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A cross-sectional study of visual impairment in elderly population in residential care in the South Indian state of Andhra Pradesh: a cross-sectional study

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ABSTRACT

Objective: To assess the prevalence and major causes of visual impairment (VI) in elderly residents of 'home for the aged' institutions in the Prakasam district in India.

Design: Cross-sectional study.

Setting: 'Home for the aged' institutions in the Prakasam district in the South Indian state of Andhra Pradesh.

Participants: All 524 residents in the 26 'homes for aged' institutions in the district were enumerated.

Primary and secondary outcome measures: Prevalence and causes of VI; visual acuity (VA) was assessed using a Snellen chart at a distance of 6 m. Pinhole VA was assessed if presenting VA was <6/18. Torchlight examination and direct ophthalmoscopy were performed. VI was defined as presenting VA <6/18 in the better eye.

Results: Of the 494 participants examined (response rate 94.3%), 78.1% were women, 72.1% had no formal schooling. The mean age of participants was 70 years (SD ±8.6 years). VI was present in 280/494 individuals (56.9%; 95% CI 52.3 to 61.3). Over 80% of the VI was due to avoidable causes including cataract (57.1%) and uncorrected refractive errors (26.4%). Among 134 individuals who had undergone bilateral cataract surgery, only 78 (58.2%) individuals had presenting VA ≥6/18 and 13/134 (9.7%) participants were blind.

Conclusions: There is high prevalence of VI in the institutionalised elderly population in the Prakasam district in India. A significant proportion of this elderly population with VI can benefit from spectacles and cataract surgery. Strategies are required to provide high-quality services to this population.

ARTICLE SUMMARY

Article focus

- To understand the prevalence and causes of visual impairment (VI) in institutionalised elderly population, especially avoidable VI so that effective strategies can be planned.
- This is the first paper describing the VI in this population from India.
- Understanding and addressing the problem of VI may lead to better quality of life and contribute 'healthy aging' in this vulnerable population.

Key messages

- There is a very high prevalence of VI.
- Most of the VI can be addressed by cataract surgery and spectacles.
- Although the prevalence of cataract surgery is high, poor visual outcome following cataract surgery is a matter of concern.

Strengths and limitations of this study

- Covered all the institutions in the district with a good response rate.
- A validated eye examination protocol was used.
- Comprehensive eye examination was not performed and there is a possibility of overestimation of cataract.

INTRODUCTION

Visual impairment (VI) is a public health challenge affecting over 285 million people worldwide, including 39 million blind.[1] The research both from India and other parts of the world has revealed that VI increases with increasing age.[1 2] It is also estimated that people aged 50 years and older comprise 65% and 82% of the total visually impaired and blind, respectively.[1] Studies have also shown a higher prevalence of VI in elderly people living in nursing homes compared with those living in non-institutionalised settings.[3–5] Possible reasons for this include poor awareness by professional care givers 'of residents' visual function, visual status, need for spectacles or ocular disease or lack of referral.[5] Even if referral is done unless

measures are taken to facilitate the process, the uptake of services is reported to be low.[6] Furthermore, VI may lead to falls, in turn leading to fractures with adverse impact on the quality of life of the individuals.[7–11] It has been noted that correcting refractive error with single vision spectacles and the use of cataract surgery when required may be effective ways of preventing falls from a population perspective.[10]

India is witnessing a demographic transition with an increasing proportion of older individuals with increased life expectancy.[12] The social structure too is changing from joint families to nuclear families. Owing to these changes, there is a likelihood that the proportion of elderly people living in 'home for the aged' institutions may increase to proportions seen in developed countries today. In the context of the current study, the 'homes for the aged' institutions are those where elderly people enrol themselves or are enrolled by their kin owing to lack of financial resources or dedicated time to take care of the elderly in their own homes. Typically, these institutions are run by non-government organisations (NGOs) with partial support from government funds and donations from philanthropists. Some of the institutions are managed by private individuals with a monthly fee which is paid either by the elderly person or by their kin. Most of these institutions offer food and accommodation. Private institutions are well staffed with support staff (including nursing assistants and domestic help) helping the elderly in the daily routine tasks.

To our knowledge, there are no studies on VI which focus on the institutionalised elderly population in a rural setting in India. Understanding the prevalence and the causes of VI can help plan strategies to provide services and contribute towards 'healthy aging' in these populations.

METHODS

The study was undertaken in the Prakasam district in the South Indian state of Andhra Pradesh. The study covered all the 26 'home for the aged' institutions of the district. Of the 26 institutions, 17 of them are run by NGO with partial funding from the Government of Andhra Pradesh, India. The remaining institutes are run by private agencies. A list containing the addresses and details of the old-age institutions was obtained from Department of Health and Family Welfare, Government of Andhra Pradesh.

