Article published online: 2023-11-01



# Glaucoma the Silent Thief of Vision! A Study to Assess Current Trends on Awareness and Knowledge About Glaucoma

Amit Kumar Jain[1] Neha Singh[1] Naveen Kumar Singh[2] Praveen Kumar Singh[1] Suman Rajpoot[1]

[1] Department of Ophthalmology, Kanti Devi Medical College Hospital and Research Center, Mathura, Uttar Pradesh, India
[2] Department of Anaesthesia, Kanti Devi Medical College Hospital and Research Center, Mathura, Uttar Pradesh, India

**Address for correspondence** Dr. Amit Kumar Jain, MBBS, DNB (Ophthalmology), MNAMS, Professor and HOD, Department of Ophthalmology, Kanti Devi Medical College Hospital and Research Center, Mathura, Uttar Pradesh 281406, India (e-mail: dramitjain75@gmail.com).

Ann Natl Acad Med Sci (India) 2023;59:202–208.

## Abstract

**Introduction** Worldwide nearly 70 million populations are affected by glaucoma, a leading cause of irreversible blindness. Awareness and knowledge about glaucoma is the key to early diagnosis and effective management to prevent debilitating blindness. In India, the literature has shown that the level of awareness ranges from 0.32 to 13.5%, much lower than developed countries. Previous studies found higher levels of education and socioeconomic status along with positive family history of ocular diseases were directly related to improved levels of awareness and knowledge about glaucoma. Considering the improvement in literacy standards, socioeconomic status, and better utilization of medical care in the past few years, we aimed to assess the current trends in levels of awareness and knowledge about glaucoma in the North Indian population.

**Methodology** This prospective cross-sectional questionnaire-based study included 1,536 participants enrolled from the outpatient department of a tertiary care teaching hospital. Data for the study were collected from the responses given by participants from two sets of questionnaires adopted and validated from previous similar work on awareness of glaucoma. Statistical analysis was done by applying the chi-square test and Fisher exact probability test using IBM SPSS Statistics version 20.

**Results** In total, 7.74% of study participants were aware of glaucoma and the newspaper was the most common source of (57.9%) information. A significant correlation ($p < 0.05$) was found for male sex, education status, and past medical history between aware and not aware participants; however, non-significant ($p = 0.182$) correlation was seen for upper and lower socioeconomic status among the same group participants. Only 16% of aware participants had a good knowledge of glaucoma.

**Conclusion** In current trends, the state of awareness and knowledge on glaucoma in the Indian population was poor compared to that in the Western world, although the levels of education status and the presence of past medical history had significant

**Keywords**
- Glaucoma
- awareness
- knowledge
- literacy
- north India

**article published online**
November 1, 2023

**DOI** https://doi.org/10.1055/s-0043-1772215.
**ISSN** 0379-038X.



Thieme Medical and Scientific Publishers Pvt. Ltd., A-12, 2nd Floor, Sector 2, Noida-201301 UP, India

correlation among aware and not aware population, but socioeconomic status had no significant correlation. Electronic media and health camps were among the least common source of information; hence, improvised awareness programs and opportunistic screening of glaucoma is the answer to control this silent thief of vision called glaucoma.

## Introduction

Glaucoma is one of the major contributors to irreversible blindness; however, the progression of blindness can be slowed once diagnosed in the early stages of the disease. Globally, approximately 7 crore population is affected with glaucoma, wherein India has the second largest population affected with glaucoma.[1,2] Glaucoma is commonly called a silent thief of vision because, in the majority of cases, this condition is either asymptomatic or with subtle symptoms like floaters or frequent change of near glasses.[3] The disease is so silent in progression that a large percentage of the affected population presents to ophthalmologists in advanced stages of glaucoma with significant irreversible loss of visual fields.[3,4] Previous studies had concluded that nearly 50 to 90% of glaucoma cases remain undiagnosed; hence, a large number of cases are diagnosed at the advanced stage of the disease.[3,5] The most acceptable approach to prevent the glaucoma-induced blindness is the timely detection of glaucoma in its early stages of presentation.[2] Lack of awareness about glaucoma, literacy status, socioeconomic status, and insufficient healthcare facilities are important contributing factors to the late detection and early management of glaucoma.[3] Several previous studies found that either the lack of awareness or amount of patient's knowledge related to eye problems among population plays a significant role in timely detection and early management of glaucoma.[5–7]

