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VISUAL IMPAIRMENT AND ASSOCIATED FACTORS AMONG ADULTS OF A RURAL AREA OF KALABURAGI CITY

Community Medicine

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ABSTRACT

Background: Visual impairments are important preventable morbidities particularly in developing countries like India, where its prevalence is measured through bilateral distance visual acuity. Although there has been a considerable reduction in the infective causes of Visual impairments, the global burden of blindness has not significantly altered for over a decade. Almost 80-90 % of population is suffering from preventable causes of blindness stressing again an urgent need for screening programs and increasing availability of medical care in our country for prevention of ocular morbidities particularly in rural communities.**Objectives:** To determine the prevalence of visual impairments across various subgroups of the rural adult population and identify its associated risk factors. **Methods:** A cross-sectional study was conducted at the Hebbal village of Kalaburagi District. Visual impairment and blindness were defined using the World Health Organization (WHO) standard. All the adults (2418) of rural area were included in the study and house to house visit was made data collection. SPSS software was used to calculate percentages and conduct chi-square tests. **Results:** A total of 2418 adults aged ≥18years were enumerated and prevalence of PRVA-visual impairment/ blindness (WHO definition) in the adult population was 16.91 % (n=409). Prevalence of Near Visual Impairment - Presenting near visual acuity in the adult population 15.84%. Our study demonstrates a highly significant association between visual impairment (VI) and several socio-demographic variables, i.e., a strong positive association with increasing age (χ^2 = 646.70, p < 0.001). **Conclusions:** Most frequent causes of VI were uncorrected refractive error followed by cataract focusing on development of intensive programs for cataract surgery, detection and treatment of glaucoma, correction of refractive errors and vitamin A prophylaxis for xerophthalmia need to be targeted to further reduce the burden of ocular morbidity.

KEYWORDS

Visual Impairment, Blindness, Adults, Rural Area.

INTRODUCTION:

Eyes, the most treasured organs of human body and vision, one of the dominant senses of mankind. Vision loss can be characterized as blindness and vision impairment. Visual impairment and blindness due to various preventable ocular diseases is a significant public health problem in many parts of the world including India. According to WHO, globally, at least 2.2 billion people have a near or distance vision impairment and at least 1 billion of these, vision impairment can be prevented as the leading causes of vision impairment and blindness at a global level are refractive errors and cataracts, both of which are largely preventable[1].

Visual impairment and blindness impose substantial social and economic burdens on individuals and society, including suffering, disability, loss of productivity, and diminished quality of life for millions of people. It is estimated that at least half of all cases of blindness can be prevented through timely diagnosis and appropriate treatment[2] Visual impairment, particularly among individuals in the young and productive age group, has significant social and economic implications[3] Population-based studies across various regions indicate that uncorrected refractive errors and cataracts are predominant causes among younger adults, whereas age-related eye diseases are more common among older adults. Vision impairment severely affects quality of life in adult populations, with affected individuals experiencing lower employment rates and higher prevalence of depression and anxiety[1]

According to a quick survey conducted by the Central Government in the year 2015-19, the incidence of blindness has decreased from 1.1% (2006-2007) to 0.36%. Also, as mentioned in the national policy of the central government, the aim is to reduce the rate of blindness to 0.25% by the year 2025[4].

Most data on the prevalence of visual impairment and its associated factors are derived from institutions such as blind homes, hospitals, and schools. However, data on visual impairment and associated factors among adult rural populations remain limited due to restricted access to these areas. Studies conducted in rural settings not only enhance understanding of the patterns and determinants of visual impairment but also assist in formulating effective strategies to further reduce the burden of visual impairment, particularly by addressing preventable causes. With this background, the present study was conducted in a rural area of Kalaburagi district to assess the extent of visual impairment across different subgroups of the adult population and to identify factors associated with visual impairment.

