Original Article

# Prevalence of visual impairment and its association with vision-related quality of life among elderly persons in a resettlement colony of Delhi

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## Abstract

**Background:** The population of India is ageing. The number and percentage of elderly persons is increasing. Visual impairment is common among elderly persons and affects their vision-related quality of life. The objective of this study was to estimate the prevalence of visual impairment among elderly persons aged 60 years and above residing in a resettlement colony of Delhi and study its association with socio-demographic variables and vision-related quality of life. **Methods:** A total of 604 elderly participants were selected by simple random sampling. House-to-house visit was done, and a self-developed pre-tested semi-structured interview schedule was used to collect socio-demographic information. Visual acuity was measured using Snellen's chart, and distant direct ophthalmoscopy was done to diagnose cataract. Vision-related quality of life was assessed by Indian Vision Function Questionnaire-33 (IND-VFQ-33). **Results:** Of the 604 participants, 555 (91.9%) were available for interview. The prevalence of visual impairment was 24.5% (95% CI: 20.9% - 28.1%). Cataract was the leading cause of visual impairment (50.7%), followed by uncorrected refractive error (36.8%). Illiteracy (aOR: 3.49, 1.37-8.87), economic dependence on family members (aOR: 1.92, 1.04 – 3.54), not currently working (aOR: 1.89, 1.20-2.98) and chewing of tobacco products (aOR: 2.56, 1.48-4.42) were significantly associated with visual impairment among study participants. Vison-related quality of life was worse among those with visual impairment. **Conclusion:** Burden of visual impairment is high among elderly persons living in urban resettlement colonies. It is largely avoidable. Eye-care services should be accessible and affordable to them.

**Keywords:** Elderly, quality of life, visual impairment

## Introduction

Globally, an estimated 253 million people live with vision impairment, out of which 36 million are blind, and 217 million have moderate to severe vision impairment.[1] Most of the visually impaired people are aged 50 years and above. The burden of visual impairment in India is estimated at 62 million; of these, 54 million persons have low vision, and 8 million are blind.[2] The number of elderly persons is rising.[3] The already high burden of visual impairment in elderly persons is projected to increase even more in the future. Uncorrected refractive errors and cataract are the two commonest causes of visual impairment. Cataract remains the leading cause of blindness in low- and middle-income countries. Over four-fifth of visual impairment among elderly persons is either avoidable or treatable.[1]

The prevalence of visual impairment among elderly persons in India ranges from 22%[4] to 35%.[5] Cataract and uncorrected

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refractive errors are the most common causes of both visual impairment and blindness in India.[5]

One of the objectives of Universal Eye Health: a global action plan 2014-19, is to generate periodic evidence on prevalence and causes of visual impairment to understand the magnitude and trend over time, which is crucial for resource allocation, planning of eye-health service provision and synergies with other programmes.[6] Scarce published literature is available on the magnitude of visual impairment among elderly persons in resettlement colonies. Further, vision-related quality of life among persons with visual impairment is largely an unexplored area.

Hence, this community-based study was undertaken in a resettlement colony of Delhi to estimate the prevalence of visual impairment among elderly persons aged 60 years and above and assess its association with socio-demographic variables and vision-related quality of life.

## Materials and Methods

This study was conducted in Dakshinpuri Extension, which is the Urban Field Practice Area of the Centre for Community Medicine, AIIMS, New Delhi. It comprises of a total population of approximately 35000, including about 2800 persons aged 60 years and above. The demographic data of the population is stored in a Health Management Information System (HMIS), which is updated regularly.

The sample size was calculated based on a prevalence of visual impairment (presenting visual acuity of worse than 6/18 in the better eye) of 25% among elderly persons aged ≥60 years, relative precision of 15%, and 95% confidence interval.[7] Sample size was calculated to be 513. Accounting for non-response rate of 15%, the sample size was increased to 604. Simple random sampling was done to select 604 elderly participants. Data collection was undertaken during May to July 2017.

The investigator was trained by one of the authors (NG) for three weeks at Dr. Rajendra Prasad Centre for Ophthalmic Sciences, AIIMS, New Delhi to assess visual acuity, and identify cataract by a flash light and distant direct ophthalmoscopy. The author (NG) has more than 10 years of experience in the field of Ophthalmology. At the end of the training, there was complete agreement between the trainer and the investigator. Training was imparted in the administration of IND-VFQ-33 by another author (AKG), who has more than 25 years of experience of working in the community.

