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Prevalence and causes of visual impairment amongst older adults in a rural area of North India: a cross-sectional study

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ABSTRACT

Objectives To determine the prevalence, causes and associated factors for visual impairment (VI) in rural population of Jhajjar district, Haryana, north India.

Methods A community-based, cross-sectional study was conducted in two blocks of Jhajjar district. A total of 34 villages were selected using probability proportionate to size sampling method. Adults aged 50 years and above were selected using compact segment cluster sampling approach. Presenting visual acuity using LogMAR E chart was measured along with collection of other demographic details as part of the house-to-house survey. Subjective refraction and torch light examination were performed at a clinic site within the village to ascertain VI and its cause. VI was considered when presenting visual acuity was less than 6/18 in the better eye. Common causes of VI viz uncorrected refractive errors, cataract, central corneal opacity and others were noted by optometrists. Descriptive analysis was undertaken. Multivariate logistic regression analysis was performed for determining associated factors with VI.

Results Out of 2025 enumerated adults, 1690 (83.5%) were examined at the household level and 1575 (78%) completed all study procedures. The prevalence of VI was found to be 24.5% (95% CI 21.1 to 26.3) and blindness was 5% (95% CI 3.9 to 6.1). The most common causes of VI were uncorrected refractive errors (50%) and cataract (37%). The VI in study participants was found to be associated with age, gender, marital and educational status.

Conclusions VI is still a public health problem in rural population of Jhajjar district, Haryana. Provision of spectacles and cataract surgical services are simple interventions to address this issue.

Strengths and limitations of this study

- ► It is a community-based study using rapid survey procedures.
- ► It is the first assessment for visual impairment in Jhajjar district, Haryana within north India and generates evidence for programmatic action.
- ► There might be underestimation of posterior segment pathologies as their diagnosis is difficult to ascertain in an undilated pupil.
- ► This study is done in a rural population, thus results might not be generalisable to urban settings.

INTRODUCTION

Eye diseases, vision loss and resulting disability remain major public health concerns.[1] It has been estimated that, globally, 253 million people are visually impaired, out of which 36 million are blind and 217 million have moderate to severe visual impairment (VI).[2] Though there has been a decline noted in prevalence of blindness over recent times, blindness has actually increased in absolute terms owing to increase in numbers of older people with rise in life expectancy.[2] Much of this global burden is distributed unevenly and some regions have higher burden compared with others. The south Asia (that includes India) region contributes maximum to global blindness and moderate or severe VI burden. It is estimated that south Asia has 12 million blind people and 61 million people with moderate or severe VI.[2] The age standardised prevalence of moderate or severe VI in South Asia is three times higher than high-income regions.[2] Much of the load of blindness (80%) has been attributed to avoidable causes that can be either prevented or corrected easily.[1] The maximum VI is seen in older adult population that is after 50 years of age—86% of those blind and 80% of those with moderate or severe VI are older than 50 years.[2] The global eye health action plan 2014–2019, endorsed by the 66th World Health Assembly, charted out broad eye health programmatic components. A vital target was set to achieve reduction in prevalence of avoidable VI by one-quarter until 2019 against baseline values in year 2010. One of the key objectives included under this plan was to undertake epidemiological surveys on

VI at regular intervals nationally and subnationally, so as to generate evidence about magnitude and causes of VI.[3]

According to recent global estimates, India records one of the highest prevalence of VI. The age-standardised prevalence of blindness and moderate or severe VI in India is 4% and 17%, respectively, among adults aged 50 and more.[2] The last nationwide blindness assessment undertaken in India was published way back in 2008.[4] Though there has been recent increase in epidemiological research on VI, these studies are largely done in southern part of India. There is a need to generate population-level evidence on VI in northern states of India for efficient planning of eye care services, where studies in this context are lacking especially from rural parts. Against this background, the current study was done to determine prevalence and causes of VI in older adults in a rural area of north India. We also report here the common associated factors with VI in the study population.

MATERIALS AND METHODS

This was a community-based cross-sectional survey.

