Assessment of knowledge, attitude, and practice of glaucoma among different cadres of optometrists

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Purpose: To assess the level of knowledge, attitude, and clinical practice of glaucoma among optometry students and optometry practitioners with different years of clinical experience and academic background.

Methods: A survey with 20 questions on knowledge, attitude, and practice (KAP) of glaucoma was prepared and self-administered to optometry students and optometry practitioners practicing in an eye hospital/clinic/optical with varied years of clinical experience and education qualification. Results: Among the 558 participants, 57% were optometry practitioners and 43% were students. The knowledge scores among optometry practitioners increased significantly with an increase in the years of clinical experience (P < 0.001). Participants with master’s degrees scored higher than participants with bachelor’s degrees (P = 0.12). There was no statistically significant difference in knowledge scores based on the type of clinical practice - hospital, private practice, or optical (P = 0.39). Practicing optometrists who performed slit-lamp examination, gonioscopy, IOP measurements, and disc evaluation for the detection of glaucoma had significantly higher knowledge scores than those who did not perform these tests in their practice (P < 0.05). A positive attitude toward glaucoma learning through workshops and hands-on training was reported by optometrists and students. Conclusion: Knowledge about glaucoma was good among optometrists and optometry students and was better among those who handled the diagnostics. All the optometrists had a positive attitude toward enhancing their practice through proper training.

Key words: Glaucoma, KAP, optometrist, optometry practice, optometry students

The worldwide prevalence of glaucoma was estimated to increase to 111.8 million by 2040.[3] In India, various population studies stated about 90% of glaucoma remains undiagnosed.[2‑4] The major component of any glaucoma management is early case detection and prompt treatment by eye care professionals.[5] Optometrists have a predominant role in primary eye care, and limited evidence is available on knowledge, attitude, and practice (KAP) of glaucoma among optometrists. Hence, this questionnaire-based survey was carried out to assess the KAP of glaucoma among optometrists.

Methods

This was a cross-sectional self-administered questionnaire-based survey on the current KAP of glaucoma detection among optometrists. The study was conducted in agreement with the ethical principles as laid down in the Helsinki Declaration after approval from the institute’s research and ethics committee. The flowchart of the study methodology is presented in Fig. 1.

Designing the KAP of glaucoma detection survey questionnaire

The previous works of literature were searched using PubMed and Google Scholar on the available KAP questionnaires. Keywords used were “KAP,” “Glaucoma,” and “Optometrists.” We found 15 articles using the search, and among them, six were found to be relevant. All the articles were reviewed by two experts in the field of glaucoma research, and the items for the questionnaire were developed. The experts had more than 14 years of experience (clinical, research, and teaching) in optometry and a Ph.D. in Optometry. A total of 41 knowledge questions, eight questions on practice, and five questions on attitude toward glaucoma were identified from previous literature.[6‑9] The experts reviewed and finalized 20 questions for the current study.

Identifying the domains and items of the KAP questionnaire

Twenty questions on the domains of knowledge, attitude, and practice were finalized. The content was reviewed to ensure that there were no leading, confusing, or double-barreled questions. This structured questionnaire included the demographic details of the participants; the first ten questions assessed the knowledge about glaucoma, the next eight questions determined the clinical practice of glaucoma, and the last two questions ascertained the attitude toward glaucoma learning. Under the knowledge domain, basic questions about glaucoma were queried. The practice domain included the details of their clinical practice, and the attitude domain included their interest in attending workshops and hands-on sessions on glaucoma detection.

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Sampling method
The study included undergraduate (B.S. Opt.) optometry students involved in a clinical internship program in tertiary eye hospitals located in Chennai, postgraduate (M. Opt.) optometry students from standard optometry schools, and optometry practitioners practicing in an eye hospital/clinic or a private sector located in Chennai. Optometrists were approached by a single examiner in various hospitals, optical shops, and optometry schools to participate in this survey. The data were collected from January to June 2019. Undergraduate Optometry students of 1st, 2nd, and 3rd years were not included in the study. The sampling procedure involved in this study was convenient sampling, and the survey questionnaire was administered to the interested participants after getting written consent. A total of 930 optometrists were approached by the examiner from various hospitals, optical shops, and optometry schools to participate in this survey. Among them, 558 (60%) participants readily accepted to participate in the study and 372 (40%) did not consent to participate in the study. The common reasons for non-participation included lack of interest or time to be a part of the study.

Data analysis
During statistical analysis, participants were classified based on their educational or academic qualifications, practicing sector, and the number of years of clinical experience. The qualification was sub-classified as Bachelors and Masters in Optometry. The practicing sector was sub-classified as the hospital sector, optical sector, and private clinical sector. The number of years of clinical experience was sub-classified as less than 1 year, 2–5 years, and 6 or more years of clinical experience.