The awareness and knowledge about glaucoma is directly or indirectly influenced by the factors, such as education status, socioeconomic status, family history of glaucoma, type of occupation, presence of chronic diseases like diabetes and hypertension, media attachment, and information by nongovernmental or governmental agencies.[6,8] The previous publications in Indian studies found that the awareness levels of glaucoma in the population were 13.5,[7] 10.2,[9] and 0.32%.[10] These findings suggest that the level of awareness about glaucoma had a vast range from a maximum of 13.5% to as low as 0.32%. In previous studies, the percentage of study participants aware about glaucoma having some knowledge was 10,[1] 18,[2] and 8.7%.[5] This wide range of awareness and low levels of knowledge about the glaucoma in Indian population is the major factors for delayed presentation and late management of glaucoma.

Over the past four decades, the Indian government has gradually adopted economy-related policies to improvise the economic status of the population in the country, similarly a huge growth in health care infrastructure, both in urban and rural sectors, has been noticed over past two decades. This infrastructure growth causes changes in perception, treatment-seeking behavior, and belief about health care in the Indian population.[11,12] The adult literacy rate showed a considerable improvement from 52.2% in 1991 to 74% in 2011 among the population of the age group of 7 years and above in India.[13] In the year 1976, the Indian government launched the National Programme for Control of Blindness (NPCB) where information, education, and communication were its important elements to spread awareness on eye care in the community.[14]

In lieu of the adoption of newer economy policies by the Indian government, shift in health care utilization among rural and poor population, and improvised literacy rate in India, this study was conducted to assess the current trends in the level of awareness and knowledge about glaucoma among rural north Indian population. We also analyzed the correlation of education status, literacy status, and past medical history with awareness and estimated the grades of knowledge among aware participants. Additional data were also analyzed to assess the commonest source of information about glaucoma in study participants.

## Materials and Methods

This prospective cross-sectional questionnaire-based study was conducted in a rural tertiary care center in north India. Patients presenting to the outpatient department of the institute from November 2021 to April 2022 and those who were 18 years or older were included in the study. Informed consent was obtained from all participants, and the study was approved by institutional ethics committee. Participants with prior diagnosis of glaucoma were excluded from the study as they could have gained knowledge of the disease after diagnosis. At the confidence interval of 95%, prevalence (p) of 10%, absolute precision (d) of 1.5%, and at 90% power using formula $n = (Z\alpha + Z\beta)^2 \times pq/d^2$, where $Z\alpha = 1.96$, $Z\beta = 0$, and $q = 1 - p$, the sample size ($n$) calculated was 1,536.

Totally 1,536 participants fulfilling the inclusion criteria, who gave informed consent for study participation, were enrolled in this study. Demographic profiles of all participants including age, sex, occupation, literacy, and socioeconomic status were recorded. The subjects were classified as illiterate, middle school pass, high school pass, graduate, or professional according to the literacy status. Modified Kupuswamy classification[15] was used to determine the socioeconomic status of the subject based on education status, occupation of the head of the family, and per capita income per month. The study questionnaire (Annexure I) was initially designed in English

 

and then converted to Hindi, the local language. Patients giving affirmative response to the question "have you heard of glaucoma and know that it can cause blindness" were considered as being aware of the disease. Another set of study questionnaire (Annexure II) was designed to collect further information from those participants aware of glaucoma to know about their understanding of the disease in terms of source of information, knowledge of risk factors, symptoms, and treatment using structured questionnaire. These questionnaires were adopted from a similar study done on awareness of glaucoma in a tier 2 city by Prabhu et al[8] and validated by a group of ophthalmologists.

Glaucoma knowledge was graded as good, fair, and poor as per criteria using risk factors and treatment knowledge.

- Grade 1 (Good knowledge): Knows about two or more risk factors and has knowledge of medical and surgical treatment of glaucoma.
- Grade 2 (Fair knowledge): Knows at least one risk factor and one treatment modality of glaucoma.
- Grade 3 (Poor knowledge): No knowledge of risk factors or treatment.