Study setting

The study was conducted in Jhajjar district of north India. The Jhajjar district is one of the 21 districts of the state of Haryana, situated at 65 km distance from the National Capital Territory of Delhi. The total population of the district was 958 405 as per census 2011.[5] The district comprised predominantly rural population (75%) with sex ratio highly skewed towards men (862 women per 1000 men). The study was done in two of the five blocks, namely Bahadurgarh and Jhajjar, selected randomly from all the five blocks. Rural population was only considered within these blocks for the purpose of this study as rural areas are reported to have more burden of VI than urban counterparts.[4] A list of villages in these blocks was prepared and villages were arranged according to the increasing size of population. Selection of villages was done based on 'Probability Proportional to Size' sampling method giving weightage according to population size. Thirty-four villages were selected in these two blocks using this strategy. Each village was considered as a cluster and compact cluster sampling strategy was employed for selection of households within each cluster. Each selected village was broken down to compact segments of 400–600 population. One compact segment was selected randomly using concealed envelopes and all adults in the target age more than or equal to 50 years were enumerated. It was ensured that a minimum of 45–50 participants in the target age group were enumerated in each selected segment for examination. The data were collected during January to May 2014.

Sample size

We assumed prevalence of VI in adults more than 50 years as 18.5%.[6] This was the most recent estimate available from northern India. With relative precision of 15%, design effect of 1.5 to account for cluster design and 25% non-response, 1469 participants were required in this current study to meet the objective of determining prevalence of VI.

Ethics statement

The study procedures conformed to the principles laid out by Declaration of Helsinki. The local consent was taken from the village leaders for participation at the cluster level. Participants were explained about study aspects through participant information sheets designed in local language. Sequentially, written informed consent was obtained from head of household for all participants within the household that were enrolled in this study. All participants detected with VI were referred to the ophthalmic outpatient department at All India Institute of Medical Sciences, Jhajjar complex.

Examination teams

Two study teams were engaged in data collection and examination. Each team comprised of one optometrist, social worker (SW) and health assistant (HA). The personnel selected for this epidemiological research work were rendering primary eye care in the vision clinics for more than 2 years including vision examination by LogMAR charts. The optometrists were degree/diploma holders in optometry. The teams were sensitised and trained in all procedures related to data collection and examination. A 3-day training including field practice session was conducted for all study personnel by the epidemiologist and ophthalmologist and included components of enumeration of participants and eliciting relevant details as per data collection instruments, vision examination and detailed work-up for visually impaired persons for ascertaining the cause. The interobserver correlation (Kappa) coefficient was found to be 0.7–0.8 for same level of observers.

At first level, house-to-house visit was done by the SW and HA. The SW took written informed consent from head of households and explained all study procedures to all study participants, and built adequate rapport and coordinated referral of participants for detailed eye work-up by optometrists. Demographic details, ocular disease history (past cataract surgeries and spectacle use) and presenting distance visual acuity were measured for eligible study participants by the HA with the help of the SW. The presenting visual acuity was measured using screening chart corresponding to five 'E' 6/12 optotypes. Correct identification of four letters out of five was considered as pass criteria. The visual acuity measurement was done at a distance of 4 m, outdoors and under the shade on bright and sunny days. Adequate care was given to avoid reflections and glare on the vision placard. Presenting visual acuity was considered as vision with spectacles if using spectacles for distance vision. All participants with presenting visual acuity <6/12 in either eye; adults using spectacles and those with previous cataract surgery were referred to a temporary makeshift clinic

within a village building where optometrists performed detailed eye assessment. The optometrists repeated the visual acuity assessment using retro-illuminated conventional logMAR tumbling E charts and performed the torch light examination and non-cycloplegic refraction. Lens was assessed using torch light. A pupil that clearly appeared grey or white when examined with oblique light was noted as obvious lens opacity and cataract.[7] Common causes of VI viz uncorrected refractive errors, cataract, central corneal opacity and 'others' were documented by optometrists.

Quality assurance and standardisation of all study procedures and equipment were done throughout the conduct of this study to minimise errors during the data collection. Pilot testing of all procedures was done in one of the villages that were not part of the study clusters. The study investigating team, including the epidemiologist and ophthalmologist, supervised all data collection and examination procedures. The epidemiologist was responsible for finalisation of study compact segment within each cluster village and finalisation of central location for clinical examination to maximise access for all participants. Visitors to households and those people outside the selected compact segment were not included in the study procedures to minimise bias. Random checks to households were done to examine the information collected from household members and their visual status. The ophthalmologist also examined randomly eyes of visually impaired persons to cross-check findings of optometrists. Ten per cent of all participants' forms and recorded vision findings were rechecked within the study cluster by the epidemiologist and ophthalmologist, including those that were detected with normal visual acuity at the initial time of screening at household level.