Scores were given for questions categorized under “knowledge about glaucoma.” Each correct response was scored as “1,” the wrong response as “0,” and the total score out of 10 was given for all participants. A score of above 5 was set as a good level of knowledge and 5 or below as a poor level of knowledge.

| Category                        | Sample (n) | Median score (IQR) | P     |
|---------------------------------|------------|--------------------|-------|
| Respondents                     | 0.35*      |                    |       |
| Student                         | 238        | 8 (6.5)            |       |
| Practitioners                   | 320        | 8.5 (6)            |       |
| Qualification of Students       | <0.001*    |                    |       |
| Bachelor of Optometry           | 185        | 7.5 (6.5)          |       |
| Master of Optometry             | 53         | 8 (4.5)            |       |
| Qualification of Practitioners  | 0.12*      |                    |       |
| Bachelor of Optometry           | 285        | 8.5 (6)            |       |
| Master of Optometry             | 35         | 9 (4)              |       |
| Clinical experience             | <0.001†    |                    |       |
| Less than 1 year                | 23         | 6 (6)              |       |
| 1-5 years                       | 233        | 8.5 (6)            |       |
| 6 or more years                 | 64         | 9 (3.5)            |       |
| Type of working sector (n=291)  | 0.39 †     |                    |       |
| Hospital sector                 | 246        | 9 (5)              |       |
| Optical sector                  | 20         | 8 (4.5)            |       |
| Private sector                  | 25         | 8 (4)              |       |

*Mann-Whitney U test. †Kruskal-Wallis test

Figure 1: Flowchart of detailed methodology
Table 2: Distribution of practitioners’ response to the clinical practice of glaucoma

| Years of Clinical Experience | Total practitioners \((n=320)\) n (%) | Less than 1 year \((n=23)\) n (%) | 1-5 years \((n=233)\) n (%) | ≥6 years \((n=64)\) n (%) | \(P^*\) |
|-----------------------------|-----------------------------------|---------------------------------|--------------------------|------------------------|--------|
| Can you treat glaucoma at your clinic? | | | | | |
| Yes | 154 (48) | 11 (48) | 119 (51) | 24 (38) | 0.83 |
| No | 161 (50) | 12 (52) | 109 (47) | 40 (63) | 0.83 |
| According to you, which professional can best diagnose and treat glaucoma? | | | | | |
| Opticians | 133 (41) | 9 (39) | 102 (44) | 11 (17) | 0.22 |
| Optometrists | 195 (61) | 13 (57) | 149 (64) | 3 (5) | 0.87 |
| Ophthalmologists | 305 (95) | 23 (100) | 223 (95) | 51 (80) | 0.81 |
| Glaucoma Specialists | 320 (100) | 23 (100) | 233 (100) | 51 (80) | 1.000 |
| When do you refer a patient with glaucoma to Ophthalmologist? | | | | | |
| F/H/O glaucoma | 245 (79) | 20 (87) | 179 (77) | 46 (72) | 0.142 |
| Raised IOP | 290 (91) | 22 (96) | 208 (90) | 60 (94) | 0.675 |
| Occluded angles | 256 (80) | 18 (78) | 187 (80) | 51 (80) | 0.80 |
| Elsewhere diagnosed | 238 (74) | 14 (61) | 173 (74) | 51 (80) | 0.186 |
| Which professional assesses glaucoma at your clinic? | | | | | |
| Self | 51 (16) | 5 (22) | 35 (15) | 11 (17) | 0.630 |
| Trained Refractionists | 13 (4) | 2 (9) | 8 (3) | 3 (5) | 0.404 |
| Trained Optometrists | 235 (73) | 16 (70) | 175 (75) | 44 (69) | 0.575 |
| Ophthalmologist | 275 (86) | 17 (74) | 207 (89) | 51 (80) | 0.353 |
| What evaluations are performed at your clinic to detect glaucoma | | | | | |
| Slit-lamp examination | 266 (83) | 16 (70) | 191 (82) | 59 (92) | 0.324 |
| IOP measurements | 304 (95) | 20 (87) | 224 (96) | 60 (94) | 0.253 |
| Gonioscopy | 277 (86) | 17 (74) | 211 (96) | 49 (77) | 0.017 |
| Disc evaluation | 253 (79) | 14 (61) | 184 (79) | 55 (86) | 0.311 |
| Do you counsel on compliance with AGM usage? | | | | | |
| Yes | 232 (73) | 15 (65) | 165 (74) | 52 (81) | 0.247 |
| No | 55 (17) | 6 (26) | 39 (17) | 10 (16) | 0.353 |
| Maybe | 28 (9) | 2 (9) | 24 (10) | 2 (3) | 0.353 |
| Can you prescribe AGM? | | | | | |
| Yes | 15 (5) | 4 (17) | 10 (4) | 1 (2) | 0.005 |
| No | 279 (87) | 19 (83) | 201 (86) | 59 (92) | 0.005 |
| Sometimes | 27 (8) | 1 (4) | 22 (9) | 4 (6) | 0.005 |
| Do you follow any protocol to detect glaucoma at your clinic | | | | | |
| Yes | 274 (85) | 18 (91) | 201 (86) | 55 (86) | 0.408 |
| No | 41 (13) | 5 (22) | 27 (9) | 9 (14) | 0.408 |