Data was collected by house-to-house visits to the randomly selected elderly participants. Participants who could not be contacted despite three house visits were labelled as non-respondents.

A pre-tested semi-structured interview schedule was administered to each participant. Distance visual acuity was tested with Snellen's chart. Unaided visual acuity, aided visual acuity, and pin-hole visual acuity was recorded. Examination of the eyes was done by flash light and distant direct ophthalmoscopy to look for cataract. Vision-related quality of life was assessed using Indian Vision Function Questionnaire-33 (IND-VFQ-33). This questionnaire was developed and validated in India.[8,9] The IND-VFQ-33 contains 33 questions (items) related to the degree of difficulty in performing vision-dependent activities (e.g. walking on road, climbing stairs), psychosocial impact (e.g. fear, anxiety, social interactions), and visual symptoms (e.g. glare, pain), which form the three domains (general functioning, psychosocial impact, and visual symptoms, respectively). The IND-VFQ-33 produces summary scores for the three domains rather than an overall total score. The three domains consist of 21, 5, and 7 items, respectively. The items in general functioning are scored from 1 to 5, and those in psychosocial impact, and visual symptoms, from 1 to 4. Higher the score, poorer is the vision-related quality of life.

Visual impairment was defined as visual acuity of worse than 6/18 in the better eye with available correction.[10] This is the same as presenting visual acuity of worse than 6/18 in the better eye. This also implies presenting visual acuity of worse than 6/18 in both eyes. Cataract was reported as a cause of visual impairment if there was an opacity of the lens in the pupillary area, obscuring a clear red reflex by distant direct ophthalmoscopy, and presenting vision of worse than 6/18 which did not improve with pin-hole. Refractive error was reported as a cause of visual impairment if the presenting visual acuity was worse than 6/18, which improved to 6/18 or better with pin-hole. Current smoker was a person who had smoked tobacco product in the past 1 year. Past smoker was a person who used to smoke product during his/her lifetime but had not smoked in the last 1 year. Never smoker was a person who had not smoked tobacco in his/her lifetime. Current tobacco chewer was a person who had used chewable tobacco product during the last 1 year. Past tobacco chewer was a person who used to chew tobacco products during his/her lifetime but had not done so in the last 1 year. Never tobacco chewer was a person who had not chewed tobacco product in his/her lifetime. A participant was classified as economically dependent if s/he was financially dependent on her/his family members. A participant was classified as economically partially dependent if she/he was partially dependent on her/his family members for finances. A person was economically independent if s/he did not depend on her/his family members for finances. A person was classified as working if she/he was currently engaged in some economically productive activity, including home-maker.

The study protocol received ethical approval from the Institute Ethics Committee, All India Institute of Medical Sciences, New Delhi. Written informed consent was obtained from the participants. Those participants who required any ophthalmic treatment were referred to the nearest eye care facility.

Data was entered in Microsoft Excel version 2010 and analysis was done with Stata version 12 (College station, Texas, USA).[11] Visual impairment is reported as proportion along

with 95% confidence interval. Bivariable logistic regression was done to look for association of visual impairment with socio-demographic variables, and crude odds ratio is reported. Variables with *P* value <0.2 were considered in multivariable model. Multivariable logistic regression was undertaken to determine the independent factors associated with visual impairment. Quality of life is reported as median ($q_{25}$ – $q_{75}$) of each of the domains of IND VFQ-33. For the purpose of vision-related quality of life, those with unilateral visual impairment (n = 138) were not considered in the analysis. Since the distribution of IND-VFQ-33 domain scores were not normal, non-parametric tests were used for testing significance; and scores are reported as median ($q_{25}$ – $q_{75}$). For each category of socio-demographic variable, domain scores were tested for those with and without visual impairment by Wilcoxon Rank sum test. To look for any difference between the categories of socio-demographic variables, statistical test using Wilcoxon Rank sum test or Kruskal-Wallis test was used in those with and without visual impairment, separately. Summary scores of the three domains of IND-VFQ-33 were analysed separately. Linear regression analysis was used to compare the IND-VFQ-33 domain scores between those with or without visual impairment, adjusting for age, sex, marital status, educational status, number of selected self-reported chronic conditions, and working status of the participants. The *P* value less than 0.05 was considered statistically significant.

