International Archives of
Public Health and Community Medicine

ORIGINAL RESEARCH

Prevalence of Visual Impairment among Adults Aged Forty Years and above in a Medical Officer of Health Area in Sri Lanka: Cross-Sectional Study

Chrishantha Abeysena[1*] and Champa Hapugoda[2]

[1]*Department of Public Health, Faculty of Medicine, University of Kelaniya, Sri Lanka*

[2]*Ministry of Health, Sri Lanka*

***Corresponding author:** *Professor Chrishantha Abeysena, Department of Public Health, Faculty of Medicine, University of Kelaniya, Sri Lanka, Tel: 0094-777591715*

Abstract

Background: Visual impairment is a global health problem, particularly people living in low- and middle-income countries. The objective of this study was to determine the prevalence of visual impairment and factors associated with it among adults aged ≥ 40 years in a Medical Officer of Health area in Sri Lanka.

Methods: A community based descriptive cross-sectional study was conducted among 602 adults aged ≥ 40 years selecting from cluster sampling technique. Visual acuity of < 6/18 in the better eye was considered as visual impairment. Low vision was defined as visual acuity of 6/18 to 3/60 in the better eye and blindness as < 3/60 in the better eye. The prevalence of visual impairments along with best corrected prevalence and its 95% confidence intervals (CI) were calculated. Multiple logistic regression was perform to assess the associated factors and results were expressed as Adjusted Odds Ratio (AOR) and 95% CI.

Results: Overall prevalence of visual impairment was 21.3% (95% CI: 18.0%-24.6%). The prevalence of low vision and blindness were 19.6% (95% CI: 16.4%-21.8%) and 1.7% (95% CI: 0.67%-2.7%) respectively. The prevalence of best corrected visual impairment was 11% (95% CI: 8.5%-13.4%). The prevalence of best corrected low vision and blindness was 8.3% (95% CI: 7.1%-11.5%) and 1.7% (95% CI: 0.67%-2.7%) respectively. Age ≥ 60 years (AOR = 6.30, 95% CI: 3.9-10.1) and low monthly income (AOR = 2.09, 95% CI: 1.3-3.4) were associated with visual impairment.

Conclusion: Visual impairment was a public health problem among adults aged ≥ 40 years in the above study setting.

Keywords

Blindness, Factors, Prevalence, Refractive errors, Vision

Abbreviations

CI: Confidence Intervals; MOH: Medical Officer of Health; OR: Odds Ratio; PHM: Public Health Midwife; WHO: World Health Organisation

Introduction

Visual impairment is reduction in the vision. It is a worldwide health problem in both developing and developed countries. According to World Health Organization (WHO), visual impairment includes low vision and blindness [1]. Blindness is defined as visual acuity of less than 3/60 in the better eye with best correction. Low vision is defined as visual acuity of less than 6/18, but equal to or better than 3/60, in the better eye with best correction. In 2010, WHO estimated that there were 285 million people worldwide with visual impairment, including 39 million blind and 246 million low vision [2]. It also indicated that the prevalence of worldwide visual impairment was increasing [2]. About 90% of visually impaired people live in low and middle income countries. Visual impairment is a major disabling condition in aging population. Nevertheless 80% of visual impairment can be controlled and prevented [3].

Global prevalence of visual impairment, low vision and blindness were 4.24%, 3.65% and 0.585 respectively [2]. Available prevalence studies in Sri Lanka showed different values of visual impairment in different districts [4-6]. Prevalence of visual impairment, low vision

Citation: Abeysena C, Hapugoda C (2018) Prevalence of Visual Impairment among Adults Aged Forty Years and above in a Medical Officer of Health Area in Sri Lanka: Cross-Sectional Study. Int Arch Public Health Community Med 2:013

Accepted: November 20, 2018; **Published:** November 22, 2018

and blindness of over 60 years of adults in Gampaha district was 68.1%, 51.8% and 16.3% respectively [6]. Prevalence of visual impairment and blindness with best correction among population aged ≥ 40 years in rural villages of Kandy district was 5.9% and 1.1% respectively [5]. Prevalence of visual impairment, low vision and blindness was 20.7%, 19.89% and 0.83% respectively in Matara district [4].

Uncorrected visual problems may affect education, lost employment opportunities, lower productivity and impaired quality of life. Early detection and treatment of visual problems will reduce the dependency and the burden of the disease to the society. Knowing the prevalence and associated factors will help in controlling and preventing visual impairment. Therefore it would be helpful to planners and decision makers in utilizing limited resources. WHO targeted the reduction in prevalence of avoidable visual impairment by 25% by 2019 from the baseline of 2010 [3]. The objective of this study was to determine the prevalence of visual impairment and factors associated with it among adults aged ≥ 40 years in the Medical Officer of Health (MOH) area Mahara.

