Vision centre helps reduce blindness and vision impairment. Proof of concept in a four-year longitudinal study in an urban area in India

Parikshit M Gogate1,2,3, Supriya P Phadke1, Taraprasad Das1, Shrivallabh Sane5, Soumya Moosa4, Ashok Dhangar1, Minhaj Inamdar1, Rajiv Khandekar7, Renu Magdum2, Jitendra S Bhawalkar6, Kashinath Bhoosnurmath6

Purpose: To estimate the prevalence of blindness and severe visual impairment (SVI) by using a door-to-door screening and vision center (VC) examination strategy in an urban area in western Maharashtra (Pune), India, and repeat the exercise after 4 years to study its impact. Methods: Four trained community health workers measured the visual acuity and performed an external ocular examination in patients’ homes. People with vision <6/18 were requested to visit the VC for a comprehensive eye examination by an optometrist. An ophthalmologist examined people whose vision did not improve to 6/12. A home examination was done for people who did not visit the VC despite two requests. The same population was examined twice in an interval of 4 years. Results: In the study, 44,535 people in 2015–16 and 98.14% (n = 43,708) of them in 2018–19 were examined. Blindness (vision < 3/60 in better eye), and moderate-to-severe visual impairment (MSVI, vision 6/18–6/60 in better eye) were 0.26% and 1.3%, respectively, in the first cohort, and 0.16% and 1.1%, respectively, in the second cohort (P < 0.001). When the worse eye was considered, the prevalence of blindness reduced from 0.72% to 0.44%, SVI reduced from 0.1% to 0.07%, and MVI decreased from 1.7% to 1.49% between 2015 and 2019 (P < 0.001). Females (P < 0.001) and older individuals (P < 0.001) were more likely to have blindness or SVI. In the VC, 8211 people were examined in 4 years. Conclusion: The reduction of blindness and MSVI in the urban area of Pune can be partly ascribed to the presence of a VC and attendant screening in this locality.

Key words: Cataract, blindness, visual impairment, vision centre, India

Over five decades, India has conducted several surveys to measure the magnitude of blindness and visual impairment (VI). Considering all age groups, the prevalence of blindness was 1.39% (with <6/60 as blind) in the 1971 Indian Council of Medical Research (ICMR) survey and 0.36% (with <6/60 as blind) in the 2019 National Program for Control of Blindness and Visual Impairment (NPCB VI) survey. With the <6/60 criteria, the figure was 0.71%. In people over 50 years, the prevalence of blindness (presenting vision <6/60 in better eye) was 8.5% (95% CI: 8.1–8.9) as per the nationwide survey in 2009. The World Health Organization (WHO) uses presenting vision <3/60 in the better eye for international comparisons. Using this cutoff, the prevalence was 5.34% (95% CI: 5.06–5.62).4 This downward trend in blindness and VI in India has been possible due to the combined efforts of the government, non-governmental organizations, and numerous private practitioners.8

Also, in the last five decades, various models have been proposed to reduce avoidable blindness and VI.6–9 Two significant changes were shifting from mobile to fixed facilities and mass eye care (eye camps) to person-specific care. In 2019, the World Health Organization (WHO) proposed the incorporation of “integrated people-centered eye care” (IPEC). The IPEC approach has proposed the provision of affordable and accessible eye care from community and primary levels (in villages) to tertiary care (in the city) and the integration with other specialties of health care.9 India has been practicing this pyramidal model of eye care for several years now.10–14 The greatest advantage of primary care through a fixed facility (vision center, VC) is continuity of care nearly at people’s doorstep. It also allows the possibility of conducting an all-age group eye disease survey, following the same population over time, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Cite this article as: Gogate PM, Phadke SP, Das T, Sane S, Moosa S, Dhangar A, et al. Vision centre helps reduce blindness and vision impairment. Proof of concept in a four-year longitudinal study in an urban area in India. Indian J Ophthalmol 2022;70:1742-8.
the years to measure the health benefits. This is different from the rapid assessment of avoidable blindness (RAAB). RAAB measures the prevalence of blindness and VI in one cohort (e.g., the 50+ age-group population) at one point in time. It is less expensive and less time-consuming. RAABs have helped shape eye care policies, though a prevalence study that accounts for all age groups is more desirable. The disadvantages of all age-group surveys are the time and expense. A primary eye care center addresses some of these issues/concerns.