## Results

Of the total randomly selected 604 elderly participants, 27 refused to participate in the study and 22 elderly persons could not be contacted despite three visits, including one on a weekend. Among those who refused, there were 8 men and 19 women. Among those who could not be contacted, 17 were men and 5 were women. Finally, 555 participants were interviewed. The response rate was 91.9%.

The mean age of participants was 67.9 (s.d. 6.1) years, and about two-thirds were between 60 and 70 years. Women constituted 52.7% of the study participants. Majority were married (57.7%), not formally educated (53.0%), and not working (56.0%). Two-third of the participants were partially or completely economically dependent on their family members. Majority were never smokers (58.8%) and two-third had never used smokeless tobacco (66.5%). Of the 555 participants, joint pain was self-reported by 66%, hypertension by 42%, diabetes by 23%, and respiratory diseases by 17%. A fifth of the participants did not suffer from any of the selected chronic conditions [Table 1].

Of the total 555 participants, 136 were found to have visual impairment. The prevalence of visual impairment was estimated to be 24.5% (95% CI: 20.9% - 28.1%). Among those visually impaired, 123 were moderately visually impaired (presenting visual acuity <6/18 to ≥6/60 in the better eye), five participants were severly visually impaired (presenting visual acuity <6/60 to ≥3/60), and eight were blind (presenting visual acuity <3/60 in the better eye).

There was a significant association between visual impairment and age, educational status, economic dependence, working status, and tobacco chewing status. [Table 1].

In bivariate analysis to look for association with visual impairment, age of 75 years and above, illiteracy, economic dependence on family members, and non-working status of the participant showed significant association with visual impairment. However, on multivariable analysis, visual impairment was found to be higher among those who were illiterate (OR = 3.49, 95% CI = 1.37-8.87), were not working (OR = 1.89, 95% CI = 1.20-2.98), were economically dependent on their family members (OR = 1.92, 95% CI = 1.04-3.54), or were current tobacco chewers (OR = 2.56, 95% CI = 1.48-4.42) or had two of selected self-reported chronic illness (OR = 0.39, 95% CI = 0.23-0.67) [Table 2].

Among 136 participants who were visually impaired, 69 (50.7%) had cataract, 50 (36.8%) had uncorrected refractive error, and 17 (12.5%) had other pathologies as the cause of visual impairment. Others pathologies included corneal opacities, phthisis bulbi, and posterior segment diseases.

Of the 555 participants, 136 had visual impairment. Of the remaining 419 participants, 138 had presenting visual acuity of worse than 6/18 in one eye only. As the vision-related quality of life of these 138 participants is not expected to be seriously affected, because the other eye had a presenting visual acuity of ≥6/18, they were excluded from the analysis on vision-related quality of life. So, for purpose of analysis of IND-VFQ-33 tool, 417 participants were considered, out of which 136 had visual impairment, viz., presenting visual acuity worse than 6/18 in both eyes.

Linear regression was performed across the three domains of IND-VFQ, adjusting for socio-demographic variables. The adjusted IND-VFQ scores were significantly higher, like unadjusted, among visually impaired participants than those were not, in all three domains [Table 3].

Among the categories of socio-demographic variables, IND-VFQ scores for general functioning domain and psychosocial impact domain were significantly poorer among those who were older. However, the scores among those visually impaired was significantly poorer across all the categories of socio-demographic variables. [Table 4]

## Discussion

This study was undertaken in an urban resettlement colony among elderly persons aged 60 years and above. The prevalence of visual impairment was found to be 24.5%. This is similar to the study by Gupta *et al.*, conducted in East Delhi in 2015, where the prevalence

