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Visual and hearing impairment among rural elderly of south India: A community-based study

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Aim: Of India's population, 76.6 million (7.2%) are aged above 60 years. Increasing age is associated with increasing disability and functional impairments such as low vision, loss of mobility and hearing impairment. Hence, the purpose of this paper is to study the prevalence of hearing and visual impairment among a rural elderly population in South India and its association with selected variables.

Methods: This was a cross-sectional study of elderly persons in two villages of Bangalore District, Karnataka, South India. Elderly persons identified were administered a questionnaire for assessment of demographic details, health and function related information. Visual acuity was checked using Snellen's E chart for distant vision. Hearing was assessed using pure tone audiometry.

Results: Two hundred and fifty-seven (12.2%) of the population were elderly in these two villages. Seventy-two (32.4%) of the elderly persons were facing problems completely or partially in at least one of the activities and 10 (4.5%) elderly persons had cognitive impairment. Sixty-two (35.4%) of the elderly had low vision and 22 (12.6%) were blind. On assessment with pure tone audiometry, 117 (66.9%) of the elderly persons had some degree of hearing impairment. Forty-three (24.6%) of the elderly had disabling hearing impairment. Forty-seven (26.9%) of the elderly had combined low vision associated with hearing impairment and 18 (10.2%) had combined blindness along with hearing impairment. As age advanced there was a significant increase in visual, hearing and combined impairments.

Conclusion: Visual and hearing impairment are important health problems among elderly persons in rural areas of South India. *Geriatr Gerontol Int* 2012; 12: 116–122.

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Introduction

We live in an aging world. India is a "graying" population as the mortality and fertility rates are on a decline.¹

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Of India's population, 76.6 million (7.2%) are aged above 60 years. According to the World Health Organization (WHO), India's aged population is the second largest in the world.²

Geriatric medical care differs from usual medical care in shifting the focus to preservation of function and improving the quality of life rather than treating and curing specific diseases.³ Increasing age is associated with increasing disability and functional impairments such as low vision, loss of mobility and hearing impairment. The highest onset of disability takes place in the age group of 60 years and above. Visual impairment is highest in this age group followed by hearing impairment which leads to increased functional impairments.⁴

The WHO estimates that 180 million persons worldwide have visual impairment.⁵ Eighty percent of visual impairment is considered avoidable. In various community-based studies among the elderly, the prevalence rate of low vision and cataract have been reported to range 18–88%.^{6,7} Ninety percent of blind people live in low-income countries, where older people often face barriers to health care.³ Effective interventions for these include corrective glasses and cataract extraction.

In 2005, the WHO estimated that approximately 278 million people had moderate to profound hearing impairment. Eighty percent of them live in low- and middle-income countries.⁸ While approximately one-quarter of the elderly complain of hearing problems, at least one-third have significant hearing impairment on audiological testing. Studies among hearing impaired elderly who received hearing aids have shown improved levels of social, emotional and cognitive functioning than compared with those who did not.⁹

The burden of hearing and visual impairment among older persons both globally and in India is high. Considering the fact that these two areas represent important aspects of functional ability in older persons, and the consequences of hearing and visual impairment reflect upon quality of life, there is a need to study these issues in greater detail.

Hence, a detailed assessment of prevalence and factors associated with hearing and visual impairment among elderly persons was done in two rural areas of South India which will help in the identification and rehabilitation of these elderly persons.

Methods

This was a cross-sectional study, carried out at two villages of Bangalore District, Karnataka, South India. An outreach clinic for the elderly is conducted in these villages once every month by the Senior Citizen Health service of St John's Medical College, Bangalore. All persons above the age of 60 years resident in these two villages were included in the study. Elderly persons not found at their places of residence even after three attempts to contact and moribund bedridden elderly were excluded from study.

A house-to-house survey was conducted to identify elderly persons. Informed consent was taken and a pretested questionnaire was administered by the interviewer to the subjects. Demographic details, educational status, living arrangements, occupation, financial dependence, habits, reported morbidity, health-care utilization and awareness about senior citizen services were collected. 'Standard of Living Index' was used to classify socioeconomic status of the families as low, middle and high socioeconomic class.¹⁰ Financial

dependence was assessed by asking whether the elderly person was financially dependent on family members, either partially or completely.

Activities of daily living (ADL) were measured using Bethel's ADL scale. Cognitive impairment was assessed using the Hindi Mini-Mental Status Examination (HMSE) scale, the Indian version of the Mini-Mental State Examination (MMSE), which is suitable for cognitive screening of the largely illiterate rural elderly population in India.¹¹ Basic functional assessment for mobility, ability to use upper limb, presence of depression and urinary incontinence was done.