Methods

This was a community based descriptive cross-sectional study, conducted in the MOH area Mahara, in the Gampaha district in Sri Lanka from August to October in 2009. A MOH area is a health administrative area. According to the last population census, total population of the MOH area Mahara was 176870. There were 51378 people who were forty years and above (29% of total population) [7]. Study population was all the males and females aged ≥ 40 years who were residing in MOH area Mahara for at least six months on the 1st of July 2009. Exclusion criteria were bed ridden people and hospitalized people.

Estimated prevalence of visual impairment of population aged ≥ 40 years was considered as 20.0% [4]. For calculation of the sample size we considered desired precision as 5% with 95% confidence limits, design effect as 1.5 and non-response rate as 10%. Therefore the final sample size was 634. A cluster sampling method was used. There are 44 Public Health Midwife (PHM) areas in the MOH area Mahara. PHM areas were considered as clusters. Sixteen PHM areas were selected from 44 PHM areas by simple random sampling without replacement. The size of the cluster was forty. PHM area was divided into sections by roads. In a PHM area, a road was selected randomly. First house of the road was the index house. The direction was left by standing at the front door facing outside from the index house. If there were more than one eligible participant in the house one of them was selected randomly.

An interviewer administered questionnaire was used for collecting socio-demographic, medical and behavioral factors. A record sheet was used to record the visual acuity of both eyes, visual acuity of better eye and visual acuity of better-seeing eye with best correction. The visual acuity was assessed using Snellen's chart. A place with good day light was selected. Snellen's chart was placed in good day light at eye level of seated position. The participant was made to sit six meters away from the chart. Both eyes checked separately. One eye was covered with an occluder and visual acuity of the other eye was checked. Started first with the biggest letter and proceeded to the smallest. The participant had to identify every letter on the line being presented and communicate it to the data collector. The participant was asked to read progressively smaller letters until they could read no further. The smallest line that the participant could read successfully was recorded. If the participant was unable to read the topmost line at six meters, the distance reduced to three meters and checked the ability to read or not [8]. The visual acuity was tested for each eye. Two medical undergraduates were trained for administering the questionnaire and examination of visual acuity with Snellen's chart and pinhole. One out of the five houses selected, was prepared as a place of examination and eligible participants of those five houses were invited for examination.

The visual acuity of the better-seeing eye is the eye which has the better visual acuity. The WHO definition [1] was used for defining visual impairment with presenting vision [9,10]. With the Snellen's chart, visual acuity of 6/6 to 6/18 in the better eye was considered as normal vision. Visual acuity of less than 6/18 in the better eye was considered as visual impairment. It was divided into two groups. Low vision was defined as visual acuity of 6/18 to 3/60 in the better eye and blindness as less than 3/60 in the better eye. Best corrected visual impairment is the visual acuity in the better eye achieved by participants tested with pinhole.

Prevalence of visual impairments and its 95% Confidence Intervals (CI) were calculated. Univariate logistic regression was applied for assessment of the factors associated with visual impairment. Multiple logistic regression with backward selection was performed for controlling confounding factors. Results were expressed as Odd Ratios (OR) and 95% CI.

The Ethics Review Committee of the Faculty of Medicine, University of Kelaniya granted ethical clearance. Informed written consent was obtained from participants prior to data collection. Permissions were obtained from the Regional Director of Health Services in the District of Gampaha.

Results

Six hundred and forty participants were invited. Six hundred and two participated. Therefore the non-response rate was 6%. The median age of the

participants was 53 years (Inter quartile range 17 years). There were 191 (33.7%) adults aged 60 years or more and 212 (35.2%) less than 50 years of age. There were 354 (58.8%) females. Majority of study participants were (n = 555, 92.2%) Sinhalese and Buddhist (n = 517, 85.7%).

Prevalence of visual impairment

The prevalence of visual impairment among the population aged ≥ 40 years in the MOH area Mahara was 21.3% (95% CI: 18.0%-24.6%). The prevalence of visual impairment among the age group 40-59 years was 11.4% (95% CI: 2.8%-19.9%) and the age group ≥ 60 years was 42.4% (95% CI: 35.4%-45.4%). Both males and females had similar prevalence of visual impairment, 21.3% (95% CI: 17.3%-25.3%) for males and 21.1% (95% CI: 16.8%-25.3%) for females (Table 1).

Table 1: Prevalence of visual impairments (n = 602).