Methods: A cross-sectional study was conducted at the Hebbal village of Kalaburagi District. Visual impairment and blindness were defined using the World Health Organization (WHO) standard. All the adults (2418) of rural field practice area were included in the study and house to house visit was made in the study area for data collection. A Pilot Study on 25 subjects was conducted. Relevant changes were made in the initial questionnaire; a final proforma was designed and the study continued. For diagnosing Visual Impairment due to various ocular morbidities, visual acquity was assessed by using Snellens chart, near vision was checked by Near vision chart, colour blindness was checked by using Ischiara chart, axis deviation was assessed by using cover / uncover test. Past history of ocular morbidity was taken from their records. Other ocular morbidities are detected by ocular examination with naked eye examination and torch examination of the eye. Individuals diagnosed with having any ocular morbidity were further assessed which dealt with detailed ophthalmic examination and diagnosis of various ocular morbidities using Ophtalmoscope**.** The statistical tests used are percentages and chi-square test. The statistical software SPSS is used for the analysis of the data. All the study participants were examined at household level, 409 participants were found to be having presenting visual acuity worse than 6/12 in either eye or both eyes and participants were referred for further evaluation due to any of the referral reasons— visual acuity <12 in one or both eye, ocular related complaints, glasses etc. The participants were referred to community health centre and were being examined again for confirmation of visual impairment.

RESULTS AND DISCUSSION:

The present study included 2,418 participants with a fairly balanced gender distribution and a predominance of individuals from economically and educationally disadvantaged backgrounds. Such a sociodemographic profile is consistent with several population-based

studies on visual impairment conducted in India in similar settings, where visual morbidity disproportionately affects older adults, individuals with low literacy, and those from lower socio-economic strata. The study shows 43.01% subjects were in the age group 18-30 years, 50.46% were females, 54.47% study participants were with primary education, 45.95% study participants were Labour may be agricultural or nonagricultural as their primary occupation and 57.94% belong to Class IV Socio-economic Status (Modified B.G.Prasad Classification).

A substantial proportion of the study population belonged to the economically productive age group of 18–50 years (78.83%) maximum subjects belong to the age group 18-30 years (43.01%). This finding is noteworthy, as visual impairment is often perceived as a problem predominantly affecting the elderly. However, several studies on visual impairment have reported a significant burden among younger and middle-aged adults, particularly due to uncorrected refractive errors, occupational eye injuries, and early onset cataract. The presence of nearly one-fifth of participants aged 51–70 years and a smaller proportion above 70 years aligns with evidence showing that age-related ocular conditions such as cataract, glaucoma, and age-related macular degeneration increase markedly after the fifth decade of life. A large number of studies in the past have been done in age group of 50 years and above with little focus on most productive age group. The study done by Malhotra S et al[5], stated that 55% were in the age group of 15–29 years focusing on the issue of visual impairments among the most productive age group. Gender distribution in the present study was almost equal, with a slight predominance of females (50.46%), comparable to findings from many community-based visual impairment studies that report either equal gender representation or a marginally higher burden among females. Female predominance in visual impairment has often been attributed to longer life expectancy, poorer access to eye care services, lower health-seeking behavior, and social barriers, particularly in rural and semi-urban populations. More than half of the study participants were illiterate (54.47%), while only one-fifth had education at senior secondary level or above. Low educational status has consistently been identified as a strong determinant of visual impairment in various studies. Illiteracy is associated with reduced awareness of preventable and treatable eye conditions, delayed health-care utilization, and poor compliance with corrective measures such as spectacle use or cataract surgery. In terms of occupation, the majority of participants were engaged in labor-intensive work (45.95%) or housework (29.03%). Study done by Malhotra S et al[5], on visual impairment have shown that agricultural and unskilled laborers are at increased risk due to prolonged outdoor work, exposure to dust, ultraviolet radiation, ocular trauma, and limited access to protective measures. Homemakers, particularly women, may also experience delayed diagnosis and treatment due to prioritization of family responsibilities over personal health and also due to continuous exposure to indoor air pollution in the form of fuels used for cooking like biomass, commonly used in in rural and semi-urban populations. Socio-economic status (Modified B.G. Prasad classification) assessment revealed that most participants belonged to lower socio-economic classes, with nearly 78% falling under Class IV and V. This finding is in strong agreement with many previous visual impairment studies, which consistently demonstrate an inverse relationship between socio-economic status and visual health. Financial constraints, poor accessibility to eye care services, and inability to afford spectacles or surgical interventions are well-documented contributors to higher visual impairment prevalence among lower socio-economic groups. SES is a recognized determinant of visual impairment: National analyses[6] of Indian older adults highlight that lower SES is associated with higher VI prevalence, with marginalised groups showing elevated risk compared to higher classes.