Data were analyzed using IBM SPSS Statistics version 20 copyright IBM Corporation 2010, New York 10589, United States. Unpaired test, chi-square test, and Fisher exact probability test were used to look for the presence of a significant association of awareness and knowledge with other study variables in study participants. A probability ($p$) value less than 0.05 were considered statistically significant.

## Results

The study included 1,536 participants of which 716 were males and 820 were females. In total, 119 (7.74%) participants were found to be aware of glaucoma. ►**Table 1** shows the comparison and correlation of various variables in glaucoma aware and unaware subjects.

Statistical correlation between male and female participants among aware and not aware groups was found to be significant ($p = 0.012$). The $p$-value was not significant between age group <50 years and >50 years participants ($p = 0.8386$) and also in upper and lower socioeconomic class participants ($p = 0.182$) among aware and not aware groups. However, a highly significant $p$-value (<0.001) was observed between aware and not aware groups when compared for literacy and past medical history (►**Table 2**).

The most common source of information about glaucoma among aware participants was found to be newspaper (57.9%) with the least common information source being health camp (19.3%) ►**Fig. 1**.

►**Table 3** shows the yes/no response for various questionnaires asked on risk factors, symptoms, and treatment of glaucoma to evaluate the knowledge about glaucoma among glaucoma-aware participants ($n = 119$). Nearly, one-fourth of aware participants answered yes for various risk factors (25.37%) and symptoms (27.17%) of glaucoma; however, two-third of aware participants said that treatment of glaucoma is possible (63.86%).

Among glaucoma-aware participants ($n = 119$), 16% had good knowledge, 30% had fair knowledge, whereas 54% participants had poor knowledge about glaucoma ►**Fig. 2**.

## Discussion

This study assessed the current trends in the level of awareness and knowledge about glaucoma among patients attending the outpatient department of a rural tertiary care center in north India. In the study, we evaluated the current status of perception of the participants about the nature of glaucoma its subtle clinical course, irreversible loss of visual fields, and importance of screening for early diagnosis and management of the disease.

In our study, 7.74% (119/1,536) participants were found to be aware of glaucoma which falls in the range of awareness of glaucoma reported in India (0.32–13.5%) by the previous studies.[5,7,10,11] However, it is noteworthy that these Indian studies were population-based epidemiologic surveys on either rural or urban population. A hospital-based study in central India reported the awareness level as high as 27%[2] because they included both the undiagnosed patients presenting in the department of ophthalmology and the diagnosed patients of glaucoma, which may have accounted for the higher awareness level in their study. We, on the contrary, included only undiagnosed patients coming in the outpatient department of ophthalmology at our hospital and excluded diagnosed patients of glaucoma. In our study, the awareness level for glaucoma was low (7.74%) compared to the publication data from developed countries (70–93%); however, the level of awareness was higher compared to the developing countries such as Nepal (2.4%) and Ethiopia (2.4%).[7,16,17]

In the present study, the awareness about glaucoma was found to be more in participants with higher educational status. Those who were literate and educated above middle school were significantly ($p < 0.001$) more aware of glaucoma than those who were uneducated. Similar trends have been reported by other awareness studies.[7–9] In contrast to previous studies,[2,5,7,8] we observed no significant ($p = 0.182$) relationship for the awareness of glaucoma among the participants belonging to upper socioeconomic classes (UC and UMC) and lower socioeconomic classes (LMC and LC). These observations indicate that the awareness in the population is directly proportional to the education status and has no relation with the socioeconomic status of the society, probably in the individuals the awareness toward health care increases proportionally with their education level, which is not dependent on their socioeconomic status.

In this study, we found males to be significantly more ($p = 0.012$) aware than females about glaucoma, contrary to our findings in their studies Rewri and Kekkar[5] found no significant ($p = 0.99$) gender relationship and Ve Ramesh et al[7] found that females were more aware than males. Our finding may be contributed by the facts that a greater emphasis was given to male education as compared to female education in rural north India and also the existing difference in literacy rates both in rural (77.2 male vs. 57.9

 