**Table 1: Visual impairment across socio-demographic variables among participants (*n*=555)**

| Variables (*n*) | Total (*n*) | Visual Impairment present [*n* (%)] | *P* (by Chi²) |
|---|---|---|---|
| Age categories | | | |
| 60-64 years | 167 | 31 (18.6) | 0.044 |
| 65-69 years | 188 | 44 (23.4) | |
| 70-74 years | 103 | 28 (27.4) | |
| 75 years and more | 97 | 33 (34.0) | |
| Gender | | | |
| Men | 262 | 59 (22.5) | 0.302 |
| Women | 293 | 77 (26.3) | |
| Marital status | | | |
| Married | 320 | 71 (22.1) | 0.146 |
| Widow/widower | 235 | 65 (27.7) | |
| Living status | | | |
| With spouse only | 131 | 33 (25.2) | 0.218 |
| With spouse and children | 178 | 34 (19.10) | |
| Only with children | 213 | 60 (28.2) | |
| Living Alone | 33 | 9 (27.3) | |
| Type of family | | | |
| Nuclear | 195 | 46 (23.6) | 0.717 |
| Extended | 360 | 90 (25.0) | |
| Educational status | | | |
| Above 10th standard | 54 | 6 (11.1) | <0.001 |
| 6th to 10th standard | 73 | 6 (8.2) | |
| Up to 5th standard | 134 | 32 (23.9) | |
| Illiterate | 294 | 92 (31.3) | |
| Economic dependence | | | |
| Independent | 192 | 32 (16.7) | <0.001 |
| Partially dependent | 261 | 68 (26.1) | |
| Dependent | 102 | 36 (35.3) | |
| Working status | | | |
| Working | 244 | 42 (17.2) | <0.001 |
| Not working | 311 | 94 (30.2) | |
| Smoking status | | | |
| Current smoker | 99 | 23 (23.2) | 0.762 |
| Past smoker | 130 | 35 (26.9) | |
| Never smoker | 326 | 78 (23.9) | |
| Tobacco chewing status | | | |
| Current chewer | 92 | 32 (34.8) | 0.032 |
| Past chewer | 94 | 25 (26.6) | |
| Never chewer | 369 | 79 (21.4) | |
| Number of selected self-reported chronic illness | | | |
| None | 106 | 26 (24.5) | 0.697 |
| One | 182 | 41 (22.5) | |
| Two | 174 | 48 (27.6) | |
| Three - four | 93 | 21 (22.6) | |

was 24.96%.[7] Our results are also similar to a study by Vijaya *et al.*, which estimated the prevalence of visual impairment among elderly persons in Chennai to be 22.6%.[4] However, other studies from outside Delhi show higher prevalence of visual impairment among elderly persons. A study by Baldev *et al.* conducted in Ludhiana in 2017 showed prevalence to be 38%.[12] In a similar study by Marmamula *et al.* conducted in Andhra Pradesh in 2013 showed prevalence to be 34.3% among elderly persons.[13] In a study by Neena *et al.* (multi-centric study from 16 districts, 2008), the prevalence of visual impairment among elderly persons was 36.5%.[5] In 2018, Malhotra *et al.* reported the prevalence of visual impairment among elderly persons from Haryana as 34.3%.[14] The lower prevalence in our study setting could be due to healthier elderly persons migrating from the villages to the cities, as they often take care of their grandchildren when their sons and daughters-in-law are away for work.

The prevalence of visual impairment among elderly persons from studies from abroad show that the prevalence varies from 4.8% to 52.9%.[15-17] However, socio-cultural and developmental variations across different countries exists, along with usage of different definitions which may result in such variation.