We collected eye health data from people living in an urban slum/low-income area in Pune city (Maharashtra, India) during two time points: 2015–16 and 2018–19. We conducted a door-to-door screening of the entire population/community and complemented it with further diagnosis and treatment in a VC established in the locality. This communication is a report of the population-based eye care modeled/delivered through the VC.

**Methods**

The protocol was reviewed and approved by the institutional ethics subcommittee (IESC/FP/2019/05). The study adhered to the tenets of the declaration of Helsinki for the study of human subjects. The ethics committee permission was obtained from the ‘D.Y.Patil Medical College, Pimpri, Pune’s ethics committee.

This study had two time points, 2015–16 and 2018–19, from the project implemented on Operation Eyesight’s flagship Hospital-Based Community Eye Health model. At the first time point, eye screening of the designated slum/low-income population of Pune city was conducted by a door-to-door survey. Before the study, community health workers (CHWs) recruited from the same community were trained on communication skills and eye examination techniques. Trained CHWs compiled the demographic data and measured the visual acuity of individuals in their homes by using Snellen’s charts/Landolt C charts and referred individuals with <6/18 in any eye to the VC located within 2 km from their residence. At the VC, an optometrist performed a comprehensive eye examination of both eyes for these people. An ophthalmologist further examined those whose vision did not improve beyond 6/12. The ophthalmologist assigned a cause of the vision impairment and/or blindness to those whose vision did not improve beyond 6/60. The ophthalmologist categorized the causes of visual impairment/blindness into an avoidable (preventable or treatable) or a non-avoidable cause. The avoidable one was considered as the cause of blindness when both the causes were present. Untreatable blind patients were assisted in obtaining disability (seeing-blindness) certificates from government authorities.

The optometrist visited the homes of people with vision impairment if they did not visit the VC. These people were again requested to visit the VC for a consultation with the ophthalmologist. The ophthalmologist made a home visit to people who still did not visit within a week of the optometrist’s examination. The optometrist, equipped with hand-held devices such as an auto-refractometer (Plus Optix), handheld slit-lamp (Kanghua), and rebound tonometer (Icare), made home visits; the ophthalmologist, when visited, also carried all these equipment, and additionally, an ophthalmoscope (Heine, Germany) and prism bar, to confirm the diagnosis. The initial assessment was done from January 2015 to July 2016. The ophthalmologist, optometrist for the first 2 years, the social worker cum coordinator, and the four CHWs were all females.

A repeat examination of the same population was performed from May 2018 to March 2019. The survey processes were essentially similar to the first component of the study. The CHWs collected demographic details of each family member (age, gender, occupation, place of work, history of systemic illness, known disability, pregnancy, and lactation). They also documented migration, further disability, and death. The comprehensive eye examination by the optometrist and ophthalmologist in 2019 was similar to the one done in 2015–16.

Distant presenting visual acuity (PVA) in the better eye <6/18 was categorized as visual impairment (VI). The PVA was used to define visual impairment and was further classified as early visual impairment (EVI; PVA: <6/12–6/18), moderate visual impairment (MVI; PVA: <6/18–6/60), severe visual impairment (SVI; PVA: <6/60–3/60), and blindness (PVA: <3/60).

**Statistical Analysis:** Data were entered into Microsoft Excel by a dedicated data entry operator. Data analysis was performed using SPSS (Statistical Package for Social Sciences) version 27.0. Quantitative data variables were expressed using mean and SD (standard deviation). A Chi-square test was used to find the association between good and poor vision with age, gender, and patient identity as “head of the family” (Yes/No). Chi-square test and Wilcoxon sign rank test were used to find the significant difference between good and poor vision in 2015 and 2019. P < 0.05 was considered significant.

**Results**

Four trained CHWs recorded vision and collected other data from the population block in the ‘Yerawada–Vishrantwadi ward of Pune Municipal Corporation in 2015. At the first time point, 44,535 individuals of 9213 households were examined, and at the second time point, 43,708 (98.1% of the first cohort) individuals of 9039 (98.1% of the first cohort) households were examined. In either cohort, there were 49.8% males [Table 1].