*Kruskal-Wallis test

Statistical analysis was carried out using the statistical package for social sciences software, version 20 (SPSS Inc., Chicago IL), and graphs were built in Microsoft® Excel 2016. Discrete data were expressed as the number of subjects/participants (n) and proportion or percentages (%). Normality was tested, and appropriate parametric or non-parametric tests were performed.

Results

A total of 558 participants completed the survey; 238 (43%) of them were optometry students and 320 (57%) were optometry practitioners. Of the 238 Optometry students, 79 (33%) were male students and 159 (67%) were females. Similarly, the proportions of male and female practitioners were 129 (40%) and 191 (60%), respectively.

Knowledge of glaucoma

The median knowledge score increased with higher education among students \((P < 0.05)\) and with the increase in years of clinical experience among practitioners \((P < 0.05)\) [Table 1]. The median score of the optometrists practicing in a tertiary hospital sector was higher than that of those practicing in an optical...
Clinical practice patterns among the practitioners are given in Table 2. This was grouped as practitioners with less than 1 year of clinical experience, 1–5 years, and 6 or more years of clinical experience. All the practitioners responded to glaucoma specialists as the best professionals to detect and diagnose patients with glaucoma. When questioned about the referral pattern of glaucoma, more than 90% of practitioners in all groups responded raised IOP as a foremost factor for glaucoma referral. Positive family history of glaucoma was second majorly selected by practitioners with less than 1 year (87%), whereas the other two groups of practitioners responded occluded angles of the anterior chamber (80%) for referring the patients to glaucoma clinic. Another multi-response question was designed to understand the clinical tests done by an optometrist in South India for evaluating glaucoma. IOP measurement was predominately selected by the practitioners in all groups followed by gonioscopy [Table 2].

The knowledge scores of the practitioners who perform and who do not perform the stated clinical test for evaluating glaucoma at their clinic were compared irrespective of their clinical experience [Table 3]. The median knowledge score of the practitioners who perform the mentioned clinical test to evaluate glaucoma was significantly higher than that of the practitioners who do not perform.

**Attitude towards glaucoma learning**

Among 238 students, 96% (229) had a positive attitude toward glaucoma learning and responded that they are interested to attend continuous education programs on glaucoma. Similarly, among 320 practitioners, 93% (298) were interested in attending workshops on glaucoma. Another multi-response question was designed to know about the best-equipped method for learning glaucoma techniques among students and practitioners. They preferred glaucoma workshops and hands-on sessions followed by continuous medical education [Fig. 2].

**Discussion**

Early detection and diagnosis by an optometrist are important to avoid irreversible vision loss in glaucoma. There were no studies in India to understand the current level of knowledge, attitude, and practice patterns of glaucoma among the optometry fraternity. In this study, we have reported that the knowledge of glaucoma was better with higher academic qualifications among students and a higher number of years of clinical experience among optometry practitioners. The study highlights the need for training the optometry students and practitioners for diagnosing glaucoma through continuous education programs.

**Knowledge about glaucoma**

In this study, the knowledge score was higher in practitioners with high clinical experience. When knowledge scores were compared based on the qualification of the participants, both students and practitioners with master’s degrees had higher scores than participants with bachelor’s degrees. In this study, practitioners had a better understanding of glaucoma than students engaged in an internship program. Similarly, participants with a secondary level of education had better knowledge about glaucoma than participants with a primary level of education. The number of respondents with a good level of knowledge increased with an increase in the number of years of experience. Hence, the understanding of glaucoma is not adequate among students and less-experienced practitioners. The probable reason could be the regular practice and strategy they follow in their clinical setup. Hence, it is evident that when adequate training on glaucoma is given for optometry students and practitioners, the level of understating about the disease might improve.

