Original Article

# Incorporating primary eye care into primary health care: Piloting a perceived visual disability questionnaire based model in rural southern India – An observational study

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**Purpose:** Over 20% of the world's visually impaired and blind populations live in India. Integration of primary eye care (PEC) into existing primary health care by trained personnel could address access-related barriers. We piloted an unreported, modified WHO disability questionnaire-based model for community health workers (CHWs) to screen and refer persons with perceived visual impairment instead of the traditional visual acuity model. The objective of the study was (1) to determine the prevalence of perceived visual impairment, rate of follow-up postreferral, distribution of ocular morbidity, visual impairment, and proportion of appropriate referrals and (2) to compare results of this intervention with those of existing services. **Methods:** CHWs were trained in administering a questionnaire for identification and referral of persons with perceived visual impairment in 7 rural villages and 22 tribal hamlets from the institutional database. In this cross-sectional study, patients screened and referred to PEC services from September 2014 to March 2015 underwent comprehensive ocular examination by an optometrist and ophthalmologist. Data collected from their records were analyzed retrospectively. **Results:** Of 18,534 individuals screened, 3082 (16.64%, 95% confidence interval: 16.06–17.14) complained of perceived visual impairment and were referred; 463 (15%) of these followed up for examination. Correct referrals were noted in 452 (97.6%) cases. Cataract (52.3%) and refractive error (15.8%) were the most common morbidities. There was a 39.6% increase in uptake of eye care services from baseline. **Conclusion:** The questionnaire-based screening tool administered by CHWs can lead to appropriate identification and referral of persons with ocular morbidity impacting uptake of eye care services.

**Key words:** Community health workers, perceived visual impairment, primary eye care, questionnaire based, screening

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Blindness and visual impairment continue to be public health problems in India[1,2] which is home to >20% of the of global visually impaired and blind populations.[3] With over 90% of blindness in India being avoidable[1] by cost-effective treatment, the challenge lies in improving access and availability to the most needy populations. Strengthening of primary eye care (PEC) by its integration into existing primary health care (PHC) seems promising as it would empower the existing grass-root level workforce to impart PEC making the program more accessible and sustainable at the community level.[4,5]

Grass-root level workers have been involved in identification and referral of persons needing eye care in some Indian states.[5-7] However, there are several lacunae in the scope of PEC and definition of skills of front-line workers.[8] In one of the models studied, PHC workers are required to check vision,[9] in addition to PHC work.[10] It is important to find a model where community health workers (CHWs) in PHC can effectively screen without being overworked.[11]

We piloted a model wherein CHWs and not PEC workers such as paramedical ophthalmic assistants (as is the norm) administered a modified WHO questionnaire for identifying perceived visual disability.[12] The aim of the pilot study was to determine the numbers identified with visual problems, establish follow-up rates, proportions correctly referred by CHWs, and effect of this intervention on uptake of existing services.

## Methods

### Setting and population

This study was conducted in the rural and tribal service areas of the Department of Community Health of a tertiary care teaching hospital in Tamil Nadu, India. The rural service area comprises a block consisting of 82 villages. The department provides community-based screening, PHC, outpatient services, and secondary level care at its 180-bed hospital located within

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its service area. Bimonthly ophthalmology clinics have been running at this location for the past 12 years. The tribal service area consists of 250 hamlets in a mountainous terrain. The population in the tribal areas is being served through mobile clinics for over 30 years. A primary care center in the tribal hills was established around the time of commencement of the study.

A multidisciplinary project was initiated in September 2014 by the Departments of Ophthalmology and Community Health including hearing and motor disability as well. This cross-sectional study is a retrospective analysis of the data generated related to ocular morbidity. Institutional Review Board and Ethics Committee approval of the institution was obtained (IRB No. 10616 [Retro]).

At least one or more villages from each of the three primary health center areas at that time were chosen to get a representation of the entire block. In the tribal area, a combination of accessible and hard to access hamlets was chosen for representativeness. Seven villages and 22 hamlets were thus included. Eight CHWs, four each from rural and tribal populations were identified for training. The CHWs had various levels of experience in the field as general PHC workers but none in visual disability screening.