**Table 1** Demographic profile of glaucoma aware and not aware participants

| Variable | Subcategory | Awareness about glaucoma | | Total |
|---|---|---|---|---|
| | | Yes ($n = 119$) | No ($n = 1,417$) | n = 1,536 |
| Gender | | | | |
| | Male | 69 (57.98%) | 647 (45.65%) | 716 |
| | Female | 50 (42.01%) | 770 (54.34%) | 820 |
| **Age** | | | | |
| | <35 | 4 (3.36%) | 73 (5.15%) | 77 |
| | 36–45 | 31 (26.05%) | 255 (17.99%) | 286 |
| | 46–55 | 49 (41.11%) | 622 (43.89%) | 671 |
| | 56–65 | 34 (28.57%) | 458 (32.32%) | 492 |
| | > 66 | 1 (0.84%) | 9 (0.63%) | 10 |
| Mean age ± SD (years) | | **50.63 ± 10.66** | **50.79 ± 10.41** | |
| Socioeconomic status (Modified Kupuswamy) | | | | |
| | Upper class | 12 (10.08%) | 173 (12.2%) | 185 |
| | Upper middle class | 28 (23.5%) | 216 (15.24%) | 244 |
| | Lower middle class | 47 (39.49%) | 370 (26.11%) | 417 |
| | Upper lower class | 24 (20.16%) | 418 (29.4%) | 442 |
| | Lower class | 8 (6.7%) | 240 (16.93%) | 248 |
| Education status | | | | |
| | Illiterate | 5 (4.2%) | 631 (44.5%) | 636 |
| | Middle school | 60 (50.4%) | 551 (38.8%) | 611 |
| | High school | 48 (40.3%) | 200 (14.11%) | 248 |
| | Graduate | 2 (1.6%) | 15 (1.05%) | 17 |
| | Professional | 4 (3.3%) | 20 (1.4%) | 24 |
| Past medical history | | | | |
| | Diabetes | 29 (24.3%) | 30 (2.1%) | 59 |
| | Past ocular history | 37 (31.2%) | 36 (2.5%) | 73 |
| | Family history of glaucoma | 8 (6.7%) | 18 (1.2%) | 26 |
| | No past medical history | 45 (37.8%) | 1333 (94%) | 1,378 |

**Note:** Bold data indicates the values which can easily be correlated with the text explained with results.
Abbreviation: SD, standard deviation.

female) and urban (88.8 male vs. 79.1 female) populations of India.[13]

Our study showed that the participants having any past medical history such as diabetes, positive family history of glaucoma, or ocular diseases were significantly ($p < 0.001$) more aware about glaucoma as compared to participants with no past medical history. Similar to our study, Prabhu et al[8] also found a higher awareness about glaucoma in diabetic patients. Patients with the family history of glaucoma and other ocular conditions were also found to be significantly more aware of the disease akin to previous studies.[10,18] These significant correlations with awareness about glaucoma may be accounted by regular visits of diabetic and ocular disease patients to the ophthalmologists.

The present study found newspapers to be the most common source of information in glaucoma-aware participants, followed by relatives and close acquaintances. Previous studies have, however, reported close acquaintances as the most common source of information.[2,5] These differences in the source may be attributed to an enhanced use of mass media to create awareness about glaucoma in the recent past.

We observed that 79 (66.3%) of the aware participants could not answer any risk factors or treatment modality of glaucoma. In total, 29 (24.3%) participants knew at least one risk factor and treatment modality of glaucoma, while only 20 (16.8%) participants knew about two risk factors and treatment modalities. These observations were similar to the study done by Prabhu et al[8] where among the aware patients 54.5% knew one/no risk factor or treatment modality, 22.7% knew at least one risk factor and treatment modality and 22.7% patients knew two or more risk factor and treatment modalities. These findings suggest that the awareness of disease can be improvised by using mass media and upgraded policies, but the detailed knowledge of the disease depends on the interaction with the specialist.

 