Operational definitions

Various terms used were defined as below:

- Older adults: Participants >50 years of age.[2]
- Below poverty line (BPL): Was considered for an adult when monthly income was less than US$4.6 (INR 300), and was confirmed by the presence of BPL ration card by the family.[8]
- VI: This was defined as per definitions suggested by WHO.[9] VI was considered in this study when presenting visual acuity was less than 6/18 in the better eye. It included moderate VI, severe VI and blindness. Moderate VI was defined as presenting visual acuity <6/18 and >6/60 in the better eye. Severe VI was defined as presenting visual acuity <6/60 and >3/60 in the better eye.
- Blindness: Was defined as presenting visual acuity <3/60 in the better eye.
- Unilateral VI: Presenting visual acuity worse than 6/18 in one eye but better than or equal to 6/18 in other eye. Those with bilateral VI were not considered.[10]
- Unilateral blindness: Presenting visual acuity worse than 3/60 in one eye but better than or equal to 6/18 in other eye. Those with bilateral VI were not considered.[10]
- Uncorrected refractive error: When the presenting visual acuity was less than 6/18 but improved to 6/18 or better with refraction.
- Cataract: Opacity of the crystalline lens in the pupillary area, as seen with torchlight.
- Central corneal opacity: Easily visible corneal opacity present over the pupil.
- Other causes of VI: All causes other than mentioned above were included in this category.

For ascertaining cause of VI, first, the cause was recorded for each eye separately and then for the person. In a possible scenario of two causes for VI present for each eye, one that was more avoidable that is either preventable or treatable was recorded. For uncorrected refractive error and untreated cataract present in the same person, uncorrected refractive error was recorded as principle cause for VI. This is as per suggested methodology of WHO for surveys on blindness and VI.[11]

Data management and analysis

Data entry was performed using Microsoft Access based database with inbuilt consistency and validation checks. Statistical analysis was carried out using Stata V.12.0 (Stata Corp., College Station, Texas, USA). Data were presented as numbers and percentages. Prevalence estimates were computed and presented along with 95% CI. These have been adjusted for cluster design. Multivariate logistic regression analysis was performed for determining associated factors using survey analysis (*svy:logit* command) to account for cluster design and confounding. The results were presented as OR and 95% CI.

RESULTS

A total of 2025 persons aged >50 years were enumerated in 34 study clusters of rural Jhajjar. Out of these, 1690 (83.5%) were examined at household level, 146 participants were found to be have been presenting visual acuity >6/12 in both eyes and 1544 participants were referred for further evaluation due to any of the referral reasons— visual acuity <6/12 in any eye, spectacle use or history of cataract surgery. Out of the referred participants, 1429 participants reached the temporary clinic and were being examined again. Thus, a total of 1575 participants (including 146 with normal presenting visual acuity at the household level) have been included in the present study to estimate the prevalence of VI. The sociodemographic characteristics of the enumerated and examined participants are shown in table 1. The mean age (SD) of the examined persons was 62.9 (9.7) years, and was similar for both men (63.1 (9.9)years) and women (62.9 (9.5) years). Out of all the examined persons, 817 (52%) were illiterate, 1085 (69%) were engaged in house work and 1156 (73%) were married.

Table 1 Sociodemographic characteristics

Variable	Enumerated adults n=2025 (%)	Examined adults n=1575 (%)
Age (years)		
50–59	771 (38)	584 (37)
60–69	745 (37)	584 (37)
≥70	509 (25)	407 (26)
Gender		
Men	973 (48)	678 (43)
Women	1052 (52)	897 (57)
Marriage		
Married	1511 (75)	1156 (73)
Single (unmarried/widower)	514 (25)	419 (27)
Occupation		
Housework	1305 (64)	1085 (69)
Labour—agricultural/non-agricultural	326 (16)	218 (14)
Office/skilled work	166 (8)	99 (6)
Unemployed/retired	228 (12)	173 (11)
Education		
Illiterate	1017 (50)	817 (52)
Primary (up to fifth class)	272 (13)	221 (14)
Secondary (up to 10thclass)	600 (30)	452 (29)
Senior secondary and above	136 (7)	85 (5)
Poverty line (PL)		
Above PL	1668 (82)	1294 (82)
Below PL	357 (18)	281 (18)

Prevalence of VI and blindness

A total of 386 participants were found to be visually impaired yielding a prevalence of 24.5% (95% CI 21.1 to 26.3) as shown in table 2. The predominant category was moderate VI as seen in 277 individuals, with prevalence as 17.6% (95% CI 14.9 to 18.6). Blindness was found in 79 participants with prevalence of 5.0% (95% CI 3.9 to 6.1).