### Training

A training module was developed for CHWs to screen and refer those with perceived visual impairment. The screening tool was a questionnaire [Fig.1] adapted from the WHO manual "Training in the community for people with disabilities, guide for local supervisors"[12] and translated into the local language. The CHWs underwent training in the Department of Ophthalmology over a half-day session with the use of clinical pictures, powerpoint presentations, patient examination, and role plays. Each health worker was provided with a kit including forms, questionnaire, clinical pictures to match common ocular conditions, toy for checking fixation, and following in children[13] instead of the candle in the original WHO questionnaire in the interest of safety. They were trained to collect demographic data, administer questionnaires, and refer appropriately to the project clinics where referred patients were examined. Several practical demonstrations including role plays were done to ensure uniformity in the administration of questions including observation of each health worker during pilot administration. During the survey period, regular weekly meetings were held between the CHWs and trainers for appropriateness of screening, referral, and addressing their queries and concerns from the field.

### Survey and referral

The CHWs conducted house-to-house surveys in their assigned areas from October 2014 to March 2015. Baseline demographic data for households screened were collected. The questionnaire was administered to the head of the household or a responsible adult family member living within the household for at least 6 months. Questions 1–5 of the original form regarding visual problems for distance, near, vision in low light, and different appearance of eyes were asked about every household member.[12] Question 6 was added for identifying common clinical conditions: cataract, squint, corneal opacity, corneal ulcer, and inflamed/red-eye by matching clinical pictures. Sections 7, 8, and 9 pertained to gross vision and cataract screening in children aged 3 months to 3 years. If an affirmative answer was received for any of the above for any individual in the household, the person was said to have "perceived visual impairment," and referral slips for further evaluation were given for that person. Individuals from the rural and tribal areas were referred to their respective special (ophthalmology) clinics at the secondary care hospital or the primary care setup, respectively. For two hamlets with very poor access, to improve

**Screening for Disability – Household Screening: Form - 2**

Village Name: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ Village Code _ _ _ H.H.Sl No _ _ _

| | Eye | Y/N | Ind. Sl Nos |
|---|---|---|---|
| 1. | Is there a person in the family who cannot see as well as others ? | | |
| 2. | Is there a person in the family who cannot see as well when it is dark ? | | |
| 3. | Is there a person in the family who cannot see objects that are far away, such as trees or birds ? | | |
| 4. | Is there a person in the family who cannot see objects that are very close, such as seeds held in his or her hands ? | | |
| 5. | Is there a person whose eyes look very different from other people ? | | |
| 6. | Is there anyone in the house whose eyes have problems as shown in the given pictures ? | | |
| | a. cataract | | |
| | b. squint | | |
| | c. corneal opacity | | |
| | d. acutely inflamed eye | | |
| | e. corneal ulcer | | |
| | **Children 3 months - 3 years** | Y/N | Ind. Sl Nos |
| | Let the child sit on the mother's lap. Hold a toy about 30 – 50 cm in front of the child. Move the toy from side to side and up and down. Observe the child. | | |
| 7. | Do the child's eye's follow the toy as you move it ? (if the child does not follow the toy even once in 3 attempts, the child may have difficulty seeing) | | |

**Figure 1:** Questionnaire for household screening

accessibility for those referred, the team visited the hamlet and evaluation was carried out in temporary clinics organized in the convenient setting of a school in the area.

### Ophthalmic evaluation

The special clinics (distinct from regular clinics) for those screened and referred were held from November 2014 to June 2015. Individuals presenting to these clinics after referral were evaluated by an experienced ophthalmologist, optometrist, and paramedical worker. Presenting and best-corrected visual acuity was assessed using Snellen's chart/Cardiff cards/Torchlight fixation and following as appropriate and refraction done when required. The ophthalmologist performed a comprehensive examination using a slit-lamp bio-microscope (Appasamy, India), applanation tonometry, and dilated fundoscopy using a 90 diopter lens (Volk Optical, USA). In the tribal temporary clinics, we used a handheld slit lamp (Heine, Germany) and Tonopen (Reichert, NY, USA) for intraocular pressure measurements and indirect ophthalmoscopy (Heine, Germany) for dilated fundus examination, all else being the same. Patients were referred to the base hospital if they required further evaluation for specific ocular morbidity, cataract surgery, or low vision rehabilitation.

Blindness was defined according to the then existing National Program for Control of Blindness definition as presenting a vision of <6/60 in the better eye and low vision as presenting a vision of <6/18–6/60in the better eye.[14] Proportions that followed up after referral and those correctly referred were calculated.