Using a prevalence estimate of 8% VI, power of 80%, 20% precision on either side of the prevalence estimate (6.4–9.6%), 95% confidence limits and 10% non-response, the sample size required was 345 individuals. As this study was a part of service delivery strategy, all the residents enrolled in 26 institutions were studied.

The study protocol was approved by the Institutional Review Board of L V Prasad Eye Institute in 2011. The study was conducted in accordance with the tenets of the Declaration of Helsinki. Data collection was accomplished between June and September 2011. All the institutions were visited and after explaining the study objectives and protocol, due approval was obtained from the respective head of the institution for inclusion in the study. Written informed consent was obtained from each study participant before starting the examination.

Data collection

A study team consisting of one ophthalmic officer and one field assistant was involved in data collection. The rapid assessment of visual impairment (RAVI) examination protocol was used for the study.[13] Data collected through an interview included the details pertaining to the participant's age, education and usage of spectacles. Any history of eye surgery in either eye such as place and cost of surgery was recorded.

Unaided visual acuity (VA) in each eye was measured using a Snellen 'E' chart at a distance of 6 m. The chart was fixed on the wall where sufficient natural light was available. Participants with VA <6/18 in either of the eyes were re-assessed using a multiple pinhole occluder. Aided VA was assessed if a participant reported the use of spectacles. Direct ophthalmoscopy through undilated pupils was performed to screen for the presence of cataract, other media opacities and posterior segment disease.

Study definitions

Indian definitions for blindness and moderate VI were used. VI was defined as presenting VA <6/18 in the better eye.[14] It encompasses both moderate VI (presenting VA <6/18 to 6/60 in the better eye) and blindness (presenting VA <6/60 in the better eye). Uncorrected refractive errors were defined as presenting VA <6/18, but improving to 6/18 or better with pinhole. Cataract was defined as an opacity of the crystalline lens in the pupillary area and causing VI (presenting VA <6/18 and not improving with pinhole). Posterior capsular opacification (PCO) was deemed to be present if there was a dull glow or no glow on direct ophthalmoscopy in the absence of corneal opacities among those operated for cataract.

In cases where there was more than one cause of VI, the cause which was more easily treatable or correctable to achieve a VA 6/18 or better was considered as the primary cause. For example, if an individual had cataract and uncorrected refractive error, the primary cause for VI was considered to be uncorrected refractive error. The causes of VI were evaluated separately for each eye and then for the person. All persons with presenting VA <6/18 in either eye and/or uncorrected presbyopia were referred to the nearest eye care facility for management. All such referred participants received a referral letter with details on the VA and probable diagnosis and visits to clinics were facilitated.

The data were entered in the database created in MS Access (Microsoft Office 2007). Data analysis was done

Table 1 Participant's characteristics and categories of visual impairment (n=494)

	Presenting VA ≥6/18 in the better eye n (%)	Presenting VA <6/18 to 6/60 in the better eye n (%)	Presenting VA <6/60 in the better eye n (%)	Total n (%)
Age groups (years)				
50–59	28 (13.1)	6 (3.4)	5 (4.8)	39 (7.9)
60–69	77 (36.0)	59 (33.5)	39 (37.5)	175 (35.4)
70–79	81 (37.9)	74 (42.0)	34 (32.7)	189 (38.3)
80 and above	28 (13.1)	37 (21.0)	26 (25.0)	91 (18.4)
Gender				
Male	47 (22.0)	34 (19.3)	27 (26.0)	108 (21.9)
Female	167 (78.0)	142 (80.7)	77 (74.0)	386 (78.1)
Total	214 (100)	176 (100)	104 (100)	494 (100)

VA, visual acuity.

using SPSS V.16.0 (SPSS Inc, Chicago, Illinois, USA). Point prevalence estimates and 95% CI were calculated. Continuous variables were compared using Student t test while categorical variables were analysed using χ^2 test. A p value of 0.05 was considered as significant. The χ^2 test was used to assess the association between VI and other categorical variables.

RESULTS

Of the 524 residents enumerated from 26 institutions for the elderly, 494 (94.3%) were available for examination. Fifteen residents had other morbidities (bed ridden owing to fractures, systemic illness and mentally unsound) and examination could not be conducted. Another 15 residents were not available during the visit. Among those examined, 78.1% were women and 72.1% had no formal schooling. The mean age of the participants was 70 years (SD=8.6 years; median=70 years). Nearly 92% of those examined were aged 60 years and older.