Table 1: Sociodemographic characters of the study subjects(n=2418)

Character	Number	Percentage
Age (Years)		
18-30	1040	43.01%
31-50	866	35.82%
51-70	462	19.10%
>70	50	2.07%
Gender		
Male	1198	49.54%
Female	1220	50.46%
Education		
Illiterate	1317	54.47%
Primary (up to 7th class)	255	10.55%
Secondary (up to 10thclass)	358	14.80%
Senior secondary and above	488	20.18%
Occupation		
Housework	702	29.03%
Student	165	6.82%
Labour—agricultural/nonagricultural	1111	45.95%
Office/skilled work	273	11.29%
Unemployed/retired	167	6.91%
Socio-economic Status (Modified B.G.Prasad Classification)		
Class I	16	0.66%
Class II	162	6.70%
Class III	350	14.48%
Class IV	1401	57.94%
Class V	489	20.22%

Table 2: Categories of Visual Impairment (According to WHO)

Distance Visual Impairment **Presenting visual acuity(PRVA)**	**Number**	**Percentage**
No visual impairment ≥6/12	**2009**	**83.09**
Early visual impairment(EVI) <6/12 - 6/18	**178**	**7.36**
Moderate visual impairment(MVI) <6/18 – 6/60	**208**	**8.60**
Severe visual impairment(SVI) <6/60 - 3/60	**20**	**0.83**
Blindness <3/60	**03**	**0.12**
Near Visual Impairment **Presenting near visual acuity**	**Number**	**Percentage**
No visual impairment ≥N6	2035	84.16
Visual impairment <N6	383	15.84

The International Classification of Diseases 11 (2018) classifies vision impairment into two groups: distance and near presenting vision impairment. Prevalence of PRVA-visual impairment/ blindness (WHO definition) in the adult population of our study was 16.91 % (i.e.; 409 participants are suffering with visual impairment/ blindness). Most frequent cause was under corrected refractive error. 83.09% had no distance visual impairment, with small proportions in early/moderate/severe impairment, and 0.12% blindness. 84.16% had no near visual impairment, with 15.84% impaired near vision. These distributions align with global patterns where unaddressed refractive error and presbyopia remain key contributors to mild and moderate visual impairment1. Similar findings also demonstrated in study done by Sethu Sheeladevi et al17 where overall, 10.2% (95% CI: 6.9–14.8) of adults in India were estimated to have URE

Table 3: Prevalence and Association of Causes of Visual Impairment and Blindness depending on presenting visual acquity

Causes	Early visual impairment (EVI) <6/12 - 6/18	Moderate visual impairment (MVI) <6/18 – 6/60	Severe visual impairment (SVI) <6/60 - 3/60	Blindness <3/60	Total	P value
	Number (Percentage)	Number (Percentage)	Number (Percentage)	Number (Percentage)	Number (Percentage)	Chi-square test = 216.59 P-value <0.001
Uncorrected Refractive errors	**144(35.21)**	**63(15.41)**	**2(0.48)**	**0(0)**	**209 (51.10)**	
Cataract	**1(0.25)**	**144(35.21)**	**17(4.16)**	**2(0.48)**	**164 (40.10)**	
Others	**33(8.06)**	**1(0.24)**	**1(0.25)**	**1(0.25)**	**36(8.80**	
Total	**178(43.52)**	**208(50.86)**	**20(4.89)**	**3(0.73)**	**409(100)**	