In the 2015–16 survey, 1.7% (n = 740 of 44535) people had visual impairment (visual acuity <6/18), and 118 people (0.26%) were blind in the better eye [Table 2]. In the 2019 survey, 1.3% (n = 556 of 44708) people had visual impairment or other symptoms in the home screening; 95 of them (0.21% of the sample) had blindness and SVI, and 72 (0.16%) people were blind in the better eye. In the first (2015–16) cohort, prevalence of blindness (<3/60), SVI (3/60–<6/60), and visual impairment (6/60–6/24) in the better eye for the 51–70-year-olds was 0.8%, 0.6%, and 6.9%, respectively, and for 70+year olds was 5%, 0.9%, and 10.5%, respectively. Additionally, 71 children had failed the test by the CHWs; the optometrist examined them, and 21 required examinations by the ophthalmologist.

On re-survey and examination in 2019, a total of 827 people were not examined for the following reasons: 222 had died, 396 had moved to another locality, 28 refused repeat examination, and 181 were lost to follow-up. In this cohort, 72/43,708 (0.16%) had vision <3/60 in the better eye, and 23 (0.05%) had vision between 3/60 and 5/60. Further, 94.2% had vision ≥6/12 in the better eye in 2019.
Between the two time points, the prevalence of blindness reduced from 0.26% to 0.16, SVI halved (from 0.1% to 0.05%), and MVI decreased from 1.3% to 1.1% in the better eye [Table 2].

The visual disability grades were significantly different in the cohort of 2015 compared to 2019: Chi-square = 26.6, degree of freedom = 3, \( P < 0.001 \).

The visual disability grades were significantly different among males (Chi square = 14.7, degree of freedom = 3, \( P = 0.0001 \)) and females (Chi square = 13.3, degree of freedom = 3, \( P = 0.0003 \)) when compared to 2015–2019.

This variation in visual disability grade in both screening time points was more among females compared to males.

Gender difference: In 2015–16, the prevalence of blindness in the better eye was 0.21% (51/22,188) and 0.3% (67/22,188) in males and females, respectively; the prevalence of SVI in the better eye was 0.31% (71/22,188) and 0.4% (90/22,347) in males and females, respectively. The vision impairment (VA <6/18 in the better eye) was 1.1% (237/22,188) in males and 1.5% (342/21,775) in females. In both time points, females had more blindness and visual impairment than males (\( P < 0.001 \)); people in the older age group had more blindness and visual impairment than young people (\( P < 0.001 \)); heads of the family were more likely to have blindness and visual impairment (presumably because they were older individuals (\( P < 0.001 \)). In 2015, the prevalence of blindness (<3/60), SVI (3/60–6/60), and VI (6/60–6/24) in the better eye for the 51–70-year olds was 0.8%, 0.6%, and 6.9%, respectively, and for those over 70 years old, 5%, 0.9%, and 10.5%, respectively.

The prevalence of blindness and severe visual impairment in women was higher than in males. We observed a reduction of blindness and visual impairment over the years, and the gender gap in eyes with vision <6/12 narrowed.

When the worse eye was considered, the prevalence of blindness reduced from 0.72 to 0.44%, SVI reduced from 0.1% to 0.07%, and MVI decreased from 1.7% to 1.49% between 2015 and 2019 (\( P < 0.001 \) by Wilcoxon signed-rank test) as shown in Table 3.

There was a significant difference between 2015 and 2019 for the worse eye data (\( P < 0.001 \)) and the change in males, females, age 51–70 and >70 years by the Wilcoxon signed-rank test.

Table 4 shows the number and spectrum of people with blindness during the 2015–2016 and 2018–19 periods. The principal cause of blindness was cataract, with a proportion of 44.9% and 41.6% in the first and second surveys, respectively. Table 5 shows the causes of severe visual impairment during the two-time periods.

In 2015, cataract patients had more severe grades of visual disabilities compared to those in 2019.

The VC started functioning in January 2015. In 4 years, 2015–2019, the VC examined 8211 patients (3377 males, including 529 boys, and 4834 females, including 520 girls). During these years, 352 people (144, 42% males) underwent cataract surgery, spectacles were prescribed to 4024 people (1656 or 41.2% males and 2368 or 58.8% females), 1943 people purchased spectacles (43.2% males: 732 adults and 107 boys; 56.8% females: 960 adults and 144 girls).