**Table 2** Comparison and statistical correlation of different factors among glaucoma aware and not aware participants

| Variable | Subcategory | Number of participants on basis of awareness | | Statistical analysis | |
|---|---|---|---|---|---|
| | | Aware $n = 119$ | Not aware $n = 1,417$ | *p*-Value | Odds ratio 95% Confidence interval |
| Gender | | | | | |
| | Male | 69 | 647 | 0.012[a] | 1.642 |
| | Female | 50 | 770 | | 1.124 to 2.399 |
| Age (years) | | | | | |
| | <50 | 53 | 611 | 0.8386 | 1.059 |
| | >50 | 66 | 806 | | 0.7269 to 1.544 |
| Education status | | | | | |
| | Illiterate | 5 | 631 | <0.0001[a] | 0.0546 |
| | Literate | 114 | 786 | | 0.2217 to 0.1346 |
| Socioeconomic status | | | | | |
| | Upper class | 40 | 389 | 0.1827 | 1.338 |
| | Lower class | 79 | 1,028 | | 0.8988 to 1.992 |
| Past medical history | | | | | |
| History of diabetes | Yes | 29 | 30 | <0.0001[a] | 14.897 |
| | No | 90 | 1387 | | 8.567 to 25.906 |
| Family history of glaucoma | Present | 8 | 18 | <0.0001[a] | 5.602 |
| | Absent | 111 | 1,399 | | 2.382 to 13.174 |
| Past history of ocular condition | Yes | 37 | 36 | <0.0001[a] | 17.309 |
| | No | 82 | 1,381 | | 10.392 to 28.830 |

[a]*p*-Value <0.05 significant.

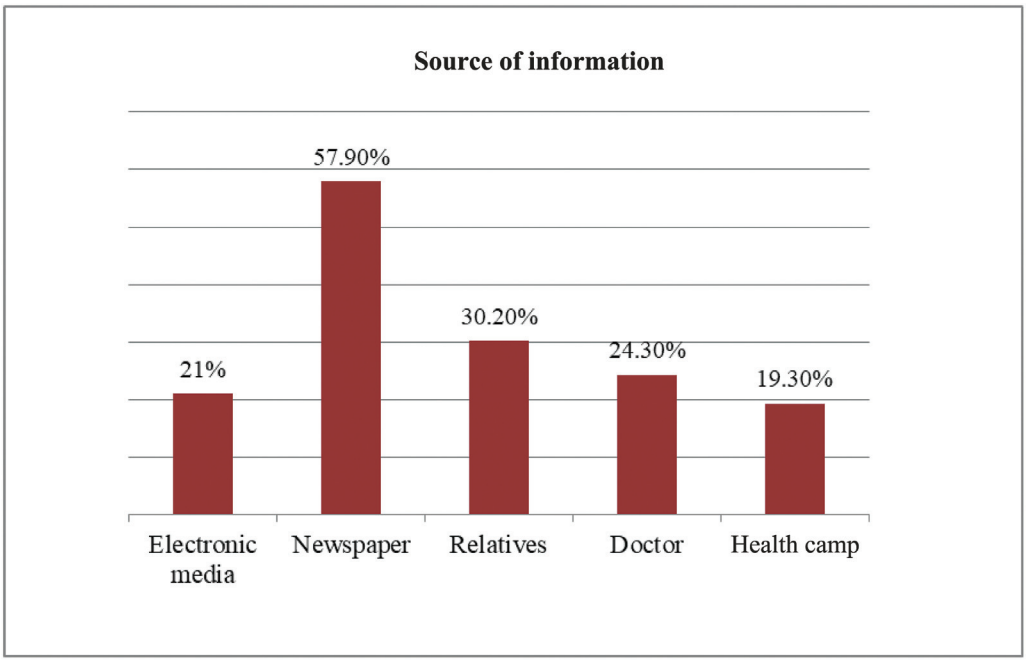


**Fig. 1** Source of information in glaucoma aware participants.

 

**Table 3** Response of glaucoma aware participants ($n = 119$) about glaucoma knowledge questionnaire

| Questionnaire response | | Yes | No |
|---|---|---|---|
| Risk factors | | | |
| | Diabetes | 34 (28.57%) | 85 |
| | Family history | 32 (26.89%) | 87 |
| | Steroid use | 18 (15.12%) | 101 |
| | Obesity | 35 (29.41%) | 84 |
| | Raised IOP | 32 (26.89%) | 87 |
| | | 151 (25.37%) | 444 (74.62%) |
| Symptoms | | | |
| | Asymptomatic | 10 (8.40%) | 109 |
| | Field loss | 43 (36.14%) | 76 |
| | Reading glasses change | 44 (36.97%) | 75 |
| | | 97 (27.17%) | 260 (72.82%) |
| Treatment | | | |
| | Possible | 76 (63.86%) | 43 |
| | Eye drop | 22 (18.48%) | 97 |
| | Laser | 27 (22.68%) | 92 |
| | Surgery | 44 (36.97%) | 75 |
| | | 169 (35.5%) | 307 (64.5%) |

Abbreviation: IOP, Intra Ocular Pressure.