Table 2 Categories of visual impairment

	Presenting visual acuity	Number	Percentage	95% CI
Normal	≥6/18	1189	75.5	
Moderate visual impairment	<6/18–6/60	277	17.6	14.9 to 18.6
Severe visual impairment	<6/60–3/60	30	1.9	0.9 to 2.8
Blindness	<3/60	79	5.0	3.9 to 6.1

Causes of VI and blindness

On ascertaining causes among visually impaired adults, 50% were found to have uncorrected refractive errors and 37% had cataract (table 3). Cataract was the predominant cause contributing to severe VI (70%) and blindness (57%), respectively. The central corneal opacities resulted in 65% of VI and 19% of blindness. Other causes contributed to 13% of VI and 34% of blindness, respectively.

Factors associated with VI and blindness

On multivariable logistic regression analysis (table 4), VI was found to be associated with increasing age. Adults aged 60–69 years and more than or equal to 70 years had four times (adjusted OR (aOR) 3.7, 95% CI 2.7 to 5.3) and six times (aOR 6.1, 95% CI 4.3 to 8.6) significantly higher odds of VI than adults aged 50–59 years. Women compared with men were found to be positively associated with VI on bivariate analysis but, after adjusting for other factors on multivariable analysis, were found to be negatively associated (aOR 0.7, 95% CI 0.5 to 0.9). Single adults compared with married adults were found to have two times higher odds of VI (aOR 1.6, 95% CI 1.1 to 2.1). Education was also found to be significantly associated with VI; increasing level of education was found to be protective. Compared with illiterate adults, the odds of VI were lesser among those educated up to the primary level (aOR 0.6, 95% CI 0.5 to 0.8), secondary level (aOR 0.3, 95% CI 0.2 to 0.5) and senior secondary level (aOR 0.3, 95% CI 0.2 to 0.6).

Similar factors such as increasing age, marital status and educational levels were found to be associated significantly with blindness.

Unilateral VI: prevalence, causes and associated factors

Participants with bilateral VI (386) were excluded for this analysis and prevalence of unilateral VI was considered for the remaining 1189 participants. A total of 227 participants were identified with unilateral VI, with prevalence as 14.4% (95% CI 12.3 to 16.5). The most common cause was uncorrected refractive errors in 173 (76%), cataract in 28 (12%), central corneal opacity in 16 (7%), others in 10 (4%) adults, respectively. On multivariate logistic regression analysis (table 5), the odds of unilateral VI were found to be three times higher in adults aged 60–69 years (aOR 2.6, 95% CI 1.7 to 4.0) and six times higher in adults aged ≥70 years (aOR 5.2, 95% CI 3.4 to 8.1), respectively, compared with adults aged 50–59 years. The odds of unilateral VI were found to be 50% lesser in adults educated up to primary level compared with illiterate adults (aOR 0.5, 95% CI 0.3 to 0.9).

DISCUSSION

To best of our knowledge, this was the first population-level assessment of VI and blindness conducted within Jhajjar district of state Haryana. The prevalence

Table 3 Causes of visual impairment

Cause	Moderate visual impairment n (%)	Severe visual impairment n (%)	Blindness n (%)	Total n (%)
Uncorrected refractive errors	182 (65.7)	03 (10.0)	07 (8.9)	192 (49.7)
Cataract	77 (27.8)	21 (70.0)	45 (56.9)	143 (37.0)
Central corneal opacity	11 (4.0)	03 (10.0)	12 (15.2)	26 (6.7)
Others	07 (2.5)	03 (10.0)	15 (18.9)	25 (6.5)
Total	277	30	79	386

