

Research Article

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B-Scan Ultrasonography “A Valuable Adjunct in Community Cataract Screening Camps”

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ABSTRACT

Background: Cataract remains a leading cause of avoidable blindness worldwide with a substantial burden in developing countries, where majority of population resides particularly in rural areas with limited access to eye care services. thus, community-based cataract screening camps play an important role as many patients present with dense or mature cataracts that preclude visualization of the posterior segment, therefore incorporation of B-scan ultrasonography at the camp site helps in preoperative detection of retinal abnormalities and facilitating timely referral.

Aim: To evaluate the clinical utility of B-scan ultrasonography incorporated into a mobile ophthalmic unit for detecting posterior segment pathologies in patients with dense cataracts attending community-based cataract screening camps.

Material and Methods: This prospective observational study was conducted at a tertiary care hospital in central India for 18 months. Patients aged ≥ 40 years with senile dense cataracts obscuring fundus visualization underwent comprehensive ophthalmic evaluation and B-scan ultrasonography at camp site.

Results: Of 2,853 patients with senile cataract screened, 452 (15.8%) required B-scan ultrasonography. Females constituted 56.6%, and the common age group was 60–69 years (30.5%). Mature cataract was predominant (68.7%). Significant posterior segment abnormalities were detected in 45/452 patients (9.95%), comprising vitreous haemorrhage (44.4%), vitreous opacities (22.2%), retinal detachment (17.8%), and posterior staphyloma (15.6%).

Conclusion: Incorporating B-scan ultrasonography into mobile cataract screening units enables detection of posterior segment pathology, facilitating appropriate surgical planning, telemedicine-assisted consultation, timely vitreoretinal referral, realistic visual outcome and patient counselling. It may also reduce anxiety and psychological distress associated with unexpectedly poor visual outcomes.

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Introduction

Cataract remains the leading cause of avoidable blindness worldwide in developing countries like India, disproportionately the large proportion of population resides in rural and suburban areas where access to comprehensive ophthalmic services is limited, hence in these scenario community-based cataract screening camps play a vital role in identifying visually impaired individuals and facilitating timely referral for surgical intervention. However, a significant number of patients presenting at outreach camps have dense or mature cataracts, precluding direct visualization of the posterior segment [1].

Although various modalities are available for posterior segment evaluation, including direct and indirect ophthalmoscopy, slit-lamp bio-microscopy with a 90-D lens, B-scan ultrasonography, and Optical Coherence Tomography (OCT) etc. However, B-scan ultrasonography is particularly valuable when media opacity

prevent fundus visualization. It is a rapid, non-invasive, and cost-effective modality that enables detection of otherwise occult posterior segment pathologies, which may significantly influence visual prognosis following cataract surgery [2,3].

Considering these advantages, we incorporated B-scan ultrasonography into our mobile eye care unit conducting outreach cataract screening camps, enabling preoperative posterior segment assessment for more realistic outcome.

With this perspective the present study aims to evaluate the role and utility of B-scan ultrasonography in cataract screening outreach camps conducted through the mobile eye care unit and to assess its impact on the detection of posterior segment pathology, surgical decision-making, and patient management.

Materials and Methods

This prospective, observational study was conducted in the Department of Ophthalmology at a tertiary care teaching hospital in Central India over a period of 18 months, from January 2025

to June 2026. Written informed consent was obtained from all participants before enrolment. The study included patients evaluated at the camp site diagnosed with senile dense cataract where fundus evaluation not possible.

Inclusion Criteria

- Patients aged ≥ 40 years with visually significant senile cataract.
- Eyes with mature, hypermature, hard brown, or dense diffuse posterior subcapsular cataracts precluding direct visualization of the fundus.
- Patients willing to participate and provide written informed consent.

Exclusion Criteria

- Paediatric cataract.
- History of ocular trauma.
- Previous intraocular surgery.
- Open-globe injury or active ocular infection.
- Patients unwilling to participate in the study.

All enrolled patients underwent a comprehensive ophthalmic evaluation in mobile eye care unit, including assessment of Best-Corrected Visual Acuity (BCVA), slit-lamp bio-microscopy of the anterior segment, intraocular pressure measurement, and cataract grading of both eyes. In patients with dense cataracts preventing fundus examination, posterior segment evaluation was performed using B-scan ultrasonography.

B-scan ultrasonography was performed using an Appasamy Marvel high resolution ophthalmic ultrasound unit equipped with a 12-MHz probe, installed in a fully equipped mobile eye care bus operating at the outreach camp sites. After instillation of coupling gel, scanning was performed through the closed eyelid under aseptic precautions. Dynamic real-time scanning was carried out to evaluate the vitreous cavity, retina, choroid, optic nerve head and posterior sclera. Any posterior segment abnormalities detected were documented systematically and patients were counselled regarding the diagnosis, visual prognosis, and the need for appropriate referral and further management before cataract surgery.