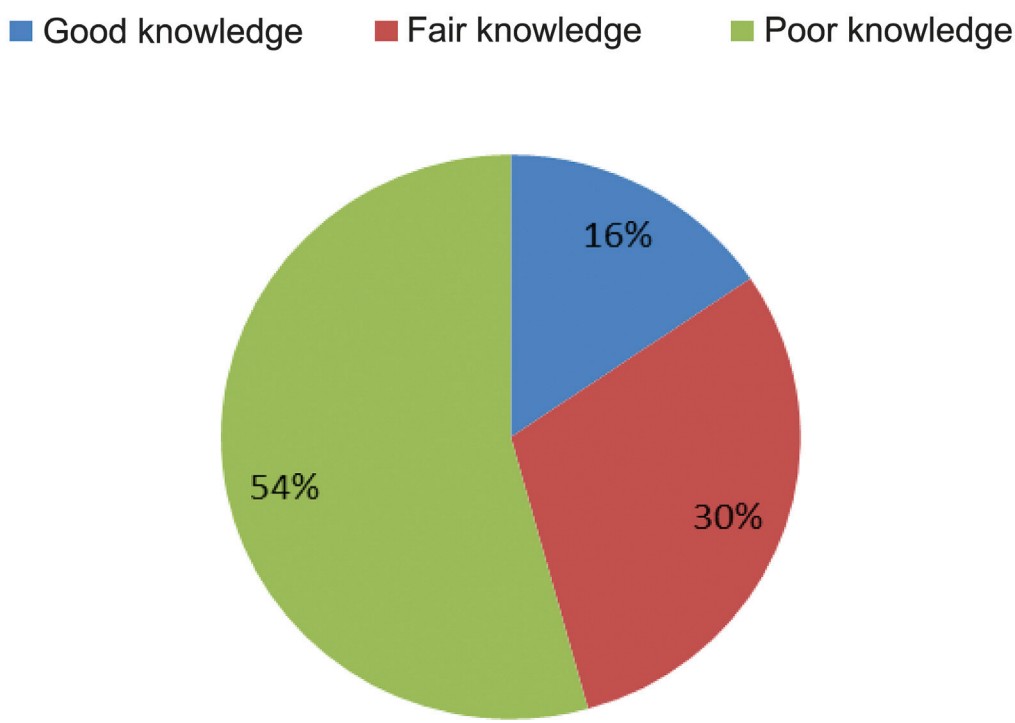


**Fig. 2** Distribution of glaucoma aware participants ($n = 119$) in different grades of knowledge about glaucoma.

Our study indicated that awareness and knowledge in a rural population were poor despite improvised access to eye care services and the implementation of various health policies by the governmental agencies. Over past few years, many studies done in different sets of populations showed similar trends in levels of awareness and knowledge.[7–10]

 

## Conclusion

The level of awareness among the Indian population was found to be poor compared with Western countries. This highlights the gaps in our health care system. The poor literacy rate accounts for such a poor level of awareness in the Indian population. A significant correlation was present between glaucoma-aware and not-aware population in terms of education status and past medical history because the patients with diabetes, ocular diseases, and positive family history of glaucoma regularly visit ophthalmologists. More than half of the study participants in glaucoma awareness group had poor knowledge about the disease, which indicates that disease details are independent of mere awareness. We found that the newspaper was the most common source of information and electronic media was the second least common source of information because the reach of newspaper in rural areas of India is still greater than the electronic media like TV or the internet.

The awareness programs should be planned in such a way that they are accessible to people belonging to all kinds of socioeconomic strata. The use of mass media such as TV/radio in glaucoma awareness programs should be enhanced. The unique concept of opportunistic screening by Vashist et al[19] can be used for early diagnosis of glaucoma. Opportunistic screening will allow for glaucoma screening in patients presenting to health care providers with other illnesses unrelated to glaucoma. Lastly, a person with some knowledge of glaucoma is more likely to seek earlier eye care intervention than those without any knowledge, and furthermore, they can become a source of information to others. Hence, eye care education programs should focus on increasing both specific knowledge on glaucoma and general awareness of the disease.