of VI in our study sample was found to be 24.5% (95% CI 21.1 to 26.3). This is almost similar to recent population-level estimates from southern states of India. The reported prevalence of VI in adults aged ≥50 years in a newly formed southern state of Telengana was 23.5% (95% CI 22.1 to 25.0).[12] The Andhra Pradesh Rapid Assessment of Visual Impairment study that included both rural and urban clusters estimated prevalence of VI as 23.1% (95% CI 21.8 to 24.5).[13] These studies followed almost similar methodology as ours especially in regard to ocular examination. In an urban setting of Delhi within north India, the prevalence of VI was reported slightly lower as 18.5% (95% CI 16.4 to 20.6).[6] Our study included all rural clusters and it has been reported earlier that the magnitude of VI is higher in rural areas than urban areas. The differences in rural and urban clusters might be ascribed to differences in accessibility and availability of eye care services and personnel. There has not been much progress in reduction of magnitude of VI as the nationwide study (16 districts, predominantly rural) published in 2008 that estimated VI as 25%.[4] The prevalence estimate for VI reported for other Asian countries is also variable and is reported lower than Indian estimates—Sri Lanka 6%,[14] China 13%,[15] Bangladesh 10%,[16] Malaysia 3%,[17] Indonesia 8%[18] and Nepal 19%.[19] The prevalence in these studies differed owing to variations in study location, methods used in visual assessment, sample size, access to eye care services and socioeconomic variations of the population studied.

In our study, 87% of VI was contributed by two causes—uncorrected refractive errors (50%) followed by cataract (37%). The most common cause for blindness (57%) and severe VI (70%) was cataract. This is consistent with other studies[6 12 13] where 80%–90% of VI is attributed to these two causes. Globally, majority of VI is contributed by uncorrected refractive errors followed by cataract.[1] Cataract and uncorrected refractive errors combined contributed to 55% of blindness and 77% of vision impairment in adults aged 50 years and older in 2015.[20] Also, globally in 2015, the leading causes of moderate or severe VI in those aged 50 years and older were uncorrected refractive errors (52%) followed by cataract (25%). Uncorrected

Table 4 Bivariate analysis and multivariate analysis for visual impairment

Variable	Participants n (1575)	Visual impairment (n) %	Unadjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value
Age (Years)						
50–59	584	46 (08)	1.0		1.0	
60–69	584	162 (28)	4.5 (3.2 to 6.3)	<0.001	3.8 (2.7 to 5.3)	<0.001
≥70	407	178 (44)	9.1 (6.6 to 12.6)	<0.001	6.1 (4.3 to 8.6)	<0.001
Gender						
Men	678	150 (22)	1.0		1.0	
Women	897	236 (26)	1.3 (1.0 to 1.6)	0.10	0.7 (0.5 to 0.9)	0.009
Marriage						
Married	1156	226 (20)	1.0		1.0	
Single (unmarried/widower)	419	160 (38)	2.5 (1.9 to 3.3)	<0.001	1.6 (1.1 to 2.1)	0.007
Education						
Illiterate	817	271 (33)	1.0		1.0	
Primary (up to fifth class)	221	46 (21)	0.5 (0.4 to 0.7)	<0.001	0.6 (0.5 to 0.8)	0.003
Secondary (up to 10th class)	452	59 (13)	0.3 (0.2 to 0.4)	<0.001	0.3 (02 to 0.5)	<0.001
Senior secondary and above	85	10 (12)	0.3 (0.1 to 0.5)	<0.001	0.3 (0.2 to 0.6)	0.001

Table 5 Bivariate analysis and multivariate analysis for unilateral visual impairment

Variable	Participants n (1189)*	Unilateral visual impairment (n) %	Unadjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value
Age (Years)						
50–59	538	47 (09)	1.0		1.0	
60–69	422	93 (22)	2.9 (1.9 to 4.4)	<0.001	2.6 (1.7 to 4.0)	<0.001
≥70	229	87 (38)	6.4 (4.4 to 9.3)	<0.001	5.2 (3.4, 8.1)	<0.001
Gender						
Men	528	86 (16)	1.0		1.0	
Women	661	141 (21)	1.4 (1.0 to 1.9)	0.09	1.0 (0.7 to 1.5)	0.89
Marriage						
Married	930	151 (16)	1.0		1.0	
Single (unmarried/widower)	259	76 (29)	2.1 (1.5 to 3.0)	0.04	1.4 (0.9 to 2.1)	0.12
Education						
Illiterate	546	139 (26)	1.0		1.0	
Primary (up to fifth class)	175	22 (13)	0.4 (0.3 to 0.6)	0.005	0.5 (0.3 to 0.9)	0.02
Secondary (up to 10th class)	393	58 (15)	0.5 (0.4 to 0.7)	0.06	0.7 (0.5 to 1.1)	0.16
Senior Secondary and above	75	08 (11)	0.3 (0.2 to 0.8)	0.08	0.5 (0.2 to 1.2)	0.11

