



Patients' perception of glaucoma diagnosis practice: Results from a survey of glaucoma patients in North India

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Abstract

Purpose This study assesses the practice patterns of diagnosing ophthalmologists, as reported by glaucoma patients attending specialty glaucoma clinics in urban and rural areas of North India, for a second opinion.

Methods Prospective cross-sectional study using a structured interview-based survey was conducted from 1 November 2011 to 31 October 2012 on patients attending two specialty glaucoma care facilities in North India. Both clinics were in North India; however, one was rural (Kaithal) and one was urban (Delhi). Patients were asked through descriptions of machines and processes, regarding practice patterns of their glaucoma diagnosing ophthalmologists. The interview was conducted by ophthalmic assistants in tune with the vernacular of the region, in a language understood by the interviewee.

Results A total of 1506 patients consented to participate in the survey. The majority of patients reported undergoing tests for intraocular pressure measurement; however, 56–60% of these tests were carried out by the non-contact tonometer. More than 90% of patients reported no knowledge regarding the type and severity of the glaucoma they suffered from, and even less reported undergoing gonioscopy (3.6% Karnal and 16% Delhi). 84–86% patients who underwent perimetry reported undergoing at least some digital imaging of the optic disc.

Conclusions Better counselling of, and communication with, the patient would help increase their awareness regarding their condition and the care required. This has the potential to enable better compliance with and adherence to treatment. Standardized training of ophthalmologists to improve clinical diagnosis of glaucoma would also go a long way.

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Introduction

Glaucoma has been established as one of the leading causes of irreversible blindness [1, 2], with over 2.9 million blind and 4 million visually impaired worldwide [3]. In India, the prevalence of glaucoma has

been estimated to be around 11.2 million in the over 40 year age group, with many more suffering undetected [4]. Early diagnosis and appropriate treatment can prevent blindness from glaucoma, and this requires efforts from both the doctor and the patient [5].

However, in India, like many low- and middle-income countries, a crunch in trained ophthalmic manpower is persistent, with one ophthalmologist per population of 100,000, a situation made worse by inequity in their distribution across the country, with the majority of ophthalmologists being clustered in urban areas and cities [6]. The “pyramidal model” defines a structure wherein the comprehensive ophthalmologist at secondary centres can be trained to screen for and diagnose primary glaucomas as well as perform a basic laser procedure [7].

Nevertheless, gaps persist between the training of ophthalmologists and the needs of the patients [8, 9]. While the pyramidal model has taken effect in the catchment areas serviced by these centres, in rural areas where access to quality eye care is still limited, formal glaucoma diagnosis is performed by either a general physician, or a comprehensive ophthalmologist, and more uncommonly by a glaucoma specialist or a non-glaucoma ophthalmic subspecialist [10, 11]. In either case, it is imperative for primary care physicians to understand the family history of patients presenting with ophthalmic conditions and refer those with a (suspected) family history of glaucoma to the nearest ophthalmologist [12]. Glaucoma diagnosis and management can differ in practice when conducted by a general ophthalmologist or non-glaucoma subspecialist ophthalmologist and when conducted by an ophthalmologist trained in glaucoma care [11]. The gaps in service delivery of formal eye care can even manifest as consumer barriers to eye care utilization (direct and indirect costs borne, lack of felt need and dependence on attendants) [13, 14] and can result in patients resorting to informal, unqualified sources of health care. Lack of patient awareness and knowledge about glaucoma as a disease can precipitate matters further.

Needless to say, the cracks in the delivery and receipt of glaucoma care in India are a systematic failure brought about in tandem by provider constraints and consumer demand. Under the umbrella of the National Programme for the Control of Blindness and Visual Impairment (NPCB) [15] and through

international, national and region specific eye care organizations, community outreach programs [7] which aim to spread awareness and knowledge about various eye diseases and their signs and symptoms are gathering steam across the country. However, service delivery for eye care, and glaucoma in particular, is dependent on clinical diagnosis [16], for which homogenous protocols are yet to be adopted.