### Authors' Contribution

A.K.J. did the review of the literature to formulate the study design, performed statistical analysis, and also wrote the manuscript. N.S. and N.K.S. prepared study questionnaire, master excel sheet of data, and also helped in statistical analysis. P.K.S. and S.R. collected the participant's data and filled it in the annexure form.

### Conflict of Interest

None declared.

### Acknowledgment

Firstly, we thank all our study participants for giving their valuable time for answering the study questionnaire. We extend our sincere thanks to the computer operator (Mr. Nikhil Mandal) for his unconditional support in compiling and analyzing the data for this study.

## References

1 Ahmed Z, Srikanth K, Rajalakshmi AR. Knowledge and awareness of glaucoma in South India. TNOA J Ophthal Sci Res 2019;57(03): 203–207
2 Maharana PK, Rai VG, Pattebahadur R, Singhi S, Chauhan AK. Awareness and knowledge of glaucoma in central India: a hospital-based study. Asia Pac J Ophthalmol (Phila) 2017;6 (03):243–249
3 Kumar GP, Gayam K, Kavitha S, Venkatesh R. An innovative approach to create glaucoma awareness and its impact among the general population. TNOA J Ophthal Sci Res 2020;58(03):169
4 Nkum G, Lartey S, Frimpong C, Micah F, Nkum B. Awareness and knowledge of glaucoma among adult patients at the eye clinic of a teaching hospital. Ghana Med J 2015;49(03):195–199
5 Rewri P, Kakkar M. Awareness, knowledge, and practice: a survey of glaucoma in north Indian rural residents. Indian J Ophthalmol 2014;62(04):482–486
6 Alemu DS, Gudeta AD, Gebreselassie KL. Awareness and knowledge of glaucoma and associated factors among adults: a cross sectional study in Gondar Town, Northwest Ethiopia. BMC Ophthalmol 2017;17(01):154
7 Ve Ramesh S, Pradeep PG, George R, et al. Determinants of glaucoma awareness and knowledge in urban Chennai. Indian J Ophthalmol 2009;57(05):355–360
8 Prabhu M, Patil SH, Kangokar PC. Glaucoma awareness and knowledge in a tertiary care hospital in a tier-2 city in South India. J Sci Soc 2013;40(01):3–8
9 Dandona R, Dandona L, John RK, McCarty CA, Rao GN. Awareness of eye diseases in an urban population in southern India. Bull World Health Organ 2001;79(02):96–102
10 Krishnaiah S, Kovai V, Srinivas M, Shamanna BR, Rao GN, Thomas R. Awareness of glaucoma in the rural population of Southern India. Indian J Ophthalmol 2005;53(03):205–208
11 Pal P, Ghosh J. Inequality in India: a survey of recent trends. Flat world, big gaps: economic liberalization, globalization, poverty and inequality. New York: UN Publications; 2007
12 Ghosh S. Trends and differentials in health care utilization pattern in India. J Health Manag 2014;16(03):337–363
13 Govinda R, Bandyopadhyay M. Literacy and Elementary Education in India. Journal of Educational Planning and Administration 2021;35(04):269–295
14 Vemparala R, Gupta P. National Programme for control of blindness (NPCB) in the 12th five year plan: an overview. Delhi J Ophthalmol 2017;27(04):290–292
15 Bairwa M, Rajput M, Sachdeva S. Modified Kuppuswamy's socioeconomic scale: social researcher should include updated income criteria, 2012. Indian J Community Med 2013;38(03): 185–186
16 Thapa SS, Berg RV, Khanal S, et al. Prevalence of visual impairment, cataract surgery and awareness of cataract and glaucoma in Bhaktapur district of Nepal: the Bhaktapur Glaucoma Study. BMC Ophthalmol 2011;11(01):2
17 Tenkir A, Solomon B, Deribew A. Glaucoma awareness among people attending ophthalmic outreach services in Southwestern Ethiopia. BMC Ophthalmol 2010;10(01):17
18 Pfeiffer N, Krieglstein GK, Wellek S. Knowledge about glaucoma in the unselected population: a German survey. J Glaucoma 2002;11 (05):458–463
19 Vashist P, Singh S, Gupta N, Saxena R. Role of early screening for diabetic retinopathy in patients with diabetes mellitus: an overview. Indian J Community Med 2011;36(04):247–252

 