### Comparative analysis with existing services

We compared the number, demographics, ocular morbidity, and visual impairment data of patients presenting to the regular peripheral clinics from the rest of the rural block with those from the project during the same period (November 2014 to June 2015). These patients were either self-referred or may have been guided by health worker as routine but were not part of the study area. We also looked at the numbers of patients coming for 3 successive years before the intervention.

### Statistical analysis

Data were entered in SPSS for Windows, Version 16.0. Chicago, SPSS Inc. Percentages (with 95% confidence interval [CI]) for patients referred for perceived visual impairment, those examined vision categories, and ocular morbidity was calculated. The data of the ophthalmic evaluation were linked to the database of the community health department to get further demographic details as required.

## Results

A total population of 18,534 (4813 households), 13,505 (72.9%) rural and 5029 (27.3%) tribal, was screened by 8 CHWs. Each rural and tribal CHW screened 3376 and 1257 persons respectively on an average. Mean age among those screened was 33.31 (±19.6, range: 0–99 years) and 49.6% were female; 3082 (16.6%, 95% CI: 16.06–17.14%) of these complained of ocular symptoms, while 463 of those with complaints (15%, 95% CI: 13.7–16.2%) presented to the peripheral clinics for further evaluation. The mean age and gender distribution among all with visual complaints was 53.5 years (±15.9, range: 0–99 years), 56.2% females and those who followed up 50.1 years (±16.2, range: 2–99 years), 54.2% females, respectively. Separate details for rural and tribal populations are shown in Fig. 2 and Table 1. There were 1532 children 14 years and below. among all screened (8.3%), out of whom 71 (4.6%) complained of a visual problem. Of these, 21 (29.6%) followed up for further evaluation. The distribution of ocular morbidity among those that presented to the peripheral clinics for evaluation is represented in Fig. 3.

Of those presenting to the clinic, 452 (97.6%) patients were correctly referred by the CHWs. The most common pathology among those from the rural population was refractive errors (30.8%), whereas cataract (31.1%) was the most common pathology among the tribal population.

Among those presenting for evaluation, the prevalence of blindness was 5.1% (95 CI: 2.73–7.47) among rural and 10.6% (95% CI: 5.39–15.85) among the tribal populations. If blindness was defined as presenting visual acuity in the better eye being worse than 3/60, the prevalence changed to 3.0% in the former and 6.1% in the latter. In the 50 years and above population, using the NPCB definition, this was 6.1% (95 CI: 2.6–9.6) and 11.5% (95% CI: 4.1–17.9), respectively, in the rural and tribal groups. The most common cause of blindness in the rural population was cataract (58.8% [10/17]). In the tribal population, 7 of 14 were blind from cataract (50%) and rest were incurable causes. In those 50 and above, cataract accounted for 90.9% and 77.8% of blindness among rural and tribal populations. The distribution of blindness and low vision is represented in Table 2. Visual impairment was found in 18.1% among the rural and 25.8% of the tribal population. The most common cause of visual impairment was also cataract in both populations.

During the same period (November 2014–June 2015), 1214 (1.25%) of a population of 97,134 presented to the regular peripheral clinics from the rest of the rural block. Demographics of this population are presented in Table 1. The distribution of visual disability and ocular morbidity among this population is shown in Table 2 and Fig. 3, respectively.

On comparing total numbers presenting to the peripheral eye clinics in the 12 months before (October 2013– September 2014) and after (October 2014–September 2015) the project, there was a 39.6% increase in patients seeking eye care services at the rural peripheral eye clinics compared to the previous

**Table 1: Study population demographics**

| | Mean age (years)±SD (range) | | | Gender (percentage female) | | |
|---|---|---|---|---|---|---|
| | Rural | Tribal | *P* | Rural | Tribal | *P* |
| Population screened | 35.16±20.2 (0-99) | 28.14±16.6 (0-99) | <0.001 | 50.03 | 48.3 | 0.0155 |
| Population with perceived visual need | 53.83±16.3 (2-99) | 50.61±13.9 (4-94) | <0.001 | 56.9 | 51.9 | 0.0414 |
| Population presenting for evaluation | 49.6±16.9 (5-91) | 50.6±0.25 (1-85) | 0.4973 | 59.2 | 49.2 | 0.0503 |
| Self-referred patients (regular clinics) | 50.36±17.27 (0-95) | - | | 63 | - | |

SD: Standard deviation

year. Monthly statistics of numbers accessing the peripheral eye clinics continued to be above average even after the project period was over [Fig. 4]. The peripheral clinic in the tribal area was a new setup and hence here comparative numbers from previous years were unavailable.