Figure 1: Mobile eye care bus



Figure 2: B-scan ultrasonography equipped in mobile eye care



Figure 3: B Scan machine



Figure 4: Ultrasonography unit in mobile eye care

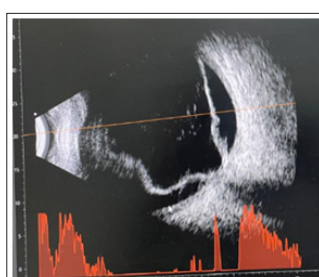


Figure 5: Retinal detachment on B Scan ultrasonography

Results

Analysis of current study showed that total number of 2,853 patients with senile cataract were screened during the community outreach cataract camps. Of these, 452 patients (15.8%) required preoperative B-scan ultrasonography as posterior segment evaluation was not possible owing to dense cataracts (Chart 1).

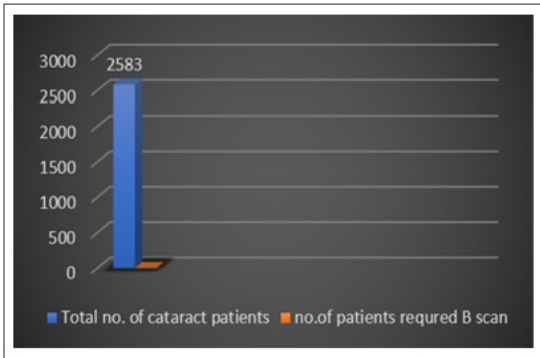


Chart 1: Number of camp patients required preoperative B-scan ultrasonography

Among these 452 patients, females constituted the majority (56.6%), while males accounted for 43.4%(Chart2).

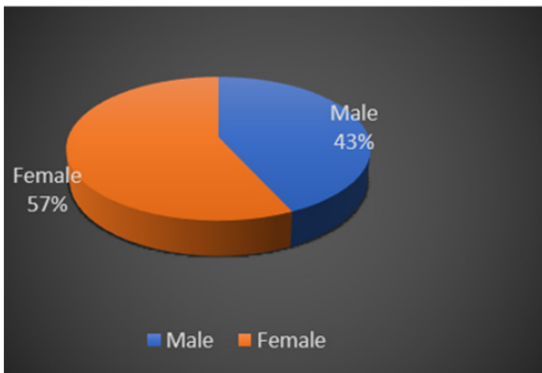


Chart 2: showed percentage of male and female

Additionally, the highest proportion of patients belonged to the 60–69-year age group (30.5%), followed by the 50–59-year and 70–79-year age groups, each comprising 25.0% of the study population Chart 3.

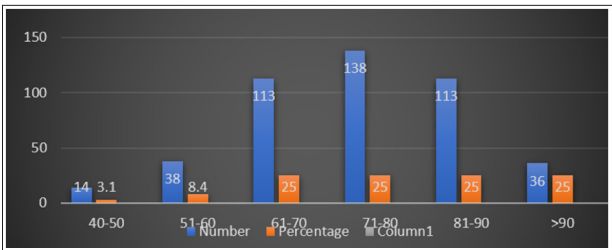


Chart 3: Showed Common Age Group

With regard to cataract morphology, mature cataract was the most common clinical presentation, observed in 68.7% of patients. This was followed by nuclear sclerosis with or without associated posterior subcapsular and/or cortical cataract (17.8%), Hypermature cataract 11.5% while hard brown cataract accounted for 4.6% of cases Chart 4.

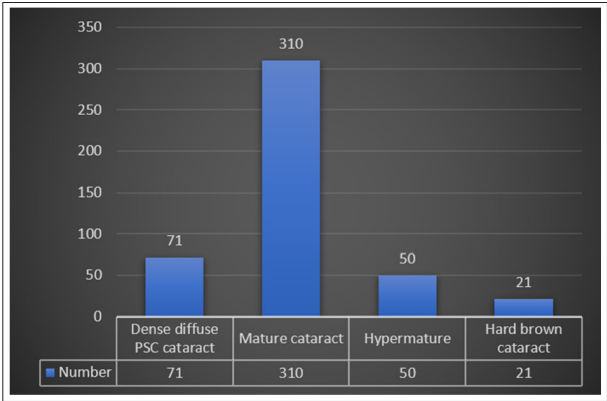


Chart 4: Showing Cataract Morphology

Furthermore, of the 452 patients who underwent Bscan ultrasonography, as posterior segment evaluation was not possible clinically due to dense cataracts, 45 patients (9.95%) had significant findings on ultrasonography. Among these patients, vitreous haemorrhage was the most frequent posterior segment abnormality, detected in 20 patients (44.4%), followed by vitreous opacities in 10 patients (22.2%), retinal detachment in 9 patients (20%), and posterior staphyloma in 7 patients (15.6%) Chart 5.