**Table 2: Association of visual impairment with socio-demographic variables (*n*=555)**

| Sub-categories (*n*) | Crude odds ratio | *P* | Adjusted odds ratio | *P* |
|---|---|---|---|---|
| Age-categories | | | | |
| 60-64 years (167) | Reference | - | - | - |
| 65-69 years (188) | 1.34 (0.80-2.25) | 0.265 | 1.07 (0.61-1.86) | 0.81 |
| 70-74 years (103) | 1.63 (0.91-2.95) | 0.097 | 1.27 (0.67-2.39) | 0.46 |
| 75 years and more (97) | 2.26 (1.26-4.05) | 0.005 | 1.46 (0.76-2.81) | 0.25 |
| Sex | | | | |
| Men (262) | Reference | - | - | - |
| Women (293) | 1.23 (0.83-1.81) | 0.304 | - | - |
| Marital status | | | | |
| Married (320) | Reference | - | - | - |
| Widow/widower (235) | 1.35 (0.91-1.99) | 0.132 | 0.96 (0.62-1.49) | 0.85 |
| Living status | | | | |
| With spouse only (131) | Reference | - | - | - |
| With spouse and children (178) | 0.70 (0.41-1.21) | 0.200 | - | - |
| Only with children (213) | 1.17 (0.71-1.91) | 0.547 | - | - |
| Living Alone (33) | 1.11 (0.47-2.64) | 0.807 | - | - |
| Type of family | | | | |
| Nuclear (195) | Reference | - | - | - |
| Extended (360) | 1.08 (0.72-1.62) | 0.713 | - | - |
| Educational status | | | | |
| Above 10$^{th}$ standard (54) | Reference | - | - | - |
| 6$^{th}$ to 10$^{th}$ standard (73) | 0.72 (0.22-2.37) | 0.583 | 0.72 (0.21-2.42) | 0.59 |
| Up to 5$^{th}$ standard (134) | 2.51 (0.97-6.49) | 0.049 | 2.49 (0.95-6.56) | 0.06 |
| Illiterate (294) | 3.64 (1.49-8.93) | 0.003 | 3.49 (1.37-8.87) | 0.01 |
| Economic dependence | | | | |
| Independent (192) | Reference | - | - | - |
| Partially dependent (261) | 1.76 (1.10-2.83) | 0.174 | 1.38 (0.83-1.31) | 0.22 |
| Dependent (102) | 2.78 (1.54-4.82) | <0.001 | 1.92 (1.04-3.54) | 0.04 |
| Working status | | | | |
| Working (244) | Reference | - | - | - |
| Not working (311) | 2.08 (1.38-3.14) | <0.001 | 1.89 (1.20-2.98) | <0.001 |
| Smoking status | | | | |
| Never smokers (326) | Reference | - | - | - |
| Past smokers (130) | 1.17 (0.74-1.86) | 0.526 | - | - |
| Current smokers (99) | 0.96 (0.57-1.64) | 0.887 | - | - |
| Tobacco-chewing status | | | | |
| Never user (369) | Reference | - | - | - |
| Past user (94) | 1.33 (0.79-2.24) | 0.283 | 1.38 (0.79-2.40) | 0.26 |
| Current user (92) | 1.96 (1.19-3.21) | 0.008 | 2.56 (1.48-4.42) | <0.001 |
| Number of selected self-reported chronic illnesses | | | | |
| None (106) | Reference | - | - | - |
| One (182) | 0.68 (0.36-1.28) | 0.227 | 0.54 (0.27-1.06) | 0.07 |
| Two (174) | 0.51 (0.31-0.84) | 0.007 | 0.39 (0.23-0.67) | <0.001 |
| Three - four (93) | 0.68 (0.36-1.28) | 0.227 | 0.54 (0.27-1.06) | 0.07 |

The main cause of visual impairment among elderly in our study was cataract (50.9%), followed by uncorrected refractive error (36%). This is consistent with results from India and abroad.[5,12,18-21]

We found that visual impairment was significantly higher among illiterate persons compared to those who were educated till intermediate or more. This is consistent with other studies.[4,7,13,16,22,23] One explanation could be poorer socio-economic status of illiterate persons, leading to lesser treatment seeking behavior.

Non-working status of the participants was also found to be significantly associated with visual impairment in our study. Similar result was reported by Rius *et al.* from El Salvador.[24] Similarly, we found that visual impairment was significantly higher among the participants who are economically dependent on their care-providers, in comparison to those who are economically independent. As far as we searched, we could not find any literature where association of economic dependency with visual impairment was studied. This could be because of reverse causality, that is, visual impairment could have led to economic dependency and non-working. We also found that tobacco

chewing was significantly associated with visual impairment among elderly persons. It is difficult to explain this association.

**Table 3: Adjusted vision function scores among participants (*n*=417)**

| Domains of IND-VFQ-33 | Participants with VI (*n*=136) | Participants without VI (*n*=281) | *P* |
|---|---|---|---|
| General Functioning | | | |
| Unadjusted score Mean (SE) | 37.36 (1.34) | 23.05 (0.27) | <0.001 |
| Adjusted score Mean (SE) | 37.65 (0.84) | 23.15 (0.58) | <0.001 |
| Psychosocial Impact | | | |
| Unadjusted score Mean (SE) | 8.49 (0.35) | 5.20 (0.04) | <0.001 |
| Adjusted score Mean (SE) | 8.39 (0.21) | 5.24 (0.14) | <0.001 |
| Visual Symptoms | | | |
| Unadjusted score Mean (SE) | 15.80 (0.39) | 9.89 (0.21) | <0.001 |
| Adjusted score Mean (SE) | 15.61 (0.35) | 9.98 (0.24) | <0.001 |

VI=Visual impairment, SE=Standard error

Association of visual impairment with age is well-documented.[7,13,22,25] Still, we did not find any association, probably due to the presence of other socio-demographic factors such as economic dependency and non-working status which were associated with age in our multivariable model.