Vision assessment was done by checking distant visual acuity with Snellen's E chart using standard techniques. If the elderly person failed to read the topmost line (6/60) then finger counting was checked up to 1 m by a decrement of 1 m. If the elderly person still failed to respond, then hand movements close to the eyes and perception of light was assessed. If the visual acuity was less than 6/18 in the better eye with the best available correction, the subject was considered visually impaired and those with visual acuity less than 6/60 in the better eye with best available correction were considered blind (according to National Program for Control of Blindness [NPCB] guidelines).

Hearing assessment was done using pure tone audiometry. Intensity of sound was measured in decibels (dB), and both degree and type of deafness was assessed.

Both ears were checked using an otoscope to rule out any obstructive causes of hearing impairment. Pure tone audiometry was done by workers who were trained in performing audiometry. Silent rooms away from the road were selected as the place to perform audiometry. Care was taken so that the external noise was not more than 30 dB by closing all the doors and windows of the room, requesting the people around the room to maintain silence until the procedure was completed. The audiologist first checked the audiometer readings on themselves and applied the correction factor for the prevalent ambient noise. Pure tones generated at various decibels of frequencies 250, 500, 1000, 2000, 4000 and 8000 Hz was checked in each ear of the elderly. Both air conduction and bone conduction was checked in all subjects.

The WHO classification was considered to classify hearing impairment according to the pure tone average in the better hearing ear. Categories of hearing impairment ranges from "no impairment" at or below 25 dB, 26–40 dB "mild impairment", 41–55 dB "moderate impairment" and more than 55 dB as "severe impairment". The hearing threshold level, using audiometry, was taken as the better ear average for four frequencies 0.5, 1, 2 and 4 kHz.

Table 1 Age, sex distribution and reported morbidity of the elderly persons

| Age (years) | Sex | | Total (%) (n = 222) |
|---------------------------|-------------------------|----------------------|------------------------|
| | Female (%) (n = 124) | Male (%) (n = 98) | |
| 60-69 | 63 (50.8) | 48 (49.0) | 111 (50.0) |
| 70-79 | 40 (32.3) | 27 (27.6) | 67 (30.2) |
| ≥80 | 21 (16.9) | 23 (23.5) | 44 (19.8) |
| Reported morbidity | | | |
| Difficulty in mobility | 86 (69.4) | 59 (60.2) | 145 (65.3) |
| Visual problems | 67 (54.0) | 61 (62.2) | 128 (57.7) |
| Depression | 49 (39.5) | 30 (30.6) | 79 (35.6) |
| Gastritis | 40 (32.3) | 28 (28.6) | 68 (30.6) |
| Hearing problems | 28 (22.6) | 31 (31.6) | 59 (26.6) |
| Problems related to sleep | 34 (27.4) | 20 (20.4) | 54 (24.3) |
| Dental problems | 13 (10.5) | 11 (11.2) | 24 (10.8) |
| Diabetes mellitus | 11 (8.8) | 10 (10.2) | 21 (9.5) |
| Chronic skin problems | 11 (8.8) | 7 (7.1) | 18 (8.1) |
| Hypertension | 11 (8.9) | 3 (3.1) | 14 (6.3) |
| Breathing difficulty | 6 (4.8) | 6 (6.1) | 12 (5.4) |
| No health problems | 8 (6.5) | 3 (3.1) | 11 (5.0) |

Table 2 Distribution of the elderly based on activities of daily living (ADL) assessment

| Age group | ADL | Males (%) | Female (%) | Total (%) |
|------------|-------------------------------|-----------|------------|------------|
| Young old | Independent | 37 (77.1) | 44 (69.8) | 81 (72.7) |
| | Dependent/partially dependent | 11 (22.9) | 19 (30.2) | 30 (27.3) |
| Old old | Independent | 20 (74.1) | 26 (65.0) | 46 (69.1) |
| | Dependent/partially dependent | 07 (25.9) | 14 (35.0) | 21 (30.9) |
| Oldest old | Independent | 13 (56.5) | 10 (47.6) | 23 (52.3) |
| | Dependent/partially dependent | 10 (43.5) | 11 (52.4) | 21 (47.7) |
| Total | Independent | 70 (71.4) | 80 (64.5) | 150 (67.6) |
| | Dependent/partially dependent | 28 (28.6) | 44 (35.5) | 72 (32.4) |

Results

A house-to-house survey of two villages was done and 257 elderly were enumerated constituting 12.2% of the entire population. Two hundred and twenty-two elders participated in the first part of the study where sociodemographic details were collected and functional assessment was performed. One hundred and seventy-five elderly participated in the second part of the study where visual and hearing assessment was done.