*386 participants with bilateral visual impairment (VI) have been excluded for unilateral VI.

refractive errors contributed to a larger proportion of VI in South Asia (66%) than in other regions.[20]

Increasing age is one the the most common associated factor for VI.[16 21–23] In our study, elderly adults aged 70 years and above had the highest odds of VI compared with adults in the fifth decade. There have been variations in association of gender and VI in different studies depending on study location and sample studied. In our study, on multivariate analysis, women were found to have 30% lesser odds for VI than men. Similar finding has been reported from a south Indian study on VI that included marine fishing population as sample.[24] Contrastingly, some studies in Indian settings have reported no association with gender[13] or women to have higher risk for VI.[4 6 25] We found VI to be associated with single adults compared with married adults, possibly due to lack of support system and access to eye care services. VI in our study was found to be lower in those who had completed higher schooling levels. Previous studies have reported higher prevalence of VI among those who were not educated.[26–29] This could be due to higher visual need, demand and better awareness and accessibility for eye care services by more educated people in our sample as postulated in other study from Indian setting.[30]

To represent the complete burden of VI in our study population, we also computed the prevalence of unilateral VI. Our prevalence estimate of 14% was slightly higher than what had been reported earlier in Andhra Pradesh as 11.3% (95% CI 10.5 to 12.1). This study had included adults more than equal to 40 years from both rural and urban clusters.[10] The unilateral VI in our study was found to be associated with age, education and poverty status and consistency with other studies.[10 31 32] It is postulated that socioeconomic factors influence the health-seeking behaviour of individuals in terms of accessibility and affordability for eye care services. Also, VI can contribute to the individuals' and their families' socioeconomic status.[31] The persons with unilateral VI are also affected by poor quality of life[33–35] and correcting it has immense benefits.[36]

This study suffers from some limitations also. First, the cause ascertainment of VI, done by optometrists through torch light examination largely focused on anterior segment causes viz uncorrected refractive errors and cataract. The rapid assessment studies performed this way underestimate posterior segment pathologies as their diagnosis in an undilated pupil is difficult to ascertain. However, this would not affect the prevalence of VI in this population which was the primary objective for this study. Second, the reliability of the method for detection of uncorrected refractive errors, as adopted in this rapid assessment study, has not been ascertained especially in community settings. Again, this would not affect our overall prevalence of VI. Third, this study was done in only rural population; thus our results would not be generalisable to urban population. Fourth, the study would have been further strengthened if we would have estimated false positive and false negative rate of the initial vision screening at household level. However, we are reassured that the workers were well trained in recording vision and were cross-checked satisfactorily in 10% of participants.

Our study has programmatic implications. Extrapolating our high prevalence estimates for VI in rural population of 0.7 million size within Jhajjar district,

there were 27 034 visually impaired adults above the age group 50 years with uncorrected refractive errors and 12 580 visually impaired adults with cataract. These can easily be treated by cataract surgeries and provision of refractive services, including uptake of spectacles through integrated service delivery models for primary and secondary eye care.[37] Recently, the programme in Indian settings has been renamed and included VI, giving due importance to curb the burden related to VI.[38]

In conclusion, the prevalence of VI in rural Jhajjar was found to be high as 24% and blindness as 5% in adults aged 50 years and above. The most common causes of VI were uncorrected refractive errors and cataract. The prevalence of unilateral VI was 14%. Provision of spectacles and cataract surgical services are needed to tackle the unfinished agenda of VI in this population.

Contributors SM and PV conceived and designed the study with additional inputs from NG, SSS and SKG. SM, PV, NG and SSS supervised the overall conduct and data collection process for the study. MK and RR managed the data set and analysed it with additional inputs from SM, PV and SKG. SM wrote the initial draft of the manuscript. All authors contributed to the critique and modification of the manuscript, read and approved the final version.

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