### Discussion

Population-based studies are required to assess the magnitude of eye problems and the allocation of available resources. Because most cases of blindness and visual impairment occur in older adults, rapid methods recruit people 40 years of age and older.[17] Classical epidemiological studies are valuable despite requiring a larger sample, longer time frame, and additional resources as these provide superior epidemiological data. However, precisely for these reasons, classical studies are difficult to repeat. A hybrid model can use the fixed facility (ies) for the initial and repeat evaluation of people. We used this model for door-to-door screening and fixed facility of VC to assess the magnitude of visual impairment and blindness and measure the impact of eye care delivered through a VC over 4 years.

Our longitudinal eye health study of the urban low-income population in Pune (India) city showed that the prevalence of blindness and VI reduced over 4 years, blindness from 0.26% to 0.1%, and VI from 0.16% to 0.05%. Women continued to have a higher prevalence of blindness at both time points. The gender gap was narrowed after 4 years, but the difference persisted. Also, the average age of the population had increased by 4 years, but the prevalence had reduced. This was similar to results from other investigators the world over demonstrating that the females have less access to eye care.[18–21] We also...
observed that more women visited the VC. We attribute both phenomena—a greater number of people available for a repeat eye examination after 4 years and more females seeking eye care—to the nudging of people through the door-to-door survey and the existence of VC (served by predominantly female staff) in the vicinity that provided eye care throughout the year.

A rapid assessment of avoidable blindness had been done in urban Pune in 2016. This study examined 3221 individuals aged >50 years, with 80% in the lower-income group. The age- and sex-standardized prevalence of blindness was 1.3% (95% CI: 0.9–1.8). Cataract was the most common cause of blindness (45.7%), followed by overall posterior segment disorders (39.1%). The findings of the current study were similar. Additionally, diabetic retinopathy, which was not a significant cause of blindness in studies before 2005, was now observed in this study, similar to the results from two earlier studies in Maharashtra state (Pune and Sindhudurg).

Longitudinal population study (LPS) is the ideal scientific means of understanding the health outcomes vis-à-vis the interaction of social and environmental factors, utilization of health services in the community, and disease progression. However, these are expensive and need a long-term commitment.