## Discussion

To the best of our knowledge, this is the first report of a questionnaire-based screening tool administered by CHWs for identification of ocular morbidity. Prevalence of perceived visual impairment was 16.6% (95% CI: 16.06–17.14); of these, 15% (95% CI: 13.7–16.2%) presented to the project clinics. Cataract was most common in the rural community and refractive errors among the tribal. The prevalence of blindness was more among the tribal (10.6%) as compared to the rural (5.1%) population. Among those who presented, 97.6% were correct referrals.

The mean age of those complaining of ocular problems was significantly higher than those screened [Table 1] as prevalence of blindness and visual impairment increases with age.[3] There was a higher proportion of females with perceived need and among those presenting for examination, highlighting gender disparities in access to eye care as also reported by other authors.[1,15]

### Prevalence of reported visual impairment

A perceived vision problem was reported by 16.6% of the population. To the best of our knowledge, there are no reports of prevalence of perceived visual needs. This prevalence is higher than that determined by visual acuity for distance vision alone (10%)[16] and lower than that for presbyopia alone (up to 55%) reported in persons 30 years and above.[17] We calculated the prevalence of perceived visual impairment among all ranges of age and both for distance and near. Further, since this was a visual need-based screening method, persons not hampered by near vision in their daily activities, those in the presbyopic age group with myopia or nuclear sclerosis would not complain of decreased near vision.

### Rate of follow-up postreferral

The follow-up rate of persons referred for further evaluation was poor (15%) even after multiple interventions were implemented – referral cards with dates highlighted, clinics held in familiar locations, and the presence of CHWs in all the appropriate clinics. Quigley *et al*. report a 40% follow-up rate in their study on laypersons' screening for ocular problems.[18] This study was conducted in the United States and persons referred were offered free transport and inexpensive glasses if required which could have influenced follow-up rates.