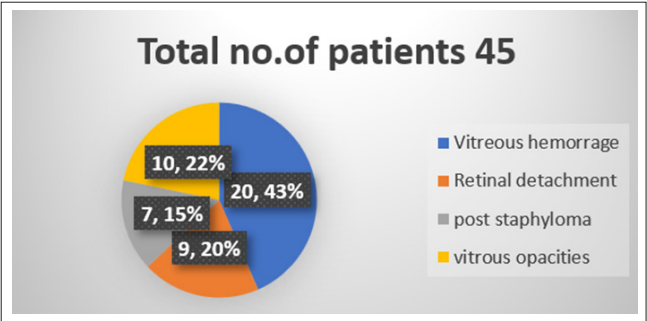


Chart 5: Showed Significant finding on ultrasonography

These findings showed the indispensable role of B-scan ultrasonography in the preoperative assessment of dense cataracts by facilitating the detection of occult posterior segment pathologies that are otherwise obscured by dense cataracts.

Discussion

The present study highlights the clinical utility of mobile B-scan ultrasonography in community-based cataract screening programmes, particularly in patients with dense cataracts in whom posterior segment evaluation is precluded. Of the 2,853 patients with senile cataract screened during the outreach camps, 452 (15.8%) required preoperative B-scan ultrasonography, with a predominance of female patients (56.6%) [4]. These findings are in coherence with the study of V. Meenakshi et al which demonstrates out of 1666 patients of senile cataract in community screening programmes , 475 (28.5%) patients required B scan due to dense cataracts with 63.1% female preponderance this shows that a substantial proportion of patients attending community screening camps require additional posterior segment assessment before cataract surgery and the disproportionate burden of cataract-related visual impairment in underserved populations with gender barriers as well, emphasizing the importance of improving access to comprehensive eye-care services [1].

The majority of patients in the present study belonged to the 60–69-year age group (30.5%), parallel findings are observed in the study of V Meenakshi, A Jain [4,5]. in which majority of patients (65.5%) belongs to the age group of 51-70yr This predominance of older patients is consistent with the age-related nature of senile cataract and also reflects delayed presentation in outreach populations.

Furthermore, mature cataract was the predominant cataract subtype in the present study (68.7%) [4]. Similar cohorts of dense cataract have demonstrated clinically in the study conducted by V.Meenakshi et al on 475 dense cataract patients in which 75% have mature cataract and Anteby et. al 19.6% of 509 patients with dense mature cataract the high proportion of advanced cataract indicates delayed presentation and supports the need for posterior segment imaging when direct fundus examination is not possible [7].

Moreover, among the 452 patients evaluated by B-scan ultrasonography, 45 eyes (9.95%) demonstrated significant posterior segment abnormalities [7]. These findings are in coherence with previous studies of eyes with dense or mature cataract Qureshi and Laghari reported posterior segment lesions in 12.0% of 750 cataract patients Anteby et al and Çetinkaya S et al reported 19.6% and 8.6% in 509 and 418 patients respectively Mendes et al. also reported potentially vision-limiting abnormalities in 30.1% of 289 eyes observed posterior segment abnormalities in 18.0% of 194 patients with dense cataracts [6-10].

Among these posterior segment findings vitreous haemorrhage was the most frequent abnormality, occurring in 20 of the 452 patients (4.4%) and accounting for 44.4% of the 45 eyes with significant B-scan abnormalities, in contrast, reported posterior staphyloma in 7.2%, patients with dense cataract Qureshi and Laghari observed retinal detachment in 3.0% of their total study population found diffuse vitreous opacity in 12.1% and Zubair et al. reported vitreous haemorrhage in 5.2% their study [8,6,9,10].

Thus, incorporating B-scan ultrasonography into a mobile ophthalmic unit in cataract screening camp has important clinical implications in patients with cataract-related media opacity as preoperative detection of posterior segment pathology facilitates appropriate surgical planning, realistic assessment of visual prognosis, and counselling of patients at the time of cataract evaluation.

Additionally detailed evaluation of the fellow eye may further help to identify the underlying retinal pathology and guide anticipated visual outcomes. When required, telemedicine-assisted consultation with a vitreoretinal specialist at the tertiary hospital can facilitate, for consideration of combined surgical intervention, or initiation of appropriate medical management for retinal pathologies if required.

Early diagnosis and proper counselling of the patients may also reduce the psychological distress associated with an unexpected poor visual outcome following an otherwise successful cataract surgery hence B-scan ultrasonography is a significant tool for comprehensive approach to cataract surgery, particularly in resource-limited and remote settings.

Conclusion

B-scan ultrasonography is a valuable adjunct to community-based cataract screening, particularly in patients with dense cataracts preventing fundus visualization. Its integration into mobile

ophthalmic units in camps facilitates detection of posterior segment pathology, timely vitreoretinal referral, telemedicine-assisted consultation, and appropriate surgical planning. Importantly, early detection enables realistic counselling regarding visual prognosis, thereby minimizing the anxiety and psychological distress associated with an unexpectedly poor postoperative visual outcome. Thus, mobile B-scan enhances comprehensive, patient-centred cataract care in underserved populations.

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