| Table 2: Visual acuity of examined individuals in 2015-16 and 2018-19 (better eye) |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Parameters                      | <3/60           | 3/60-6/60       | 6/60-6/24       | >6/18           | Total           |
| All                             |                 |                 |                 |                 |                 |
| 2015                            | 118 (0.26%)     | 43 (0.1%)       | 579 (1.3%)      | 43795 (98.3%)   | 44535           |
| 2019                            | 72 (0.16%)      | 23 (0.05%)      | 460 (1.1%)      | 43153 (98.7%)   | 43708           |
| Male                            |                 |                 |                 |                 |                 |
| 2015                            | 51 (0.2%)       | 20 (0.1%)       | 237 (1.1%)      | 21880 (98.6%)   | 22188           |
| 2019                            | 32 (0.1%)       | 8 (0.0%)        | 176 (0.9%)      | 21559 (99.0%)   | 21775           |
| Female                          |                 |                 |                 |                 |                 |
| 2015                            | 67 (0.3%)       | 23 (0.1%)       | 342 (1.5%)      | 21915 (98.1%)   | 22347           |
| 2019                            | 40 (0.2%)       | 15 (0.0%)       | 281 (0.9%)      | 21597 (98.5)    | 21933           |
| Age                             |                 |                 |                 |                 |                 |
| <5                              |                 |                 |                 |                 |                 |
| 2015                            | 0 (0.0%)        | 0 (0.0%)        | 0 (0.0%)        | 3825 (100.0%)   | 3825            |
| 2019                            | 0 (0.0%)        | 0 (0.0%)        | 0 (0.0%)        | 792 (100%)      | 792             |
| 6-18                            |                 |                 |                 |                 |                 |
| 2015                            | 1 (0.0%)        | 0 (0.0%)        | 6 (0.1%)        | 10480 (99.9%)   | 10487           |
| 2019                            | 0 (0.0%)        | 0 (0.0%)        | 2 (0.02%)       | 9728 (99.9%)    | 9730            |
| 19-30                           |                 |                 |                 |                 |                 |
| 2015                            | 7 (0.1%)        | 1 (0.0%)        | 17 (0.1%)       | 11879 (99.8%)   | 11904           |
| 2019                            | 5 (0.04%)       | 0 (0.0%)        | 15 (0.1%)       | 11204 (99.8%)   | 11224           |
| 31-50                           |                 |                 |                 |                 |                 |
| 2015                            | 13 (0.1%)       | 4 (0.0%)        | 120 (1.0%)      | 12415 (98.9)    | 12552           |
| 2019                            | 6 (0.04%)       | 3 (0.02%)       | 47 (0.3%)       | 14288 (99.6%)   | 14284           |
| 51-70                           |                 |                 |                 |                 |                 |
| 2015                            | 38 (0.8%)       | 27 (0.6%)       | 313 (6.9%)      | 4186 (91.7%)    | 4564            |
| 2019                            | 26 (0.4%)       | 13 (0.2%)       | 286 (4.5%)      | 6095 (94.9%)    | 6420            |
| >70                             |                 |                 |                 |                 |                 |
| 2015                            | 59 (5.0%)       | 11 (0.9%)       | 123 (10.5)      | 979 (83.5%)      | 1172            |
| 2019                            | 35 (2.8%)       | 7 (0.6%)        | 107 (8.5%)      | 1106 (88.1%)    | 1255            |
| Age missing                     |                 |                 |                 |                 |                 |
| 2015                            | 0               | 0               | 0               | 31 (100%)       | 31              |
| 2019                            | 0               | 0               | 3               | 0               | 3               |
| Head of Family                  |                 |                 |                 |                 |                 |
| 2015                            | 51 (1.3%)       | 12 (0.3%)       | 151 (3.8%)      | 3796 (94.7%)    | 4010            |
| 2019                            | 40 (1.1%)       | 8 (0.2%)        | 116 (3.0%)      | 3643 (95.7%)    | 3807            |
| Other Members                   |                 |                 |                 |                 |                 |
| 2015                            | 67 (0.2%)       | 31 (0.1%)       | 428 (1.1%)      | 39999 (98.7%)   | 40525           |
| 2019                            | 32 (0.1%)       | 15 (0.0%)       | 341 (0.9%)      | 39513 (99.0)    | 39901           |
longest LPS is the Andhra Pradesh Eye Disease Study (APEDS III). This group has reported longitudinal visual impairment data over the course of 15 years in the rural population. In the APEDS III, 69% of the original rural cohort was re-examined. In APEDS III, the crude incidence rate of any visual loss based on PVA and BCVA (best-corrected visual acuity) was 14.6 (95% CI: 13.6–15.7) and 6.3 (95% CI: 6.1–6.4) per 100 person-years, respectively. Significant independent risk factors for the incident visual loss were increasing age, female gender, illiteracy, past or current smoker, and current harmful alcohol use. The report attributed the high incidence of visual impairment to poor access to eye care, increasing age, and female gender. These factors were associated with higher visual impairment in this study too. The current study in Pune slums/low-income populace overcomes some of these barriers because of the proximal presence of the VC and round-year-available eye care. The benefits of the delivery of primary eye care in India through VCs have been reported. It offers affordable and appropriate eye care closer to people’s residences, and it allows community participation. High prevalence of refractive errors and other ocular comorbidities have been reported in urban slum studies in India and other South Asia countries. These can be easily addressed by VCs. A study across four countries—Kenya, Egypt, Bangladesh, and India—showed