Our study shows how major causes of VI, uncorrected refractive errors (URE), cataract, and other causes distribute across severity levels of visual impairment, defined by presenting visual acuity. Chi-square statistic indicates a strong association between cause and level of visual impairment (χ^2=216.59; P<0.001), meaning the pattern across severity categories is highly unlikely due to chance. The distribution clearly indicates that Uncorrected refractive error (51.10%) dominates early (35.21%) and moderate visual impairment (15.41%) highlighting a need for basic refractive services and spectacles. Cataract (40.10%) dominates moderate and severe impairment underscoring ongoing needs for surgical services, other causes, including pseudophakia, corneal opacity and trauma, though lower overall, still contribute to vision loss and require targeted clinical management. These findings reinforce the need for expanded refractive services, cataract surgery programs, and comprehensive eye care planning just as major studies and WHO estimates recommend as WHO states the facts on Blindness and vision impairment report1 that globally 36% of people with a distance vision impairment are due to refractive error and 17% of people with vision impairment are due to cataract. Our study findings regarding causes of visual impairment are similar to study done by VanNewkirk MR et al7 on visual impairment which stated Uncorrected refractive error was the most frequent cause of bilateral vision impairment. Malhotra, et al5 also stated that in adults aged 15–49 years the maximum visual impairment in study participants was due to uncorrected refractive errors (83.5%).

Table 4: Prevalence and Association between visual impairment with age, gender, education, occupation and Socio-economic Status

Character	Visual impairment		p-value
	Without VI (n=2009)	With VI (n=409)	
Age (Years)	**No. (%)**	**No. (%)**	**p-value**
18-30	1015(50.52)	25 (6.12)	Chi-square test = 646.70, p-value < 0.001
31-50	750(37.33)	116(28.36)	
51-70	233(11.60)	229(55.99)	
>70	11(0.55)	39(9.53)	
Gender	**No. (%)**	**No. (%)**	**p-value**
Male	1014(50.47)	184(44.98)	Chi-square test = 4.0800, p-value = 0.0431
Female	995(49.53)	225(55.02)	
Education	**No. (%)**	**No. (%)**	**p-value**
Illiterate	1008 (50.18)	305(74.57)	Ch-square test = 98.501, P-value < 0.001
Primary (up to 7th class)	213(10.60)	42(10.27)	
Secondary (up to 10thclass)	326(116.23)	39(9.54)	
Senior Secondary and above	462(22.99)	23(5.62)	
Occupation	**No. (%)**	**No. (%)**	**p-value**
Housework	577(28.72)	125(30.57)	Chi-square test = 40.073, P-value < 0.001
Student	160(7.96)	05(1.22)	
Labour—agricultural/non agricultural	886(44.10)	217(53.06)	
Office/skilled work	253(12.60)	28(6.84)	
Unemployed/ retired	133(6.62)	34(8.31)	
Socio-economic Status (Modified B.G.Prasad Classification)	**No. (%)**	**No. (%)**	**p-value**
Class I	15(0.74)	01(0.24)	Ch-square test =42.7458, p-value = 0.001
Class II	120(5.98)	42(10.27)	
Class III	282(14.04)	68(16.63)	
Class IV	1172(58.34)	229(55.99)	
Class V	420(20.90)	69(16.87)	

Our study demonstrates a highly significant association between visual impairment (VI) and several socio-demographic variables. Visual impairment showed a strong positive association with increasing age (χ^2 = 646.70, p < 0.001). More than half of the visually impaired participants belonged to the 51–70 years age group (55.99%), and an additional 9.53% were above 70 years, whereas only 6.12% of VI cases were observed in the 18–30 years group. This marked age gradient reflects the cumulative effect of age-related ocular conditions such as cataract, refractive errors, glaucoma, and retinal diseases. Similar trends have been consistently reported in community-based studies, highlighting aging as a major risk factor for visual impairment like studies done by Murthy et al.8 and Bourne et al.9 The World Health Organization (WHO) also identifies ageing as one of the strongest predictors of visual impairment globally (WHO, 2019)10. A statistically significant association was also observed between gender and visual impairment (χ^2 = 4.08, p = 0.043). Females constituted a higher proportion of visually impaired individuals (55.02%) compared to males (44.98%). This finding aligns with previous studies reporting a higher burden of visual impairment among women, particularly in developing countries Alemayehu Woldeyes 2008; Marmamula et al., 201311, 12. This finding may be attributed to longer life expectancy among women, reduced access to eye-care services, and socio-cultural barriers that limit healthcare utilization among females, particularly in rural and low-resource settings. WHO estimates indicate that women account for nearly 55% of the global burden of visual impairment, underscoring gender inequity in eye health outcomes (WHO, 2019)10. Occupation was also significantly associated with visual impairment (χ^2 = 40.07, p < 0.001). Visual impairment was most prevalent among labourers (53.06%) and individuals engaged in housework (30.57%), while it was least common among students (1.22%) and office/skilled workers (6.84%). Manual labourers may be more exposed to occupational hazards, poor working conditions, and limited access to protective measures and eye-care services, contributing to a higher prevalence of visual impairment. These findings are consistent with study done Hanen Harrabi et.al. by 43% of those with severe or extreme visual difficulty were working as an agricultural worker.[13]

