Commentary: Innovations in technology hold promise for glaucoma detection in underserved populations

Glaucoma is a leading cause of irreversible blindness across the world. In India, 11 million people were affected and another 24 million were at risk of the disease according to an estimate in 2010.[1] Nearly half of the population resides in rural parts of the country where ophthalmic care is limited.[2] The burden of the disease is expected to increase with a rise in the elderly population. Most forms of the disease are asymptomatic and gradually progressive. In turn, majority of the patients remain undiagnosed.[3] Therefore, it is necessary to develop effective strategies to detect the disease at a relatively early stage to limit visual morbidity.

Evaluation of the structure of the optic nerve head and its correlation with the function by assessing visual field is an important parameter to detect glaucoma. One also needs to assess the angle to not miss angle-closure variety of the disease. Thus, the lack of a single effective screening test and the other elements of the nature of the disease preclude screening of all population.[4,5] We need healthcare models exemplified by L. V. Prasad Eye Institute's multi-tiered, pyramidal model of eye care delivery system that reach out to the communities.[6] We also need technology and training of manpower to meet the demands. Inexpensive and non-mydriatic fundus camera, automated image analysis, software based visual field screening or assessment, tele-medicine and artificial intelligence are all the need of the hour.

We congratulate the authors for the critical appraisal of the supra threshold 'Visual Field Easy' (VFE) application (Version 8) on the iPad in comparison to the 24-2 (SITA Fast) Humphrey visual field analysis.[7] They studied 210 eyes of 210 patients (60 Normal, 150 Glaucoma). They report a sensitivity of 77.8%, specificity of 52.6% and area under receiver operating characteristic (ROC) curve of 0.419 for early glaucoma. Similarly, for moderate glaucoma, the sensitivity was 90%, specificity was 48% and area under ROC curve was 0.705.[7] A screening test should have high sensitivity to minimize false negative rate. The test should also have high specificity to avoid false positive cases. Thus, the above figures indicate limited utility of the program, despite the higher prevalence of the disease under the testing condition. Therefore, the authors appropriately concluded that supra-threshold perimetry using VFE is not suitable as a rapid screening tool for mass screening of glaucoma.

The light sensitivity of the retina varies with the location. Therefore, ensuring fixation of the patient's gaze at the fixation target during measurement of the retinal sensitivity is of paramount importance. The iPad-based software used by the authors lacks gaze tracking. Additionally, selecting the intensity of light used for supra-threshold testing is very critical.

Innovations in technology might facilitate case detection. The VFE technology is attractive and user-friendly. However, the above mentioned two major factors, besides the dependence on manual dexterity of the patients, may have largely limited its utility to screen for the relatively early stage of the disease. Performing tests of low diagnostic ability may miss established disease and also have a false positive rate that can inundate the system and thus increase overall cost. As of now, one should continue to look for other technologies to assess visual field, e.g., virtual reality. One should also consider a combination of more than one test to detect the disease.[8]

Nikhil S Choudhari, Chandra Sekhar Garudadri

V S T Glaucoma Center, Kallam Anji Reddy Campus,
L V Prasad Eye Institute, Hyderabad, Telangana, India

Correspondence to: Dr. Chandra S Garudadri, Vice-Chair, L V Prasad Eye Institute, Dr. Kallam Anji Reddy Campus, L V Prasad Marg, Banjara Hills, Hyderabad - 500 034, Telangana, India.
E-mail: gcs@lvpei.org

References

1. George R, Ve RS, Vijaya L. Glaucoma in India: Estimated burden of disease. J Glaucoma 2010;19:391-7.
2. Data on Annual Percentage of Population at Mid-Year Residing in Urban Areas. [UNITED NATIONS web site]. Available from: http://esa.un.org/unpd/wup/dataquery/. [Last accessed 2020 Mar 20].
3. Garudadri C, Senthil S, Khanna RC, Sannapaneni K. Prevalence and risk factors for primary glaucomas in adult urban and rural populations in the Andhra Pradesh eye disease study. Ophthalmology 2010;117:1352-9.
4. Tan NY, Friedman DS, Stalmans I, Ahmed II, Sng CC. Glaucoma screening: Where are we and where do we need to go? Curr Opin Ophthalmol 2020;31:91-100.
5. George R, Choudhari NS. Effective glaucoma screening in a resource-poor setting. Glaucoma Today. 2019.
6. Rao GN, Khanna RC, Athota SM, Rajshekar V, Rani PK. Integrated model of primary and secondary eye care for under-served rural areas: The L V Prasad Eye Institute experience. Indian J Ophthalmol 2012;60:396-400.
7. Ichhpujani P, Thakur S, Sahi RK, Kumar S. Validating tablet perimetry against standard Humphrey Visual Field Analyzer for glaucoma screening in Indian population. Indian J Ophthalmol 2021;69:87-91.
8. Choudhari NS, George R, Asokan R, Khanna R, Vijaya L, Garudadri CS. Combination of simple diagnostic tests to detect primary angle closure disease in a resource-constrained region. Ophthalmic Epidemiol 2019;26:430-8.

Access this article online

Quick Response Code:

Website: www.ijo.in

DOI: 10.4103/ijo.IJO_672_20

Cite this article as: Choudhari NS, Garudadri CS. Commentary: Innovations in technology hold promise for glaucoma detection in underserved populations. Indian J Ophthalmol 2021;69:91-2.