Table 3: Visual acuity of examined individuals in 2015-16 and 2018-19 (as per worse eye)

| Parameters | <3/60 | 3/60-6/60 | 6/60-6/24 | ≥6/18 | Total |
|------------|-------|-----------|-----------|-------|-------|
| All 2015   | 322 (0.72%) | 47 (0.1%) | 744 (1.7%) | 43,421 (97.5%) | 44,534 |
| 2019       | 195 (0.44%) | 31 (0.07%) | 651 (1.49%) | 42,831 (97.99%) | 43,708 |
| P          | <0.001 |
| Male 2015  | 130 (0.6%) | 187 (0.8%) | 138 (0.6%) | 21,732 (97.9%) | 22,187 |
| 2019       | 74 (0.3%) | 13 (0.1%)  | 256 (1.2%) | 21,431 (98.4%) | 21,774 |
| Female 2015| 192 (0.9%) | 262 (1.1%) | 204 (0.9%) | 21,689 (97%) | 22,347 |
| 2019       | 121 (0.6%) | 18 (0.1%)  | 392 (1.8%) | 21,403 (97.6%) | 21,934 |
| Age <5 2015| 0 (0.0%) | 0 (0.0%)  | 0 (0.0%)  | 3825 (100%) | 3825  |
| 2019       | 0 (0.0%) | 0 (0.0%)  | 0 (0.0%)  | 792 (100%) | 792   |
| 6-18 2015  | 3 (0.0%) | 3 (0.0%)  | 4 (0.0%)  | 10,477 (99.9%) | 10,487 |
| 2019       | 5 (0.05%) | 0 (0.0%)  | 3 (0.1%)  | 9725 (99.9%) | 9728  |
| 19-30 2015 | 8 (0.1%) | 9 (0.1%)  | 9 (0.1%)  | 11,878 (99.8%) | 11,904 |
| 2019       | 5 (0.04%) | 0 (0.0%)  | 15 (0.1%) | 11,204 (99.8%) | 11,224 |
| 31-50 2015 | 32 (0.3%) | 94 (0.7%) | 96 (0.8%) | 12,330 (98.2%) | 12,552 |
| 2019       | 10 (0.2%) | 6 (0.1%)  | 82 (0.6%) | 14,187 (99.3%) | 14,285 |
| 51-70 2015 | 165 (3.6%) | 245 (5.4%) | 187 (4.1%) | 3967 (86.9%) | 4564  |
| 2019       | 109 (1.7%) | 16 (0.2%) | 424 (6.6%) | 5871 (91.4%) | 6420  |
| >70 2015   | 114 (9.7%) | 98 (8.4%) | 46 (3.9%) | 913 (78%) | 1171  |
| 2019       | 69 (5.5%) | 9 (0.8%)  | 124 (9.9%) | 1052 (83.9%) | 1254  |
| Age missing 2015 | 0 | 0 | 0 | 31 (100%) | 31  |
| 2019       | 0 | 0 | 3 | 0 | 3  |
| Head of Family 2015 | 113 (2.8%) | 120 (2.9%) | 93 (2.3%) | 3683 (91.8%) | 4009 |
| 2019       | 77 (2.0%) | 6 (0.2%)  | 175 (4.6%) | 3548 (93.2%) | 3806 |
| Other Members 2015 | 209 (0.5%) | 329 (0.8%) | 249 (0.61%) | 39,738 (98%) | 40,525 |
| 2019       | 118 (0.3%) | 25 (0.1%) | 473 (1.2%) | 39,286 (98.5%) | 39,902 |

There was a significant difference between 2015 and 2019 for the worse eye data (P<0.0001) and the change in males, females, age 51-70 and >70 years by the Wilcoxon signed-rank test.
that health-seeking behavior was better in urban slums than rural areas, but the morbidity of eye disease was higher in the urban areas. VCs embedded in the primary health centers can address this problem.\textsuperscript{[2,3]} The VC has the potential to alert people to several chronic health conditions such as diabetes and hypertension and the importance of basic health care such as mother and child care, immunization, and nutrition.\textsuperscript{[3,31]}

Limitations of this study: We did not measure inter-observer agreement in vision recording. The illumination may have varied in the homes, verandas, and streets, even if the distance was ensured with a string or tape. We did not measure the quantum of illumination.

Strengths of this study: This study documents prevalence by examining each resident individual in the community, not just a representative sample. In our model, the eye care access point referred to as the VC (primary eye care facility) was in the vicinity (2 km from the screening site). It also enabled us to perform a comprehensive eye examination at both time points. The current LPS was of 4.5 years’ duration (January 2015–June 2019). The novelty of this study lies in the combination of the door-to-door survey with a comprehensive eye examination in a fixed facility. A comprehensive examination allowed us to collect non-cataract causes of blindness and visual impairment and in all age groups, not usually collected in rapid surveys. Availability and service provided by the ophthalmologist, in addition to a shorter interval of 4.5 years, ensured a better return examination, allowing the collection of data from 98.1% of the original cohort.