Education level showed a highly significant inverse association with visual impairment (χ^2 = 98.50, p < 0.001). A large majority of visually impaired individuals were illiterate (74.57%), while only 5.62% had senior secondary education or above implying higher education likely improves health awareness, health care-seeking behavior, and timely utilization of preventive and curative eye-care services, thereby reducing the burden of visual impairment. Similar associations have been reported by studies done by Sarega Gurudas et al.14 where lower educational attainment, and unemployment were common sociodemographic risk factors for vision impairment and blindness secondary education or higher ([95% CI 0·30–0·77]) and employed individuals (0·45–0·96]) had reduced odds of any vision impairment. Socio-economic status, as classified by the Modified B.G. Prasad scale, showed a significant association with visual impairment (χ^2 = 42.75, p = 0.001). Most visually impaired individuals belonged to Class IV (55.99%) and Class V (16.87%), indicating a higher burden among lower socio-economic groups. Low SES is strongly linked with poor nutrition, limited access to eye-care services, inability to afford corrective measures or surgery, and delayed presentation to health facilities. Study done by Monica Pinilla-Roncancio et al15 stated that in India 41.4% of people with disabilities are multidimensionally poor compared to 13.3% controls (p-value <0.01) demonstrating that poverty and visual impairment are bidirectionally related, creating a cycle of disability and economic deprivation.

Table 5: Association of Visual Impairment and Blindness with fuel used for cooking in rural area (n=409)

Fuel used for cooking	Early visual impairment(EVI) <6/12 - 6/18	Moderate visual impairment (MVI) <6/18 – 6/60	Severe visual impairment(SVI) <6/60 - 3/60	Blindness <3/60	Total	p value
	Number (Percentage)	Number (Percentage)	Number (Percentage)	Number (Percentage)	Number (Percentage)	Chi-square test = 1.42 P-value 0.965
Biomass	**168(41.08%)**	**194(47.43%)**	**18(4.40%)**	**03(0.73%)**	**383(93.64%)**	
LPG	**05(1.22%)**	**05(1.22%)**	**01(0.25%)**	**00(00%)**	**11(2.69%)**	
Both	**05(1.22%)**	**09(2.20%)**	**01(0.25%)**	**00(00%)**	**15(3.67%)**	
Total	**178(43.52%)**	**208(50.86%)**	**20(4.89%)**	**03(0.73%)**	**409(100%)**	

The present study assessed the association between type of fuel used for cooking and the degree of visual impairment and blindness among

a rural population (n = 409). Biomass fuel was overwhelmingly the most commonly used cooking fuel, accounting for 93.64% of households, while LPG and mixed fuel use were relatively uncommon. This reflects the continued dependence on traditional fuels in rural areas, likely due to economic constraints, limited access to clean energy, and sociocultural practices. Across all categories of visual impairment, early visual impairment (43.52%) and moderate visual impairment (50.86%) constituted the majority of cases, whereas severe visual impairment (4.89%) and blindness (0.73%) were relatively rare. Among biomass fuel users, moderate visual impairment was the most prevalent (47.43%), followed by early visual impairment (41.08%). Severe visual impairment and blindness were observed in a small proportion of biomass users (4.40% and 0.73%, respectively).

Although exposure to biomass fuel combustion products—such as smoke, particulate matter, and irritant gases—is biologically plausible as a risk factor for ocular surface disorders and chronic eye irritation, yet no statistically significant association was observed between fuel type and degrees of visual impairment (Chi-square = 1.42, p = 0.965). While our results did not show significant differences by fuel type, the biological plausibility and epidemiologic evidence linking biomass cooking fuels to eye health outcomes are well documented in the literature. A nationally representative study from India reported that older adults using unclean cooking fuels had a higher prevalence of visual impairment compared with clean fuel users, although the risk of blindness per se was not significantly elevated after adjustment16.