As shown in Table 1, 111 (50%) were young old (60-69 years), 67 (30.2%) were old old (70-79 years) and 44 (19.8%) were oldest old (≥80 years). Similar proportions were seen in men and women.

As observed in Table 1, 95% of the subjects reported at least one health problem to the question "Are you suffering from any health problems?" Difficulty in

mobility was the most common morbidity (65.3%) reported among the elderly followed by visual problems (57.7%) and depression (35.6%). Gastritis was reported by 30.6%. Hearing problem was reported by 28.4% of the elderly. Five percent of the elderly did not report any morbidity. The average number of current illnesses reported per person among the elderly was found to be 3.07 per person.

As observed in Table 2, 150 (67.6%) of the elderly persons were functionally independent. Seventy-two (32.4%) of the elderly persons were facing problems completely or partially in one or more of the other activities. The oldest old had significantly more functional dependence as compared to young old and old old, when oldest old were compared with the rest of the elderly subjects (χ^2 -test = 5.86, d.f. = 1, $P = 0.01$). Elderly women were more functionally dependent

Table 3 Age-wise distribution of cognitive impairment[†] among elderly

| HMSE | Age group Young old (%) | Old old (%) | Oldest old (%) | Total (%) |
|--------------------------------------|----------------------------|-------------|----------------|------------|
| No impairment (score ≥ 20) | 108 (97.3) | 62 (92.6) | 42 (95.5) | 212 (95.5) |
| Cognitive impairment (Score < 20) | 3 (2.7) | 5 (7.4) | 2 (4.5) | 10 (4.5) |
| Total | 111 (100) | 67 (100) | 44 (100) | 222 (100) |

[†]As assessed by Hindi Mini-Mental Status Examination (HMSE).Table 4 Prevalence of visual impairment[†], hearing impairment[‡] and combined visual and hearing impairment among the elderly

| | Age group Young old (%) (n = 78) | Old old (%) (n = 59) | Oldest old (%) (n = 38) | Total (%) (n = 175) |
|---|--|-------------------------|----------------------------|------------------------|
| Visual impairment | | | | |
| Normal | 55 (70.5) | 24 (40.7) | 12 (31.6) | 91 (52.0) |
| Low vision, not blind (VA $\leq 6/18$ to $< 6/60$) | 17 (21.8) | 26 (44.1) | 19 (50.0) | 62 (35.4) |
| Blind (VA $\leq 6/60$) | 6 (7.7) | 9 (15.3) | 7 (18.4) | 22 (12.6) |
| Hearing impairment (HI) | | | | |
| No impairment (≤ 25 dB) | 38 (48.7) | 17 (28.8) | 3 (7.9) | 58 (33.1) |
| Mild HI (26–40 dB) | 30 (38.5) | 27 (45.8) | 17 (44.7) | 74 (42.3) |
| Moderate HI (41–55 dB) | 8 (10.3) | 13 (22.0) | 15 (39.5) | 36 (20.6) |
| Severe HI (> 55 dB) | 2 (2.6) | 2 (3.4) | 3 (7.9) | 7 (4.0) |
| Combined visual and hearing impairment | | | | |
| Normal | 65 (83.3) | 32 (54.2) | 13 (34.2) | 110 (62.9) |
| HI + low vision, not blind | 9 (11.5) | 20 (33.5) | 18 (47.4) | 47 (26.9) |
| HI + blindness | 4 (9.0) | 7 (11.9) | 7 (18.4) | 18 (10.2) |

[†]Based on visual acuity (VA) assessed by using Snellen's E chart. [‡]Based on pure tone audiometry readings.

compared to elderly men, with no significant difference.

Table 3 shows that 212 (95.5%) of the elderly did not have any cognitive impairment and 10 (4.5%) of the elderly had cognitive impairment. There was no significant difference between age groups with respect to cognitive impairment.

As seen in Table 4, 62 (35.4%) of the elderly had low vision and 22 (12.6%) were blind. Visual impairment prevalence was similar among elderly men and elderly women. Visual impairment was highest among the oldest old ($n = 26$, 68.4%) and was significantly higher compared to the old old ($n = 35$, 59.4%) and young old ($n = 23$, 29.5%). As the age increases, the prevalence of visual impairment increased, when the oldest old were compared with young old and old old (χ^2 -test = 8.11, d.f. = 1, $P = 0.004$).