Conclusion

The recently published World Report on Vision (WRV) has advocated IPEC to provide people affordable, appropriate, and continuous eye care.\textsuperscript{[10]} Our model of combining screening and care with eye disease survey and longitudinal surveillance add advantage to IPEC. The proximity of the VC provides incentives for people to return for examination and removes the gender and age barriers for accessing eye care. We anticipate that future epidemiological studies might use this model for service delivery and eye disease prevalence studies.

Acknowledgments

Operation Eyesight Universal for their technical assistance and help in planning and execution of the hospital-based control of blindness project. Dr. Vivek Patwardhan, Cardiologist and Researcher, Jehangir Hospital, Pune for helping plan data collection and analysis. Medical social worker Ragni Salgude, optometrists Anuja Patil, Dimple Khandwe, Maqbool Inamdar, Shaliresh Wagh, health care workers Sunita Gaikwad, Archana Bhavsar, Jyoti Bhandwalkar, Shabana Shaikh, and Parveen Shaikh for data collection; and Rani Mhaske, Ameya Bhandwalkar, and Muskan Shaikh for data entry. Dr. Harish Kumar, Yashwant Sinha, Melissa Crocker, and Dr. Boateng Wiafe of Operation Eyesight Universal in helping write the manuscript.

Financial support and sponsorship

Community Eye Care Foundation, Pune.

Conflicts of interest

There are no conflicts of interest.

