<0.01

The anti-glaucoma medication (AGM) use and need for glaucoma filtering surgeries are described in detail in figure 1. Though almost all referred patients were using one or more AGM, approximately 1/3rd 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%)—though 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 were had severe glaucoma (as defined earlier) out of which >80% had no baseline disc documentation. About 64% had no HVF analysis report documented. Further, 99% of these patients did not undergo gonioscopy or had documented gonioscopy findings in the referral letters. The details are given in figure 2. These missing parameters were similar between 2013 and 2018.

Discussion:

India is predicted to become the second largest containment zone of glaucoma by 2020.² Globally the total number of glaucoma patients is estimated to rise by a massive 74% from 2013 to 2040.³ 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 lack of effective population screening tools. It is reported from Chennai Glaucoma Study that 50-90% of the glaucoma cases from both urban & rural India are undiagnosed and a vast majority of them are diagnosed late in the disease¹¹. The important lack of awareness about

glaucoma in the general population is the main cause of late presentation as well as higher risk of blindness from the disease¹². Awareness is estimated to range from 0.32% among the rural population in Southern India¹³, 8.3% in rural population in northern India¹⁴ to 13.5% in urban population in Southern India¹⁵. This contrasts with a slightly better 27% awareness among patients who visit the eye clinic of a city hospital in central India¹⁶, though this again is not optimal for robust eye health. The absence of knowledge regarding disease is not limited to the developing countries like India. As high as one-quarter of patients in USA cannot follow verbal or written commands from health care staffs in hospital environment, referred to as poor health literacy¹⁷. 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 tests¹⁸. Currently, the best approach to managing glaucoma in developing countries is case detection¹⁹. Ideally, every new patient visiting an eye clinic, irrespective of presenting complaints, must undergo a comprehensive eye examination. This includes vision measurement, refraction and assessment of the pupil reflex, biomicroscopy, tonometry (preferably applanation), gonioscopy wherever indicated, and a dilated fundus examination with emphasis on the disc and posterior pole. This would enable detection of the true burden of the disease problem. A significantly more number of patients in 2018 in our study presented with a higher intraocular pressure and a worse visual acuity, compared to 2013. This indicates the overall rise in the disease load and likely late and advanced presentation. Approximately 40% of the patients in either year had advanced disease at presentation. To ensure this burden does not add to the load of irreversible blindness, it is essential to deliver comprehensive ophthalmic examination to every patient.

The minimum basic clinical tests done 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 country like India, where even the self-proclaimed glaucoma specialists do not perform standard applanation tonometry or indentation gonioscopy routinely in all glaucoma patients²⁰, is it not obvious, therefore, that those clinical tests are further less performed for “other routine” patients with eye problem. What is more worrisome is that the missing of clinical tests has not shown any improvement in a tier-2 capital city like ours in a span of 5 years.

It was also observed that most of the referral patients were initially labeled to have non-specific diagnoses like disc suspect/raised intraocular pressure. A complete glaucoma diagnosis was missing in the majority. Luckily, this trend showed an improvement down the years. Significantly less number of patients in 2018 had an incomplete diagnosis than in 2013.

Almost 1/3rd of the patients in both time periods, who were already under one or more anti-glaucoma medications, were weaned from them. This indicates a component of over –treatment and overdiagnosis –which are already reported from European countries.^{5,21}.

What could have gone wrong here? Professor Thomas had pointed some possible explanations in his article like—preferential interest among general ophthalmologists for doing routine cataract & refractive surgeries (easy and safe way to generate revenue) and a grossly inadequate residency program that teach most of the would-be doctors nothing other than routine torch-light examination¹⁹. The need of the hour, hence, is the repeat training of the doctors and other health care staffs, as advocated by a WHO panel²². There is some positive news about the efficacy of such glaucoma training programs for health care providers. These include improved patients satisfaction in staffs' communication²³, improvement in medication adherence²⁴ and better communication among doctors-and-patients²⁵.

Limitation of our study is its retrospective nature, 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 inputs into how the problems could have been resolved—be it in time-constraint or lack of investigative tools like gonioscopy, visual field 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 of 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 a period of 5 years gap without evaluating the effect of any particular interventions/training programs targeted at improving ophthalmic examination skills of general ophthalmologists in the state. This is a hospital based study; therefore results cannot be extrapolated to general ophthalmologists from other areas/countries. Results of this study should be treated as an internal audit and a method of self-assessment of general ophthalmologists trying to diagnose and treat glaucoma. Nevertheless, 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.

Declarations

Conflict of interest:

- None

Disclosures:

- None

Competing Interests:

- None

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- all the data is available within the manuscript only

Animal Research (Ethics):

- not applicable

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- approval of institutional review board (IRB) of IEC, MTC campus, L V Prasad Eye Institute, Bhubaneswar, India was obtained

Consent to Publish (Ethics):

- all authors gave their permission to submit the work for publication

Plant Reproducibility

- NA

Clinical Trials Registration

- NA

Gels and Blots/ Image Manipulation

- NA

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Figures

Description of eyes needing anti-glaucoma medication use and glaucoma filtering surgery

Figure 2

Clinical features of advanced glaucoma