Prevalence and causes of visual impairment

The categories of VI and participants characteristics are presented in table 1. VI was present in 280/494 individuals (56.7%; 95% CI 52.3 to 61.1). This included 104/494 (21%; 95% CI 17.4 to 24.6) individuals with blindness and 176/494 (35.6%; 95% CI, 31.4 to 39.8) individuals with moderate VI, respectively (table 1). VI was found to be significantly association with age (p<0.01; χ^2 test) but not with gender (p=0.96). Using the WHO definition (presenting VA <3/60 in better eye), the prevalence of blindness was 20% (95% CI 16.5 to 23.5). Cataract accounted for most of the VI (57.1%) followed by uncorrected refractive errors (26.4%) and other conditions, including posterior segment disease (12.1%; table 2). The prevalence of VI based on presenting VA <6/12 in the better eye was 70.9% (95% CI 66.9 to 74.9).

Visual outcomes after cataract surgery

In total, 365 eyes of 231 individuals were found to have previously undergone cataract surgery at the time of assessment. Among these, 111 (30.4%) eyes had moderate VI and 89 (24.4%) eyes were blind even after cataract surgery. The majority were operated in private and non-governmental organisations at no cost. More than 78% of the operated eyes had intraocular lens implants. There was no association between place of surgery (p=0.25) and paying status (paid or free surgery; p=0.258). However, those with intraocular lens implants were found to have significantly better visual outcomes compared with those with aphakia (p<0.01; table 3).

Posterior segment pathology (52%) and refractive error (25%) were the leading causes of VI in the

Table 2 Causes of visual impairment (n=280)

	Presenting VA <6/18 to 6/60 in the better eye n (%)	Presenting VA <6/60 in the better eye n (%)	All visually impaired n (%)
Cataract	82 (46.6)	78 (75.0)	160 (57.1)
Refractive error	61 (34.7)	13 (12.5)	74 (26.4)
Posterior segment disease	26 (14.8)	8 (7.7)	34 (12.1)
Posterior capsular opacification	5 (2.8)	2 (1.9)	7 (2.5)
Other causes	2 (1.1)	3 (2.9)	5 (1.8)
Total	176 (100)	104 (100)	280 (100)

VA, visual acuity.

Table 3 Visual outcome after cataract surgery (eyes) with place and cost of surgery (n=365 eyes)

	Presenting VA ≥6/18 in the better eye n (%)	Presenting VA <6/18 to 6/60 in the better eye n (%)	Presenting VA <6/60 in the better eye n (%)	Total n (%)
Place of surgery				
Non-government hospitals*	113 (68.5)	71 (64.0)	57 (64.0)	241 (66.0)
Government hospital	21 (12.7)	23 (20.7)	20 (22.5)	64 (17.5)
Eye camp	31 (18.8)	17 (15.3)	12 (13.5)	60 (16.4)
Paying status				
Free	108 (65.5)	83 (74.8)	61 (68.5)	252 (69.0)
Paid	57 (34.5)	28 (25.2)	28 (31.5)	113 (31.0)
Lens status†				
Aphakia	21 (12.7)	20 (18.0)	36 (42.9)	77 (21.4)
Pseudophakia	144 (87.3)	91 (82.0)	48 (57.1)	283 (78.6)

*Included hospitals managed by non-government organisations that offer free cataract surgeries and private clinics.
†Five eyes where lens could not be examined were excluded from this analysis.
VA, visual acuity.

operated eyes (table 4). Among 134 individuals who had undergone bilateral cataract surgery, only 78 (58.2%) had presented VA 6/18 or better and 13/134 (9.7%) participants were blind. Posterior segment pathology (46.4%) and refractive error (41.1%) were the leading causes of VI among those who had bilateral cataract surgery (table 4).

DISCUSSION

We found a very high prevalence of VI in the institutionalised elderly population in Andhra Pradesh, India similar to other studies on elderly institutionalised population.[3 15–18] Consistent with other studies, we found cataract and uncorrected or inadequately corrected refractive errors are the leading causes of VI both of which are easily avoidable.[3 17–19]

The prevalence of VI using 6/12 definition ranged from as high as 57 to 15%.[3 4 18 20–25] Using the same definition we found a very high prevalence of VI (70.9%) in our study population. Our blindness prevalence estimates were also higher compared with those in other studies reporting from residential care (table 5). These differences could partly be explained by the difference in age distribution of the participants and other sociodemographic factors. Most of these studies were conducted in developed countries where the reasons for enrolment in the residential homes could be very different.[3 4 18 20–25] This is the first study to report on institutionalised elderly in India.

Table 4 Causes of visual impairment after cataract surgery (eyes and persons)

	Visual impairment (presenting visual acuity <6/18)	
Cause	Eyes, n (%)	Persons, n (%)
Posterior segment pathology	104 (52.0)	26 (46.4)
Refractive error	50 (25.0)	23 (41.1)
Posterior capsular opacity	37 (18.5)	7 (12.5)
Corneal opacity	9 (4.5)	0 (0.0)
	200 (100)	56 (100)

Although we had no control group from the general population, the reports from previous studies revealed a high prevalence of VI among residents in institutional care compared with their peers of similar age in community.[3 18 24 25] When compared with results from a previous population-based study conducted in the same state, the prevalence of VI and blindness were about 2.5 times higher than those found in the present study.[26] Only limited inferences can be made from comparison of these studies as the age groups and the study settings are different. Our findings re-emphasise the need for rigorous screening for VI coupled with provision of service among residents in institutional care on similar lines of school eye screening programmes in India.