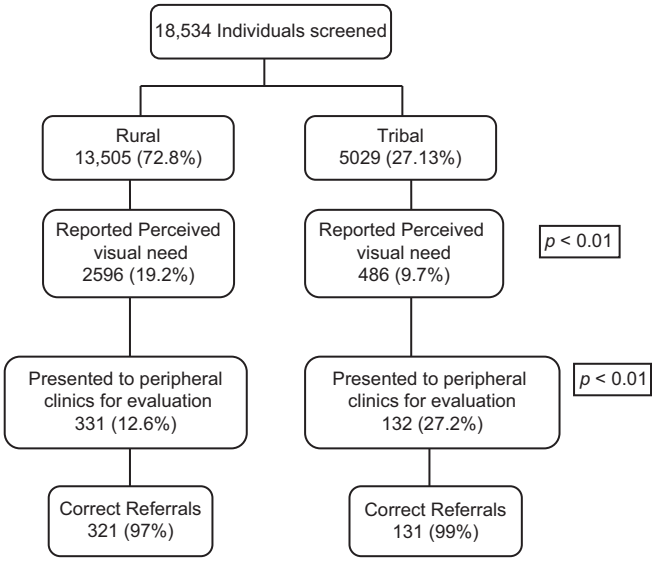


**Figure 2:** Flow of the study

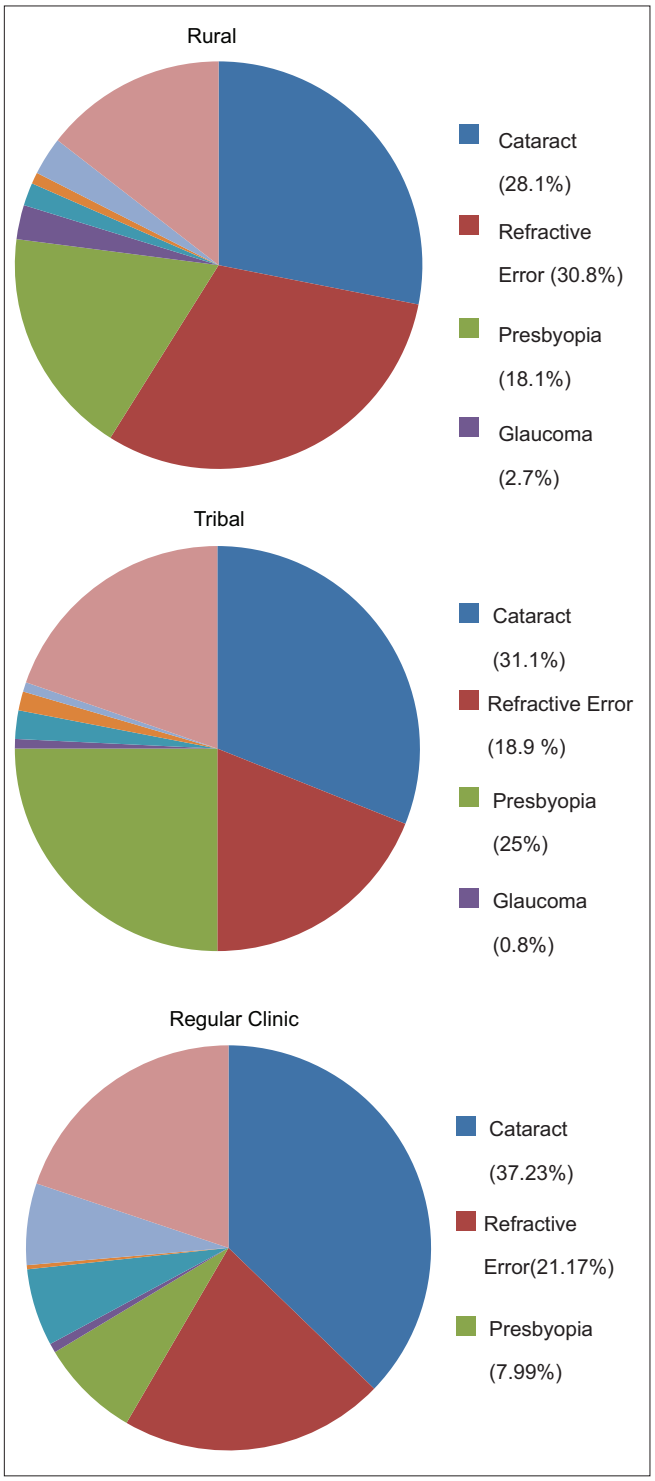


**Figure 3:** Ocular morbidity in patients presenting for evaluation

**Table 2: Distribution of levels of visual disability as evidenced by uncorrected distance visual acuity in the better eye, on Snellen's chart with National Program for Control of Blindness definitions**

| Grade | Rural block (%) | Tribal hills (%) | *P* | Patients from regular clinics (%) |
|---|---|---|---|---|
| Blind (<6/60) | 19 (5.7) | 14 (10.6) | 0.6033 | 68 (5.6) |
| Low vision (<6/18-6/60) | 60 (18.1) | 34 (25.8) | 0.3593 | 266 (21.9) |
| Normal (6/18 or better) | 252 (76.1) | 84 (63.6) | 0.0319 | 851 (70.1) |
| Missing | - | - | - | 29 (2.4) |
| Total | 331 (100) | 132 (100) | - | 1214 (100) |

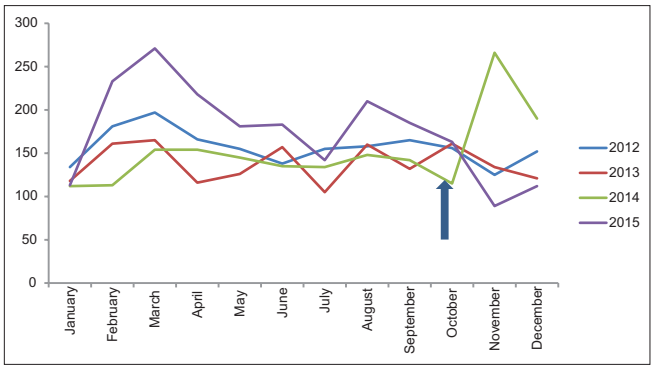


**Figure 4:** Numbers accessing eye care services at peripheral health center – 4-year data. Blue arrow represents onset of screening and referral

When calculated separately, the follow-up rates were significantly higher for the tribals: 27.2% (132/486) versus 12.8% (331/2596) for the rural ($P < 0.01$), despite a significantly lower reported visual need 9.7% in tribal as compared to 19.2% in rural population ($P < 0.01$). The higher rate of follow-up in the tribal population could be attributed to make-shift clinics held in difficult to access hamlets closer to the referred individuals residence, the presence of a first of its kind primary care facility in this area as well as one very dedicated CHW.