The aim of this study is to assess the practice patterns of diagnosing ophthalmologists, as reported by glaucoma patients attending specialty glaucoma clinics in urban and rural areas of North India, for a second opinion. This assessment will help determine the gap between the guidelines and the existing trends, providing a foundation on which modifications to the guidelines and future practice policies can be based.

Methods

Study design

This is a prospective cross-sectional study that uses data from a structured interview-based survey conducted on patients attending two specialty glaucoma care facilities in North India. The methodology and results from this study have been detailed previously [17]. The survey was conducted over a period of one year from 1 November 2011 to 31 October 2012.

Setting

Of the two North Indian facilities, one is located in the national capital region (NCR) which is 62.6% urban [18] and caters to the population of Delhi and the surrounding districts of Haryana, Uttar Pradesh and Rajasthan. The other centre is at a 78.03% rural location [19], catering to the population residing in Kaithal District of Haryana. For the purpose of this study, the specialty clinics were classified as urban or rural based on the locational majority.

Participant selection and survey administration

Glaucoma patients were defined as those who had been diagnosed with glaucoma elsewhere, at least six months before the start of the study, and were on treatment [20]. The interview questions were administered to established glaucoma patients, over the age

of 18 years, visiting either of the two glaucoma care facilities for the first time, for a second opinion.

The interview was conducted by ophthalmic assistants from the local area itself, able to understand the vernacular and explain the questions in a manner omitting linguistic misunderstanding. The interview was conducted in the local language (Hindi) as well as in English, and verbal consent was taken.

Variables

In addition to the 11 questions about demographic characteristics, glaucoma awareness and disease knowledge, the questionnaire contained 18 questions about the practice patterns of the ophthalmologists who had diagnosed and were treating the patients earlier. These included questions about the method and frequency of intraocular pressure (IOP) measurement, gonioscopy, dilation of pupils, visual perimetry and other advanced glaucoma tests.

It also had questions enquiring about the frequency of visits and the accessibility of the health care provided by the ophthalmologists.

Statistical analysis

All statistical analyses were performed using Statistical Package for the Social Sciences (SPSS) software trial version 16.0 and Microsoft Excel 2007.

Chi-square test was used to find the association between the answers reported at each centre. For all statistical analyses, $P < 0.05$ was considered as statistically significant.

Ethical considerations

The study adheres to the tenets in the Declaration of Helsinki and was approved by the institutional review board of the organization.

Results

Out of the total 1506 participants who consented to participate in the survey, 1002 (66.5%) attended at the urban clinic in Delhi and 504 (33.5%) attended at the rural clinic in Kaithal. Further demographic characteristics, glaucoma awareness and disease knowledge of the patients have been reported upon earlier [17].

Intraocular pressure (IOP) measurement

100% of the patients at the rural centre in Kaithal and 99.4% at the urban centre in Delhi reported that their eye pressure was checked at each visit.

The most common patient-reported method for measurement of IOP was with “an instrument with air pressure” (69.6% Delhi and 56.0% Kaithal). The second method reported most commonly in the Delhi centre was “with an instrument using blue light” (20.3%). However, at the Kaithal centre the second commonest method reported was “with an instrument while lying down” (32.7%). 2.7% of the patients surveyed at the Delhi clinic also reported having no recollection of their eye pressure being checked. The difference in methods to examine eye pressure was significant ($P < 0.001$), both at Delhi and at Kaithal.

Gonioscopy

Only 160 (16%) of the 1002 Delhi centre patients ($P < 0.001$) and 18 (3.6%) of the 504 Kaithal centre patients could recall the use of a “lens placed on the eye” ($P < 0.001$).

At the Delhi centre, 955 of the 1002 patients (95.3%) reported that they had never undergone an examination determining the type of glaucoma they have and 47 of the 1002 (4.7%) reported that they underwent such an examination at either their first visit, or at subsequent visits. The difference between these answers was found to be significant ($P < 0.05$). At the Kaithal centre 495 patients out of 504 (98.2%) reported that they had never undergone such an examination, while only 9 patients (1.8%) reported having undergone one at their first visit ($P < 0.05$).