Even after cataract surgery, several people had uncorrected refractive errors so a pair of spectacles can help a high proportion of the elderly people living in these institutions. We found a significant proportion of those operated for cataract had PCO causing VI. Posterior capsular opacification causing VI is also reported from earlier population-based studies.[27–29] Therefore, there is a need for follow-up of residents who undergo cataract surgery to assess their need for laser capsulotomy procedures to help these individuals regain their vision. Though earlier studies found better visual outcomes among those operated in private and non-governmental setting at no cost, no such differences were found in the current study.[26 30] This possibly could be attributed to the smaller sample and lack power to detect the true difference. However, the finding of better VA among pseudophakia compared with aphakia was consistent with other studies from the same state.[30 31]

The results of visual outcomes after cataract surgery reported in this study should not be used as a measure of the quality of services in the region. We reported cross-sectional data that included people operated at different time periods, including the transition from

Table 5 Representative studies on visual impairment in elderly

Author	Place/year	Sample size	Setting	Age group (years)*	Visual impairment (%)
Dev[20]	Nepal (2012)	385	Residential care	Mean=74	39% (<6/18)†; 20% (<6/60)†
Khanna[26]	Andhra Pradesh, India (2012)	2160	General population	≥50	13.6% (<6/18)†; 8% (<6/60)†
	Andhra Pradesh Eye Disease Study—subsample (1996–2000)	521	General population	≥50	40.3% (<6/18)†; 11% (<6/60)†
Sainz-Gomez[23]	Spain (2010)	392	Residential care	Mean=82	31.9% (≤6/18); 14.9% (≤6/60)
Lamoureux[21]	Australia (2009)	76	Residential care	Mean=83.9	46.4% (<6/12)†
Owsley[4]	The USA (2007)	380	Residential care	≥55	57% (<6/12)†; 10% (<6/60)†
VanNewkirk[25]	Australia (2000)	403	Residential care	Mean=82	41% (<6/18)‡; 22% (<6/60)‡
van der Pols[18]	Britain (2000)	1362	General population and Residential care	≥65	28.3% (<6/12)‡; 14.3% (<6/18)‡
Nottle[22]	Australia (2000)	646	Residential care	Mean=81	41% (<6/12)†
Mitchell[3]	Australia (1997)	128	Residential care	≥50	11% (<6/60)‡
Tielsch[24]	The USA (1995)	499	Residential care	≥40	15.2% (<6/12)‡; 17% (<6/60)‡

*Age either mean age or minimum age limit for enrollment is reported.
†On the basis of presenting visual acuity in the better eye.
‡On the basis of best corrected Visual acuity in the better eye.

intracapsular cataract extraction to extracapsular cataract extraction and then to small incision cataract surgery with intraocular implantations.

Our study had a few limitations. We used pinhole VA as a surrogate to define refractive errors. Use of direct ophthalmoscopy without pupillary dilatation may have lead to overestimation of cataract. It is possible that some of those with media opacities may have glaucoma, diabetic retinopathy and/or other posterior segment diseases like age-related macular degeneration. The impact of vision impairment was not assessed using patient-reported outcomes. Although it is ideal to have an ophthalmologist examine all the participants, we had an ophthalmic officer performing a complete eye examination as the protocol was simple and logistically more feasible.

Research with more robust protocols that include comprehensive examination are required to assess the causes of VI in future studies including impact of VI on visual function and its improvement following an intervention. Despite these limitations, the study has provided insights into VI in institutionalised elderly in a rural area of India for the first time. VI can be addressed in this population largely through the provision of spectacles and cataract surgery. The results also emphasise the importance of refraction and correction of refractive errors even after cataract surgery. These simple interventions can go a long way in helping these elderly individuals' lead healthier lives, lesser falls and accidents.

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Contributors SM and CSLVR contributed to the design and conduct of the study, data collection and management; SM, CSLVR and MYB were involved in analyses and interpretation of data; SM, MYB and RCK were involved in preparation of manuscript; and SM, MYB, CSLVR and RCK reviewed or approved the manuscript.

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Competing interests None.

Ethics approval Institutional Review Board of L V Prasad Eye Institute, India. The study adhered to the tenets of the Declaration of Helsinki.

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Correction

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The title of this article is incorrect and should be: 'A cross-sectional study of visual impairment in elderly population in residential care in the South Indian state of Andhra Pradesh.' We apologise for this error.

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