Poor follow-up rates of 13.5% have been reported even in persons with diagnosed ocular disease in a South Indian population,[19] in a person diagnosed with diabetic retinopathy in a low-income setting,[20] and in cataract blind patients.[21] Kovai *et al*. reported the prevalence of not seeking eye care even after noticing a difference in vision to be 68.6%.[22] Several barriers have been reported in these studies, requiring further research to improve follow-up.

While the response rate is low, it is possible that the decision to come to get evaluated could well indicate the presence of significant morbidity. This means that the concordance of finding them as true positives must be interpreted cautiously at this stage. However, the fact is that 463 people came to the clinic having been referred by CHW trained in questionnaire screening and not in ophthalmic evaluation and those who came invariably had a problem. This in itself suggests that such an approach while being a poor method to pick up all those with visual impairment is a reasonable tool to bring those with significant problems to the clinic.

### Distribution of ocular morbidity and visual impairment

Cataract (52.3%) and refractive error (15.8%) were the most common causes of blindness and the most common morbidity similar to national surveys.[1,16,23] Contribution of cataract to blindness was almost the same in both the rural (52.3%) and tribal populations (50%) and similar to the cataract contribution to world blindness (51%).[3] Other causes of blindness were refractive errors, retinal pathology, optic atrophy, and cerebral visual impairment. Noteworthy was the high prevalence of optic atrophy among the tribal population similar to indigenous populations in Australia where it is the third leading cause of blindness.[24]

Among the total population which presented for examination, presbyopia was diagnosed in 93 patients (25.5%) of those 40 years and above. A higher proportion of persons with presbyopia presented for evaluation from the tribal group [Fig. 3]. This could be explained by the nonavailability of optical shops or eye care facilities in the area.

The prevalence of blindness among those from the tribal population was almost twice that in the rural population. Higher rates of blindness have been reported from other indigenous populations as well.[24] This finding differed from other authors in our country who found blindness rates in community surveys comparable to country statistics.[25,26] This difference could be related to the migrant tribal population with poor health-seeking behaviors living in hilly terrain with poor access.[27] The numbers in this study are, however, small for reliable blindness prevalence data.

### Proportions of appropriate referrals

The referrals made by the CHWs corresponded to an actual visual deficiency for distance or near or both in 97.6% of the referrals. This is the first ever report of the use of a perceived visual need-based questionnaire administered by CHWs, so there are no studies for comparison, and further research is needed to determine sensitivity and sensitivity of this screening tool.

### Comparative analysis with the existing peripheral ophthalmology services

Twice the proportion of individuals presented to the project clinics as compared to the regular clinics (1.25% vs. 2.4%, respectively, of total population). This could be attributed to increased motivation due to home visits and possession of a referral slip for a given date. Numbers of "normal," i.e., those with normal vision or requiring no intervention were considerably lower in those referred by CHWs [Fig. 3]. However, the prevalence of blindness was similar. Proportions of individuals with refractive errors and presbyopia were higher in project group while proportion of cataract higher in the regular clinic group. Other authors have also reported that those with cataract are more likely to seek care as compared to persons with refractive errors.[22] The CHWs did not specifically refer diabetics for retinopathy screening; this was reflected in the prevalence of diabetic retinopathy being three times more in the regular clinic as patients are regularly referred into this clinic by their physicians. A positive effect was observed in service uptake. There was an increase in numbers accessing the rural peripheral clinic compared to the previous 3 years [Fig. 4]. This would be an expected after an intervention, but it is encouraging that the trend continued for at least 6 months after

the project ended. We did not have comparative data for the peripheral clinic in the tribal hills as this was a new initiative at the time of the project.

This intervention of training CHWs in the primary health system, if successful, would go a long way in incorporating PEC into PHC with long-term feasibility in contrast to sporadic eye camps which are the norm.

### Limitations

Since this was a pilot study of the utility of a visual need-based questionnaire method, sensitivity and specificity of this tool was not determined. There may have been a self-selection bias in those that actually reported for evaluation postreferral.

Barriers which prevented referred patients from accessing peripheral ophthalmology services were not assessed.

## Conclusion

This visual need-based screening tool could a promising model for the identification and effective referral of persons with highest perceived visual disability, thereby efficiently using the clinical resources as well as avoiding expensive screening camps and referring those by visual acuity cutoffs rather than perceived needs. This intervention also plays a role in improving uptake of eye care services. Further validation studies and systems research into improving follow-up after referral are needed.

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### Conflicts of interest

There are no conflicts of interest.

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