Table 4 shows that 117 (66.9%) of the elderly persons had some degree of hearing impairment, of whom 74 (42.3%) had mild degree, 36 (20.6%) moderate and seven (4.0%) severe. Thirty-five (92.1%) of the oldest old persons were hearing impaired as compared to 42

(71.2%) of the old old persons and 40 (51.3%) of the young old. As the age increases, the prevalence of hearing impairment increases, when the oldest old were compared with the rest of the elderly subjects (χ^2 -test = 13.9, d.f. = 1, $P < 0.001$).

Table 4 shows that 47 (26.9%) of the elderly had low vision associated with hearing impairment and 18 (10.2%) had blindness along with hearing impairment. Combined visual and hearing impairment was seen more commonly among the oldest old ($n = 25$, 65.8%), followed by old old ($n = 27$, 45.4%) and young old population ($n = 13$, 20.5%). As the age increases, the prevalence of combined visual and hearing impairment increased when the oldest old were compared with the rest of the elderly subjects (χ^2 -test = 13.9, d.f. = 1, $P < 0.001$).

The diagnoses associated with vision impairment are given in Table 5. External examination of eye and intraocular pressure was checked for identifying the cause of visual impairment. Cataract was the most common diagnosis (78.6%), followed by post-cataract surgery complications (13.1%).

Table 5 Medical diagnoses displayed as total no. (%) of elderly having visual impairment and hearing impairment

| Causes of visual impairment | Frequency (%) (n = 84) | Causes of hearing impairment | Frequency (%) (n = 117) |
|-----------------------------|---------------------------|------------------------------|----------------------------|
| Cataract | 66 (78.6) | Presbycusis | 104 (88.9) |
| Corneal opacity | 3 (3.6) | Otitis media | 6 (5.1) |
| Glaucoma | 1 (1.2) | Congenital deafness | 2 (1.7) |
| Post-cataract surgery | 11 (13.1) | Impacted wax | 2 (1.7) |
| Others | 3 (3.6) | Others | 3 (2.6) |

Table 6 Factors associated with visual and hearing impairment (n = 175 total population)

| Factors | Hearing impairment | | Visual impairment | | Combined hearing and visual impairment | |
|---------------------------------------|--------------------|---------|-------------------|---------|--|---------|
| | Frequency (%) | P-value | Frequency (%) | P-value | Frequency (%) | P-value |
| Low socioeconomic status | 13 (7.4) | 0.87 | 30 (17.1) | <0.001 | 7 (4.0) | 0.97 |
| Illiteracy | 87 (49.7) | 0.45 | 70 (40.0) | 0.002 | 54 (30.9) | <0.001 |
| Financial dependence | 91 (52.0) | 0.49 | 61 (34.9) | 0.88 | 52 (29.7) | 0.11 |
| Activities of daily living dependence | 45 (25.7) | 0.09 | 34 (19.4) | 0.09 | 36 (20.6) | 0.98 |
| Cognitive impairment | 5 (2.9) | 0.6 | 2 (1.1) | 0.98 | 2 (1.1) | 0.26 |

The diagnosis associated with hearing impairment is given in Table 5. The most common cause of hearing impairment was presbycusis (88.9%) followed by otitis media (5.1%). Despite the high prevalence of hearing impairment, only two elderly persons were using hearing aids, while another six had procured hearing aids they were not using. The reasons for most causes of dual sensory impairment can be easily treatable.

Table 6 shows that visual impairment was significantly higher among the elderly of low socioeconomic status (n = 30, 17.1%) and illiterates (n = 70, 40%) as compared to others. Sixty-one (34.9%) of the elderly with visual impairment were financially dependent on others. Thirty-four (19.4%) of the elderly had visual impairment and were dependent partially or completely on others for some ADL and two (1.1%) had cognitive impairment along with visual impairment.

Thirteen (7.4%) of the elderly with hearing impairment were of low socioeconomic status. Hearing impairment was significantly higher among the elderly who were illiterates (n = 87, 49.7%) and in those who were completely or partially dependent on others for financial support (n = 91, 52.0%) as compared to others. Forty-five (25.7%) of the elderly had hearing impairment and were dependent partially or completely on others for some ADL and five (2.9%) of the elderly had cognitive impairment along with hearing impairment.

Combined visual and hearing impairment was significantly high among illiterates as compared to literates.