References

1. Agarwal LP. National programme for prevention of visual impairment and control of blindness. Indian J Ophthalmol. 1978;25:1–5.
2. Murthy GVS, Gupta SK, Neena J. Current estimates of blindness in India. Br J Ophthalmol 2005;89:257–60.
3. Neena J, Rachel J, Praveen V, Murthy GV. Rapid assessment of avoidable blindness in India. Br J Ophthalmol 2005;89:257–60.
4. Agarwal A, Prasad J, Singh S. Rapid assessment of avoidable blindness in India. Br J Ophthalmol 2005;89:257–60.
5. Neena, Rachel J, Praveen V, Murthy GV. Rapid assessment of avoidable blindness in India. Br J Ophthalmol 2005;89:257–60.
6. Murthy GVS, Gupta SK, Neena J. Current estimates of blindness in India. Br J Ophthalmol 2005;89:257–60.
7. National Programme for Control of Blindness & Visual Impairment. Directorate General of Health Services, Ministry of Health & Family Welfare. National Blindness, and Visual Impairment Survey. Available from: http://www.npcbvi.gov.in.
8. Global Burden of Disease 2019 Blindness and Visual Impairment Collaborators; Vision Loss Group of the Global Burden of Disease Study. Causes of blindness and vision impairment in 2020 and trends over 30 years, and prevalence of avoidable blindness in relation to VISION 2020: The Right to Sight: An analysis for the Global Burden of Disease Study. Lancet Global Health 2021;9:e144–60.
9. Rao GN. An infrastructure model for the implementation of VISION 2020: The right to sight. Can J Ophthalmol 2004;39:589-90.
10. Namerperumalsamy P. Maintaining quality in community eye
8. Badrinath SS, Narayanan A, Hussaindeen JR, Surendran TS. The Sankara Nethralaya Community model: Technology and evidence based comprehensive quality eye care equally to all. Indian J Ophthalmol 2020;68:285-7.
9. Jain BK, Jain E, Kuyyadiyil S, Sen A, Sood D, Bajaj A. High volume and high quality eye care: Bridging the paradox. A unique rural based approach – The Chitrakoot model. Indian J Ophthalmol 2020;68:294-8.
10. World Health Organisation. World Report on Vision. Available from: https://www.who.int. [Last accessed on 2021 Jun 12].
11. Khanna RC, Sabherwal S, Sil A, Gowth M, Dole K, Kuyyadiyil S, et al. Primary eye care in India- the Vision centre model. Indian J Ophthalmol 2020;68:333-9.
12. Kovai V, Rao GN, Holden B, Krishnaiah S, Bhattacharya SK, Marmamulla S, et al. An estimate of patient costs and benefits of the new primary eye care model utilization through vision centers in Andhra Pradesh, India. Asia Pac J Public Health 2010;22:426-35.
13. Kovai V, Rao GN, Holden B, Sannapaneni K, Bhattacharya SK, Khanna R. Comparison of patient satisfaction with services of vision centers in rural areas of Andhra Pradesh, India. Indian J Ophthalmol 2010;58:407-13.
14. Das T, Keeffe J, Sivaprasad S, Rao GN. Capacity building for universal eye health coverage in South East Asia beyond 2020. Eye 2020;34:1262-70.
15. Kuper H, Polack S, Limburt H. Rapid assessment of avoidable blindness. Community Eye Health 2006;19:68-9.
16. Vashist P, Senjam SS, Gupta V, Gupta N, Kumar A. Definition of blindness under National Programme for Control of Blindness: Do we need to revise it? Indian J Ophthalmol 2017;65:92-6.
17. Marmamula S, Keeffe JE, Rao GN. Rapid assessment methods in eye care: An overview. Indian J Ophthalmol 2012;60:416-22.
18. Leilwan S, Courtright P. Gender and use of cataract surgical services in developing countries. Bull World Health Organ 2002;80:300-3.
19. Ramke J. Measuring inequality in eye care: The first step towards change. Community Eye Health 2016;29:6-7.
20. Ye Q, Chen Y, Yan W, Wang W, Zhong J, Tang C, et al. Female gender remains a significant barrier to access cataract surgery in South Asia: A systematic review and meta-analysis. J Ophthalmol 2020;2020:2091462.
21. Prasad M, Malhotra S, Kalaivani M, Vashist P, Gupta SK. Gender difference in blindness, cataract blindness and cataract surgical coverage in India: A systematic review and meta-analysis. Br J Ophthalmol 2020;104:220-4.
22. Kulkarni SR, Kondalkar S, Mactaggart, Shammanna BR, Lodhi A, Mendke R, et al. Generating evidence for planning eye care service delivery in an urban underprivileged population setting in Pune, Western India. BMJ Open Ophthalmol 2019;4:e000202.
23. Patil SA, Gogate P, Vora S, Ainamepure S, Hingane RN, Kulkarni AN, et al. Prevalence and causes of blindness and cataract surgical services in Sindhudurg district on west coast of India. Indian J Ophthalmol 2014;62:240-5.
24. Longitudinal Population Studies Strategy- Wellcome. Available from: http://www.wellcome.org/sites>default>files longitudinal. [Last accessed on 2021 Jun 02].
25. Khanna RC, Pendri P, Mettia AL, Giridhar P, Banerjee S, Shekhar K, et al. Incidence, incident causes, and risk factors: visual impairment and blindness in a rural population in India: 15-year follow-up of the Andhra Pradesh Eye Disease Study. Am J Ophthalmol 2021;223:322-32.
26. Sutradian I, Gayen P, Hasan M, Gupta RD, Roy T, Sarker M. Eye diseases: The neglected health condition among urban slum population of Dhaka, Bangladesh. BMC Ophthalmol 2019;19:38.
27. Misra V, Vashist P, Singh SS, Malhotra S, Gupta V, Dwivedi SN, et al. Awareness and eye health-seeking practices for cataract among urban slum population of Delhi. Indian J Ophthalmol 2017;65:1483-8.
28. Mberu BU, Haregu TN, Kyobutungi C, Ezeh AC. Health and health-related indicators in slum, rural, and urban communities: A comparative analysis. Glob Health Action 2016;9:33163.
29. Pregel A, Vaughan GT, Jolley E, Buttan S, Bhambal A. Ensuring universal access to eye health in urban slums in the Global South: The Case of Bhopal (India). Stud Health Technol Inform 2016;229:302-13.
30. Rao GN, Khanna RC, Athota SM, Rajeshkar V, Rani PK. Integrated model of primary and secondary eye care for underserved rural areas: The L V Prasad Eye Institute experience. Indian J Ophthalmol 2012;60:396-400.
31. Khanna R, Raman U, Rao GN. Blindness and poverty in India: The way forward. Clin Exp Optom 2007;90:406-14.