These results were supported by a previous study in 2015 by Yoshioka,10 where two groups of optometrists with and without a short diagnostic training on glaucoma were compared. Pre- and post-training results on glaucoma examination, evaluation of optic disc photography, and visual field testing for diagnosing the glaucoma patients were found to have a reduction in false-negative referrals, and the short teaching program on glaucoma improved optometrists’ ability on glaucoma evaluation. A similar study on awareness,
knowledge, and self-care practices of glaucoma among health care students in Ghana revealed that students were aware of the term glaucoma but understanding about the disease was low.\[^{8}\]

**Clinical practice of glaucoma**

As glaucoma is a silent thief and has a higher prevalence in India, optometry practitioners must be eligible to detect and diagnose the condition in its subclinical or asymptomatic stage to avoid visual impairment. In this study, the clinical practice of glaucoma was assessed by inquiring about the investigations that are necessary for glaucoma evaluation, the referral pattern of the practitioners, and the managing strategy. Most of the practitioners responded that glaucoma specialists are the best in diagnosing and treating glaucoma, followed by the optometrist. This result is similar to the study in Ghana where the majority of health care students responded to glaucoma specialists and approximately 20% of the respondents responded to optometrists as the best in diagnosing and treating glaucoma.\[^{9}\]

When the referral pattern of glaucoma was assessed, where optometrists play a major role, most of the practitioners responded to high IOP as a mainstay in glaucoma referral. Previous studies exposed that the rate of false-positive referrals was higher by optometrists when only high IOP was considered.\[^{10}\] In this study, a positive family history of glaucoma was the second majorly responded by practitioners with less than 1 year of experience. In contrast, experienced practitioners responded to occluded angles to be a sign for glaucoma referral. Though a positive family history of glaucoma is an important feature for screening, the occluded angles of the anterior chamber also remain essential for glaucoma referrals after IOP measurements. These results suggest that the accuracy of glaucoma referral increases with clinical experience and proper training, which was supported by several previous studies where the proportion of false-positive referrals by optometrists reduced significantly post glaucoma training and with clinical experience.\[^{12}\]

A comprehensive eye examination is necessary for glaucoma evaluation, which includes primary testing, disc evaluation, gonioscopy, and visual fields testing. In our survey, 86% of respondents claimed that their glaucoma patients were assessed by an ophthalmologist, but only 79% said that disc evaluation was done in their clinic, which implies that a complete ocular examination was not performed routinely. Previous studies have also shown that glaucoma diagnosis was missed by optometrists and at times by ophthalmologists and lead to the late presentation as extensive eye examination was not conducted.\[^{8}\,^{13}\]

Various studies were conducted to evaluate the diagnostic performance of glaucoma, including optic disc assessment, and the agreement between trained optometrists and ophthalmologists in glaucoma decision-making were compared. These investigations found a sensitivity and specificity of 95% and a high level of agreement between optometrists and ophthalmologists in glaucoma evaluation. Hence, it is evident that with sufficient training and experience, optometrists would be efficient in evaluating patients with glaucoma.\[^{14‑16}\] The ophthalmic community has to be sensitized regarding the need to perform gonioscopy to minimize the problem of misdiagnosis or under diagnoses of angle closure.\[^{17}\]

**Attitude toward glaucoma**

Attitude toward glaucoma learning depends upon each optometrist. The response as yes to attending a health care program on glaucoma was considered a positive attitude while a response as no was considered a negative attitude. As predicted, the majority of the participants had a positive attitude and were interested in participating in health care programs on glaucoma to improve the skills of a glaucoma evaluation. Students and practitioners with different years of experience are more interested in attending workshops and hands-on learning glaucoma evaluations than books and conferences as a practical session is more significant for glaucoma examination in clinics. A positive attitude toward glaucoma is the mainstay to update the management protocol and skills in glaucoma investigations and evaluation. This positive attitude among participants helps to rule out incorrect diagnoses of glaucoma. Also, optometrists are capable of detecting and diagnosing the condition when proper training and health care programs.\[^{15,18}\]

There are several guidelines recommended for the examination of eye structure and function for glaucomatous changes by the National Health and Medical Research Council (Australia, NHMRC), the National Institute for Health and Clinical Excellence (NICE, UK), American Optometric Association (AOA, USA), and the American Academy of Ophthalmology (AAO, USA). It is important for the optometrist to be aware of such guidelines that can be applied in their clinical practice.\[^{19,20}\] In this study, most optometry students and practitioners were found to have a positive attitude toward glaucoma learning; thus, it is noteworthy to conduct various training programs or online lectures on glaucoma and frequent assessment might help the budding optometrist to have a better KAP on glaucoma.

**Conclusion**

From this study, we can understand that the clinical experience had an impact on the KAP of glaucoma. Hence, the proper training and practice on glaucoma can improve the KAP among optometry students and young optometrists. With more participants in each group with different years of clinical experience, we can better understand the importance and effect of glaucoma training on optometrists.

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**Conflicts of interest**

There are no conflicts of interest.

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