Discussion

A significant consensus on advances in the care of the elderly was that in the past three decades there was "a wider appreciation that many of the illnesses and disabilities that were formerly considered inevitable in the elderly could now be regarded as remediable". This underscores the importance of providing appropriate health and medical care to the elderly. Characteristic properties of illness in old age are multiple pathological conditions, non-specific presentation of disease, rapid deterioration if no treatment is provided, high incidence of complications of disease and treatment and need for rehabilitation. These are considered to have important implications for health services.¹²

Of the elders in our study, 12.6% were blind (using the definition of NPCB of VA $\leq 6/60$ in the better eye with best available correction) and 35.4% had low vision. In a study done in the USA, prevalence of blindness (using the WHO definition) was 9.3%.¹³ In the Rotterdam study (using the WHO definition), the prevalence of visual impairment among the elderly ranged 0.1–11.8%.¹⁴ In a cross-sectional study done in a rural population of South India, 11.4% of the elderly people were blind (using the NPCB definition).¹⁵

In our study, 18.4% of the oldest old, 15.3% of the old and 7.7% of the young old were visually impaired. In a study done in the Netherlands by *Caroline et al.*, the prevalence of blindness (using the WHO definition) ranged from 0.1% in subjects aged 64 years to 3.9% in subjects aged 85 years or older.¹⁶

The prevalence of hearing impairment identified by pure tone audiometry in our study was found to be 66.9% using the WHO definition. In our study, prevalence of hearing impairment among the oldest old was 92%, old old was 71.2% and young old was 51.3%. Studies have shown an increase in hearing impairment as age advances. The prevalence of disabling hearing impairment was found to be between 12.6% and 14% in various studies done in India.^{6,7} In a survey done in the UK, among elderly persons aged between 61 and 70 years the prevalence of hearing impairment was 7%, while between 71 and 80 years was 18%.¹⁷ In a study of women aged 60–85 years residing in two small communities in rural Idaho, 45% had mild hearing impairment and 18% had a moderate impairment in the better ear.¹⁸

In our study, 42.3% had mild degree, 20.6% had moderate degree and 4.0% of the elders had severe degree of hearing impairment. This implies that the number of elderly suffering with disabling hearing impairment is low compared to that of the total hearing impairment.

In a study done in the USA, hearing impairment was associated with diminished function in the elderly.¹⁹ Hearing impairment was found to be associated with more rapid decline in cognitive function in people with Alzheimer's diseases and even mild hearing loss is associated with memory failure.²⁰ There was no significant association found between ADL, cognitive impairment and hearing impairment in our study.

The prevalence of combined hearing and visual impairment in the study was found to be 10.3% among the elderly. The prevalence of hearing impairment and low vision was found to be 26.9%. Prevalence of combined visual and hearing impairment was found to be 5–10% in other studies.²¹ In a study done by *Chia et al.*, elderly persons with cataracts were more likely to have hearing loss. Persons with visual impairment, compared with those without visual impairment, had lower mean audiometric thresholds across all frequencies. Combined impairment was associated with greater cognitive and functional decline.¹³

In a study by *Campbell et al.* of a USA population aged 70 years or older, 18% reported blindness in one or both eyes or some other trouble seeing, 33.2% reported problems with hearing, and 8.6% reported problems with both hearing and seeing.²² They had significantly poorer quality of life. There were no associations found between ADL, cognitive impairment and

combined hearing and visual impairment among the elderly in our study.

Most of the studies on visual and hearing impairment among elderly are based on self-reports. There are only a few population-based studies where hearing and visual impairment was assessed objectively. This study clearly demonstrates high prevalence of hearing and visual impairment among the elderly.

In the present study, there was an increase in the prevalence of visual impairment, hearing impairment and dual sensory impairment with increase in age. This finding is consistent with the results of a study conducted by *Smith et al.*²³ Cataract was the most common cause of visual impairment unlike in the study done by *Smith et al.* where macular degeneration was the most common cause.²³ Hearing aid use is much higher in studies done in Western countries as compared to our study.^{22,23}

Relationships of single sensory impairments and their disability have been extensively studied, but the psychosocial and functional impacts of dual sensory impairment are less well understood. Similar studies have to be planned on larger populations for better generalization. Hence, further research is required in this aspect, enabling a better understanding of the special needs of this group and facilitating communication among providers to identify and improve health-care outcomes.

Over the next several years, the global population will be graying, with the most significant increase in the oldest old age group. Hence, the number of elderly presenting with combined sensory impairment will also increase. The causes of these impairments can be easily identified and managed. Hence, we must be ready to scale up facilities at primary health-care level to identify and rehabilitate these elderly by helping them to lead an independent life.

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