Our study found worse vision-related quality of life scores among participants with visual impairment compared to those without visual impairment. This is similar to evidence available from other studies. Vashist *et al.* (2016) showed a poorer vision-related quality of life and visual functioning among the participants with visual impairment in both cases (corneal opacity) and controls compared to those with no visual impairment across all three domains of IND-VFQ-33 questionnaire.[26]

Dev *et al.* (2014) used Nursing Home Vision-targeted Health-related Quality of Life questionnaire (NHVQoL) to measure vision-related quality of life. This instrument consists of 9 subscales: general vision (6 items), reading (3 items), ocular symptoms (9 items), mobility (7 items), psychological distress (10 items), activities of daily living (6 items), social activities

**Table 4: Vision function scores across socio-demographic variables among participants (*n*=417)***

| | General functioning | | | Psychosocial Impact | | | Visual symptoms | | |
|---|---|---|---|---|---|---|---|---|---|
| | With VI | Without VI | *P* | With VI | Without VI | *P* | With VI | Without VI | *P* |
| Total (*n*=417) | 32.5 (26.5-58.5) | 21 (21-23) | < 0.001 | 7 (5-11) | 5 (5-5) | < 0.001 | 16 (13-19) | 8 (7-13) | <0.001 |
| Age categories (in years) | | | | | | | | | |
| 60-64 (*n*=132) | 29 (24-46) | 21 (21-22) | <0.001 | 7 (5-10) | 5 (5-5) | <0.001 | 15 (12-19) | 7 (7-11) | <0.001 |
| 65-69 (n=142) | 33 (27-41.5) | 21 (21-23) | <0.001 | 5 (5-9.5) | 5 (5-5) | <0.001 | 16 (13-18) | 7 (7-12) | <0.001 |
| 70-74 (*n*=74) | 38 (29-32) | 22 (21-24) | <0.001 | 10 (6-13) | 5 (5-5) | <0.001 | 17.5 (14-20) | 10.5 (7-13) | <0.001 |
| ≥75 (*n*=69) | 32 (26-43) | 22 (21-25) | <0.001 | 7 (5-12) | 5 (5-5) | <0.001 | 16 (14-18) | 10 (8-12) | <0.001 |
| *P* | 0.44 | 0.01 | | 0.05 | 0.47 | | 0.32 | 0.08 | |
| Sex | | | | | | | | | |
| Men (*n*=201) | 32 (26-39.2) | 21 (21-23) | <0.001 | 7 (5-11) | 5 (5-5) | <0.001 | 12 (15-18) | 7 (7.5-13) | <0.001 |
| Women (*n*=216) | 34 (25-45.2) | 22 (21-24) | <0.001 | 7 (5-11) | 5 (5-5) | <0.001 | 16 (14-19) | 7 (8-12) | <0.001 |
| *P* | 0.61 | 0.09 | | 0.96 | 0.27 | | 0.30 | 0.38 | |
| Working status | | | | | | | | | |
| Working (*n*=184) | 31 (26-45) | 21 (21-23) | <0.001 | 7 (5-11) | 5 (5-5) | <0.001 | 16 (13-18) | 7 (8-12) | <0.001 |
| Not working (*n*=233) | 33 (26-43) | 22 (21-23) | <0.001 | 7 (5-11) | 5 (5-5) | <0.001 | 16 (13-19) | 7 (8-12) | <0.001 |
| *P* | 0.72 | 0.18 | | 0.89 | 0.06 | | 0.77 | 0.68 | |
| Educational status | | | | | | | | | |
| Illiterate (*n*=224) | 34 (26-45) | 21 (21-25) | <0.001 | 7 (5-11) | 5 (5-5) | <0.001 | 16 (13-19) | 9 (7-13) | <0.001 |
| Upto 5$^{th}$ std (*n*=100) | 30 (25-38) | 21 (21-23) | <0.001 | 5 (5-11) | 5 (5-5) | <0.001 | 15.5 (14.5-18) | 7 (7-13) | <0.001 |
| 6$^{th}$ to 10$^{th}$ std (*n*=52) | 35 (31-63) | 22 (21-22) | <0.001 | 10 (7-17) | 5 (5-5) | <0.001 | 19.5 (11-23) | 7 (7-10) | <0.001 |
| Above 10$^{th}$ std (*n*=41) | 29 (32-39) | 22 (21-23) | <0.001 | 6 (5-11) | 5 (5-5) | <0.001 | 15.5 (12-16) | 7 (7-11) | <0.001 |
| *P* | 0.34 | 0.06 | | 0.47 | 0.54 | | 0.42 | 0.32 | |
| Marital status | | | | | | | | | |
| Married (*n*=170) | 36 (27-45.2) | 22 (21-24) | <0.001 | 7 (5-11) | 5 (5-5) | <0.001 | 16 (14-20) | 9 (7-12) | <0.001 |
| Widow/widower (*n*=247) | 31 (26-40) | 21 (21-23) | <0.001 | 7 (5-11) | 5 (5-5) | <0.001 | 15 (13-19) | 8 (7-12.5) | <0.001 |
| *P* | 0.16 | 0.12 | | 0.92 | 0.07 | | 0.06 | 0.41 | |
| Number of selected self-reported chronic conditions | | | | | | | | | |
| None (*n*=88) | 34 (26-45) | 21 (21-22) | <0.001 | 6 (5-11) | 5 (5-5) | <0.001 | 16 (13-21) | 7 (7-13) | <0.001 |
| One (*n*=132) | 30 (25-38) | 21 (21-23) | <0.001 | 7 (5-10) | 5 (5-5) | <0.001 | 16 (13-18) | 8 (7-12) | <0.001 |
| Two (*n*=134) | 35 (31-63) | 22 (21-24) | <0.001 | 7 (7-11) | 5 (5-5) | <0.001 | 16 (13.5-18) | 8.5 (7-12) | <0.001 |
| Three or more (*n*=63) | 29 (32-39) | 22 (21-24) | <0.001 | 11 (5-13) | 5 (5-5) | <0.001 | 17 (14-20) | 9 (7-13) | <0.001 |
| *P* | 0.56 | 0.15 | | 0.61 | 0.47 | | 0.63 | 0.44 | |