Table 6: Association of Visual Impairment and Blindness with Overcrowding in rural area (n=409)

Variable	Early visual impairment (EVI) <6/12 - 6/18	Moderate visual impairment (MVI) <6/18 – 6/60	Severe visual impairment (SVI) <6/60 - 3/60	Blindness <3/60	Total	p value
	Number (Percentage)	Number (Percentage)	Number (Percentage)	Number (Percentage)	Number (Percentage)	
Overcrowding Present	89 (21.76%)	117 (28.60%)	10 (2.45%)	1 (0.25%)	217 (53.06)	Chi-square test = 2.062, P-value = 0.559
Overcrowding Absent	89 (21.76%)	91 (22.25%)	10 (2.45%)	2 (0.48%)	192 (46.94)	
Total	178 (43.52%)	208 (50.86%)	20 (4.89%)	3 (0.73%)	409 (100%)	

This study assessed the association between household overcrowding and the severity of visual impairment and blindness among individuals residing in a rural area. Over half of the study population (53.06%) lived in overcrowded households, highlighting the high prevalence of suboptimal living conditions in the study setting. Early visual impairment (EVI) and moderate visual impairment (MVI) constituted the majority of visual morbidity across both overcrowded and non-overcrowded households. Although a slightly higher proportion of moderate visual impairment was observed among participants from overcrowded households (28.60%) compared to those without overcrowding (22.25%), this difference was not statistically significant. The chi-square test showed no significant association between overcrowding and categories of visual impairment (χ^2 = 2.062, p = 0.559), indicating that overcrowding, as an isolated factor, did not significantly influence the severity of visual impairment in this rural population.

These findings suggest that while overcrowding reflects poorer socioeconomic and living conditions, it may not independently contribute to visual impairment or blindness. Visual impairment in rural settings is more likely influenced by other determinants such as Risk Factors Consistently Linked with Visual Impairment age, female sex, lack of formal education, limited access to eye care services, Dominant Clinical Determinants Over Socio-Environmental Factors like uncorrected refractive errors, cataract prevalence, occupational exposure, nutritional deficiencies, and awareness regarding eye health. Overcrowding may act indirectly through these pathways but does not appear to have a direct measurable effect on visual status in this study.

CONCLUSION:

Overall, the findings indicate that visual impairment is disproportionately concentrated among older adults, females, illiterate individuals, manual laborers, and those belonging to lower socio-economic strata. These results underscore the need for targeted community-based screening programs, improved access to affordable eye-care services, and focused health education interventions aimed at vulnerable populations to reduce avoidable visual impairment. A statistically significant association was also observed between gender and visual impairment (χ^2 = 4.08, p = 0.043). Females constituted a higher proportion of visually impaired individuals (55.02%) compared to males (44.98%). This finding may be attributed to longer life expectancy among women, reduced access to eye-care services, and socio-cultural barriers that limit healthcare utilization among females, particularly in rural and low-resource settings. The findings emphasize the need for targeted eye-care interventions focusing on older adults, women, the illiterate population, unskilled laborers, and individuals from lower socio-economic strata. Strengthening community-based screening programs, improving health education, and ensuring affordable and accessible eye-care services are essential to reduce avoidable visual impairment. Our study shows major causes of visual impairment, uncorrected refractive errors (URE), cataract, and other causes distribute across severity levels of visual impairment, defined by presenting visual acuity. Chi-square statistic indicates a strong association between cause and level of visual impairment (χ^2=216.59; P<0.001). The distribution clearly indicates that Uncorrected refractive error (51.10%) dominates early (35.21%) and moderate visual impairment (15.41%) highlighting a need for basic refractive services and spectacles. The study findings highlight important public health considerations focusing High Burden of Visual Impairment in Rural Communities, the overall rates of early and moderate visual impairment observed align with other rural studies demonstrating a substantial burden of visual disorders in underserved settings. Interventions tailored toward strengthening rural eye care services, health education, and accessible corrective measures remain paramount for reducing the burden of visual impairment and blindness in these settings.

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