Patient-reported dilation

95.0% (951/1001) patients at Delhi and 98.2% (478/504) patients at Kaithal said dilation was done but that they could not recollect its frequency.

While some said that dilation was done at their first visit (36/1002, 3.6% in Delhi and 7/504, 1.4% in Kaithal), some reported undergoing dilation during one of the subsequent visits (9/1002, 0.1% in Delhi and 2/504, 0.4% in Kaithal), or once a year (5/1002, 0.5% in Delhi). The difference in dilation frequency was significant ($P < 0.05$), both at Delhi and at Kaithal.

Visual field analysis (VFA)

Around 10% (100/1002 in Delhi and 50/504 in Kaithal) of the patients reported that the visual field test had been done. The majority of patients at both centres reported that no such test had been done (835/1002, 83% in Delhi, and 454/504, 90% in Kaithal) and 67 (6.7%) patients at Delhi did not remember if such a test was done. The difference between various answers was significant ($P < 0.001$) at both the centres.

Most (951/1002 in Delhi and 492/504 in Kaithal) did not remember how frequently it was done. Others reported it was done once in a year (4.3% in Delhi and 2% in Kaithal), in six months (0.5% in Delhi) or once in three months (0.3% in Delhi and 0.2% in Kaithal) ($P < 0.05$).

Digital imaging of optic disc

84.7% (849/1002) of patients seen at Delhi and 87.7% (442/504) of patients seen at Kaithal reported that advanced glaucoma tests such as disc photographs, through scanning laser polarimetry with variable corneal compensation (GDx VCC), Heidelberg retina tomography (HRT), optical coherence tomography (OCT) or confocal scanning laser ophthalmoscopy (CSLO) had been done. In Delhi, 13.2% said they did not remember undergoing such a test. The difference between these answers was significant ($P < 0.001$).

Frequency of visits to ophthalmologist for glaucoma check-ups

Most patients at both the centres visited their ophthalmologist for glaucoma check-ups once in a year (Fig. 1). A substantial 32% of patients at Kaithal (compared to only 4.1% at Delhi) reported a weekly visit to their ophthalmologist.

Accessibility for ophthalmic check-ups

85.8% in Delhi and 97.2% in Kaithal reported that they travelled less than 10 km to visit the ophthalmologist. Most patients said they were accompanied by someone during their visits to the ophthalmologist (74.4% at Delhi and 92.7% in Kaithal). To see the eye doctor, most patients at Delhi (68.1%) took a private vehicle while most patients at Kaithal (91.9%) availed public transport facilities. The variation between the answers

is significant both in Delhi and in Kaithal for all three questions ($P < 0.001$) and is detailed further in Table 1.

Time spent in regular eye check-ups

At Kaithal, nearly 98% of the patients reported that they had to spend a total of 1–3 h in meeting the ophthalmologist. At Delhi, while 44.3% of the patients said it took them 1–3 h, 54.8% said it took them a total of 3–6 h. Most of this time was spent on travelling to the clinic of the ophthalmologist (49.6%, 30 min to 1 h and 48.9%, 1 to 3 h).

At Kaithal, 95% of the patients said they had to wait for 30 min to 1 h at the clinic before the actual examination process began. In Delhi, the waiting period was 30 min to 1 h for 46% patients and 1–3 h for 46.8% patients. Most patients (77% in Delhi and 83% in Kaithal) said the doctor spent less than 5 min with them to discuss about glaucoma in general, their glaucoma status and the treatment modalities available.

Discussion

This study yields considerable differences between the patient-reported practice patterns of ophthalmologists providing a glaucoma diagnosis, both at the urban centre in Delhi and at the rural centre in Kaithal. Most patients, at both the centres, reported visiting their ophthalmologists once yearly and travelling less than 10 km to do so.

The focal points from the provider-reported practice patterns in glaucoma diagnosis [11] and the Asia Pacific Glaucoma Guidelines (SEAGIG) [21], which report the ideal method and frequency of examinations for glaucoma diagnosis, are thematically collated in Table 2. The themes not ventured into by the former have been left blank in the table. The latter will be used as the gold standard for glaucoma diagnosis in practice.