VI=Visual impairment, Data presented as median ($q_{25}$ - $q_{75}$), *This *n*=417 includes 136 participants with visual impairment, and 281 who had presenting visual acuity ≥6/18 in both eyes

and hobbies (8 items), adaptation and coping (2 items) and social interaction (6 items). The study found poorer NHVQoL scores with worsening distance visual acuity in general vision, reading, activities of daily living, mobility, social activities and hobbies and social interaction.[27] Chiang *et al.* (2013), using visual function Index-11 questionnaire reported significantly worse vision functioning scores among those with visual impairment, independent of other socio-demographic factors.[28]

The family physician is the first doctor who a patient consults for most ailments. An elderly person with diminution of vision may bring it to the notice of her/his family physician either as the chief complaint, or in addition to another condition for which s/he has come for follow-up. Assessment of distance visual acuity of the patient on the Snellen's chart by the physician's support staff shall take minutes. A visual acuity of worse than 6/18 shall indicate to the doctor that the quality of life of his patient may be affected. Appropriate referral to an optometrist or ophthalmologist would help his/her patient regain normal vision, usually by provision of spectacles or cataract surgery. Posterior segment conditions of the eye may also be identified at an early stage leading to their timely management and prevention of further vision loss. Effective referral is a hallmark of a successful medical practice of a family physician.

The main strength of this study is that it is a population-based study with high response rate; hence the results are generalizable to urban resettlement colonies. However, being a cross-sectional study, temporality of the associations is not evident, and should be interpreted with caution.

## Conclusion

The prevalence of visual impairment in this study was estimated to be 24.5% (95% CI: 20.9%-28.1%), and cataract (50.7%) was the most common cause of visual impairment among elderly persons, followed by uncorrected refractive error (36.8%). Illiteracy, non-working status, economic dependency and tobacco chewing were significantly associated with visual impairment in this population. Vision-related quality of life was worse among those with visual impairment.

The study findings suggest that visual impairment is a common morbidity among elderly persons, and over 85% of it can be treated with cataract surgery and correction of refractive error. Eye-care services should be planned in such a way that they are accessible to illiterate persons, and affordable for those elderly persons who are not working and are economically dependent on their family members.

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## Conflicts of interest

There are no conflicts of interest.

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