The information in Table 2 takes the findings from the survey further and discusses their implications in the context of glaucoma care in India. This affirms the heterogeneity in glaucoma diagnosis and management patterns in India and their departure from existing gold standard guidelines.

Fig. 1 Patient-reported frequency of visits for glaucoma check-ups

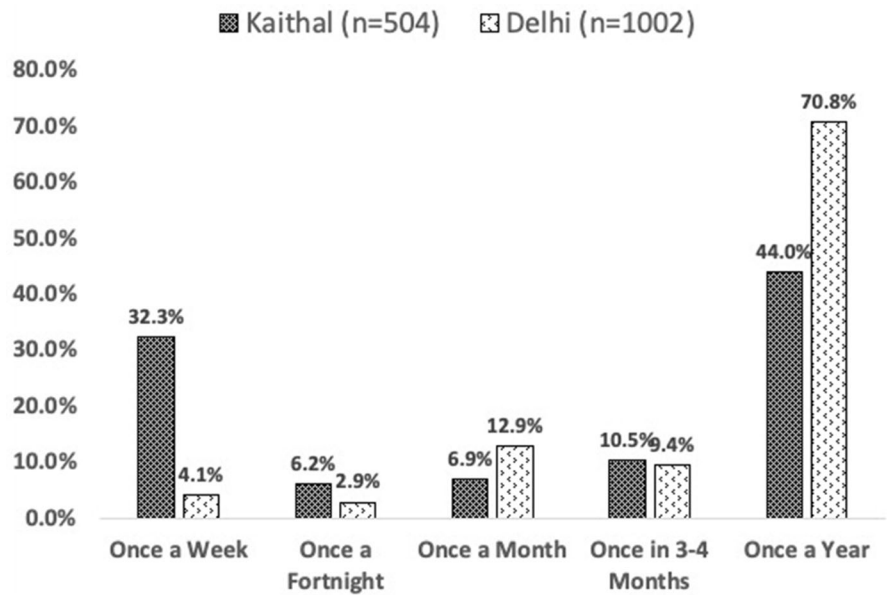


Table 1 Patient-reported accessibility to ophthalmic care

Questions	Response categories	Delhi (%)	Kaithal (%)
How far do you need to travel to see the eye doctor?	≤ 10 km	860 (85.8)	490 (97.2)
	11–50 km	111 (11.1)	10 (2.0)
	51–100 km	25 (2.5)	4 (0.8)
	≥ 100 km	6 (0.6)	0 (0)
Do you visit the eye doctor alone or accompanied by someone?	Alone	257 (25.6)	37 (7.3)
	Accompanied	745 (74.4)	467 (92.7)
How do you commute to see the eye doctor?	Public transport	320 (31.9)	463 (91.9)
	Private vehicle	682 (68.1)	41 (8.1)

Almost all the patients, at both the centres, reported that their eye pressure was checked at each visit. This is in line with the gold standard guidelines, which suggest that all patients should have their IOP checked at all visits [21]. However, 10% of the providers reported that they did not measure the IOP for all their patients, a practice fairly unheard of in today’s world [11].

However, while the guidelines state that the measurement of IOP should be done using the GAT [21], patients at both the Delhi centre and the Kaithal centre, 69.6% and 56.0%, respectively, reported that the examination was conducted using an instrument with air pressure, i.e. the non-contact tonometer (NCT). Only around 20% (Delhi) and 11% (Kaithal) of the patients reported undergoing an eye pressure examination by an instrument emitting a blue light, i.e. the

GAT. While a majority of the providers overall reported a preference towards the GAT, 25% of the general ophthalmologists preferred the NCT for an IOP check-up, and a quarter each of the general ophthalmologists and the non-glaucoma specialists preferred the method of Schiottz tonometry, in which the patient is made to lie down [11]. This latter method was the second most common method reported in Kaithal, by 32.7% of the patients.

The Schiottz tonometer has been categorized as “less than ideal” by the gold standard guidelines and is said to have no role in modern day glaucoma diagnosis. A reason behind this would be the significant variation in patient pressure values produced upon examination by the Schiottz tonometer [22–24]. However, the low-cost availability of the equipment, portability, comparable reliability and ease of use

Table 2 Provider-reported practice patterns and the gold standard guidelines

	Provider-reported practice patterns (n = 236)	Asia Pacific Glaucoma Guidelines (Gold standard)
IOP measurement	Almost 10% of the total did not check IOP for all patients. The majority across all categories preferred the Goldmann applanation tonometer, but Schiotz tonometry was preferred by 25% of the general ophthalmologists and NCT was preferred by around a quarter of the non-glaucoma specialists and general ophthalmologists	Use of Goldmann applanation tonometer (GAT) to measure IOP at every visit
Gonioscopy	More glaucoma specialists than non-glaucoma specialists performed gonioscopy in all or suspected patients, especially at the first presentation	Gonioscopy for all patients initially and repeated examinations for patients suspected with or having angle closure
Dilation	–	Examination of the optic disc only after dilation
VFA	–	Normative database-based machines, to be standardized across patient visits and multiple visits by the same patient. Glaucoma suspect patients should undergo examination frequently at early stages of disease to ascertain rates of progression
Digital imaging of optic disc	The majority of glaucoma specialists reported obtaining disc images in glaucoma patients, but non-glaucoma specialists reported only doing so in > 50%	Optimal when done for all glaucoma suspects, and patients with glaucoma at the time of diagnosis and images should be used to aid with follow-up examinations

make it a popular choice [25, 26]. On the other hand, the partiality towards the NCT, over other methods of IOP examination, can be explained to some extent by the less invasive nature of the check-up, which boosts patient confidence and ensures cooperation, thereby making the process more convenient for all. NCT measurements are also more often than not delegated to paramedics, thereby streamlining the diagnosis process and decreasing the burden of work on the ophthalmologist [27]. IOP, though not essential for diagnosis, is the only modifiable risk factor. The response to medication and the need to modify treatment are based on the precision of IOP measurements. Not using GAT for IOP measurement can impact glaucoma diagnosis and management.

The status of the angle outflow structures is another important aspect of glaucoma diagnosis and type determination. The Asia Pacific Guidelines state that gonioscopy must be performed for all patients initially at the first visit and then repeated periodically [21]. 82.6% of glaucoma specialists, 45.6% of non-glaucoma specialists and 47.9% of general ophthalmologists reported performing gonioscopy on all glaucoma patients or suspects [11]. In our study, when asked about undergoing gonioscopy, involving the

placement of a lens ion the eye, only 16% of patients attending at the Delhi centre and 3.6% patients at the Kaithal centre reported having undergone such an examination. Moreover, when asked, 95.3% and 98.2% of patients in Delhi and Kaithal were not aware of the type of glaucoma they had. Only 4.5% in Delhi and 1.8% in Kaithal reported undergoing gonioscopy at their first visit. It is alarming that gonioscopy, the standard procedure for examining the anterior chamber angle, had not been done for a majority of patients. With more than 27.6 million people above the age of 40 years affected by some form of primary angle closure disease [4], many more remain undiagnosed [28], making it imperative for ophthalmologists, including glaucoma specialists, to perform a more thorough examination prior to diagnosis.

The gold standard guidelines emphasize the importance of conducting an optic disc examination only after the patient has undergone dilation [21]. However, while the majority of the patients at both the centres (95% Delhi and 98% Kaithal) surveyed in this study said that dilation was done, they could not recollect the frequency. One of the standard techniques to examine the optic disc is automated perimetry, which has been classified as the gold standard in visual field analysis

[29]. Visual field tests help to determine the extent or stage of glaucoma damage, and those with significant visual field loss at presentation are significantly more likely to go blind during their lifetimes. Such patients require more aggressive therapy. Most of those patients who had undergone VFA in our study reported having been put through some sort of digital imaging of the optic disc.

The Asia Pacific Glaucoma Guidelines also highlight that suspected patients should be made to undergo such an examination frequently at early stages of disease, to ascertain rates of progression [21]. At both the urban and the rural centres, only a small portion of the patients reported undergoing a VFA examination (around 10%), of which a majority did not remember the frequency. We posit two theories about the visual field examinations. It is possible that either the diagnosing ophthalmologist did not advise a field test or that they had asked for a field test, but it was not performed. The latter situation could have arisen due to difficulties in convincing the patient as to the need of such a test, especially keeping in mind the associated cost and the fact that it is an out-of-pocket expenditure. The extra time taken to conduct such an examination could also have been a factor.

Studies have proved the need to correlate visual field test changes with structural damage to the optic nerve, to form a coherent picture of the overall condition and medically manage the patient accordingly [30]. This is reiterated by the gold standard guidelines that recommend digital imaging of the optic disc for all glaucoma suspects and patients and the use of images to aid with diagnosis and follow-ups [21]. Serial optic nerve head and retinal nerve fibre layer imaging can provide detailed documentation of optic disc architecture, and the absence of this step can impact progression analysis. The majority of glaucoma specialists have reported compliance with the gold standard guidelines, while non-glaucoma specialists reported adherence to the same only in a little more than 50% of the cases, making the practice uncommon even amongst ophthalmologists who have access to the imaging facilities [11].

Overall, more than 84% of the patients at both centres reported not having undergone any form of advanced disc imaging (GDx, VCC and/or HRT). Surprisingly, advanced disc imaging was reported to be more common in the rural setup (12.3%) than in

Delhi (2.1%). It cannot be ascertained if the rural population clearly understood what these advanced tests were, or if they were referring to gonioscopy as an advanced disc imaging test.

One of the key limitations of this study would be the information bias arising due to asymmetry of information between the doctor and the patient. While the doctor would have knowledge regarding the purpose behind a particular examination and its ability to aid a glaucoma diagnosis, the patient may not be aware of the same and have other considerations like cost, time taken and a lack of felt need affecting their decision to undergo such an examination. This could also have led to a situation where patients may not have understood the question, may have forgotten undergoing certain tests and/or misunderstood the procedure, its frequency and need. This is especially true as the patients were questioned in retrospect, compromising their ability to answer questions accurately and resulting in recall bias. We have tried to overcome this by using descriptions of tests and their processes, instead of conducting enquiries on the basis of their technical names or diagnostic purposes.

Additionally, in the design of the study questionnaire, patients have not been asked about the type of ophthalmologist who diagnosed their glaucoma, rendering stratified analysis difficult. While there have been earlier studies which considered either patient or provider-reported data to inform glaucoma care [31–33], a prime strength of this analysis is the considerably large sample of patients surveyed, and the range and depth of the questionnaire, especially the phrasing of the questions eliciting responses on the methods of examination, bolstered by piloting the questionnaire.

Conclusion

Despite its limitations, to the best of our knowledge, this study is unique in detailing the patient-reported glaucoma diagnosis practice patterns in North Indian urban and rural settings.

Goldmann applanation tonometry is not the preferred instrument of choice for IOP measurement, and though automated perimetry is the gold standard for documenting structural damage, it was not performed in the majority of the patients. However, all those who underwent perimetry had been put through at least

some digital imaging of the optic disc. Moreover, very few patients reported undergoing gonioscopy, and more than 90% of the patients were unaware of the type and severity of their glaucoma. Better counselling of, and communication with, the patient would help bridge this gap. Involving patients through awareness and education activities targeting at making them stakeholders in their own care may also enable better compliance with, and adherence to, treatment.

In the context of a developing country, the results from this study can help policy makers establish homogeneous guidelines in accordance with the needs of the patients, and the ability (both clinical and resource based) of the providers, as well as structure training courses for general ophthalmologists intending to diagnose glaucoma in practice. On a more individual level, it also plants awareness amongst the general ophthalmologist regarding structuring of glaucoma diagnosis and management. The authors also recommend urban–rural and north–south comparisons of survey data emerging from future studies, to facilitate an in-depth understanding of glaucoma care and the patients' perception of the same in India.

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Compliance with ethical standards

Conflict of interest All authors declare that they have no conflicts of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the Declaration of Helsinki and its later amendments or comparable ethical standards.

Informed consent Verbal informed consent was obtained from all individual participants included in the study.

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