Visual impairment	Number	Prevalence
Overall Visual impairment	128	21.3%
Age 40 - 59 years	47	11.4%
Age ≥ 60 years	81	42.4%
Male	53	21.3%
Female	75	21.1%
Low vision	118	19.6%
Age 40 - 59 years	46	11.2%
Age ≥ 60 years	72	37.7%
Male	50	20.2%
Female	68	19.2%
Low vision with best correction	56	9.3%
Age 40 - 59 years	11	2.7%
Age ≥ 60 years	45	23.6%
Male	20	8.1%
Female	36	10.2%

Prevalence of low vision and blindness

The prevalence of low vision was 19.6% (95% CI: 16.4%-21.8%) and prevalence of blindness was 1.7% (95% CI: 0.67%-2.7%) in this population. The prevalence of low vision in age group 40 to 59 years was 11.2% (95% CI: 8.1%, 14.2%). In the same age group prevalence of blindness was 0.2% (95% CI: 0.23, 0.63). The prevalence of low vision and prevalence of blindness among aged ≥ 60 years were 37.7% (95% CI: 30.8%, 44.6%) and 4.7% (95% CI: 1.7%, 7.7%) respectively. The prevalence of low vision and blindness among males were 20.2% (95% CI: 15.2%-25.2%) and 1.2% (95% CI: -0.15%-2.2%) respectively. Among females, the prevalence of low vision was 19.2% (95% CI: 15.1%-23.3%) and the prevalence of blindness was 2% (95% CI: 0.55%-3.4%).

Prevalence of best corrected visual impairment

The prevalence of best corrected visual impairment, low vision and blindness were 11% (95% CI: 8.5%, 13.4%), 9.3% (95% CI: 7.1%, 11.5%) and 1.7% (95% CI: 0.67, 2.73) respectively. The prevalence of best corrected low vision in age group 40 to 59 was 2.7% (95% CI: 1.1%-4.3%) and the age group ≥ 60 years was 23.6% (95% CI: 17.6%-29.6%). The prevalence of best corrected low vision among males was 8.1% (95% CI: 4.7%-11.5%) and among females was 10.2% (95% CI: 7.0%-13.3%) (Table 1).

Associated factors for visual impairment

Age ≥ 60 years, low educational level and low monthly income had association with visual impairment (Table 2). Multiple logistic regression results shows that age ≥ 60 years (adjusted OR = 6.30, 95% CI: 3.94-10.07) and

Table 2: Distribution of the study sample by visual impairment and selected factors.

	Visual impairment				Odds ratio (95% Confidence interval)
	Present		Absent		
	N	%	N	%	
Age in years ≥ 60	81	63.3	110	23.2	5.70 (3.75-8.66)
40 - 59	47	36.7	364	76.8	
Sex: Female	53	41.4	195	41.1	0.98 (0.66-1.47)
Male	75	58.6	279	58.9	
Educational level: Up to grade 9	97	75.8	245	51.7	2.92 (1.87-4.55)
> Grade 9	31	24.2	229	48.3	
Monthly income (SLR) < 2500	78	66.7	222	50.3	1.97 (1.28-3.0)
≥ 2500	39	33.3	219	49.7	
Employment: Non paid	79	61.7	252	53.2	0.67 (0.41-1.05)
Paid	49	38.3	222	46.8	
History of Diabetes Mellitus Present	29	22.7	93	19.6	1.20 (0.75-1.92)
Absent	99	77.3	381	80.4	
History of hypertension Present	36	28.1	109	23.0	1.31 (0.84-2.04)
Absent	92	71.9	365	77.0	
Consumed alcohol	44	34.4	148	31.2	1.15 (0.76-1.74)
Not consumed alcohol	84	65.6	326	68.8	
Smoker	34	26.8	109	23.0	1.22 (0.78-1.91)
Non-smoker	93	73.2	365	77.0	
Total	128	100	474	100	

Table 3: Adjusted odds ratios for visual impairment.

Variable	β co efficient	Standard error	OR	95% CI	p value
Monthly income < 2500 rupees	0.74	0.25	2.09	1.29-3.40	0.003
Smoking	0.49	0.25	1.63	0.98-2.71	0.057
Age ≥ 60 years	1.84	0.24	6.30	3.94-10.07	< 0.001
Low education	0.45	0.25	1.56	0.94-2.59	0.08

monthly income < 2500 rupees (adjusted OR = 2.09, 95% CI: 1.29-3.40) were associated with visual impairment. Low educational level was not significantly associated with visual impairment (adjusted OR = 1.56, 95% CI: 0.94-2.59, p = 0.08). However removing the variable low monthly income from the model and keeping the other variables as it was, discovered a significant association between low educational level and visual impairment (adjusted OR = 2.01, 95% CI: 1.25-3.23, p < 0.01) (Table 3).

Discussion

The prevalence of overall visual impairment based on presenting visual acuity among the population aged ≥ 40 years in the MOH area Mahara was 21.3%. The prevalence of low vision and blindness were 19.6% and 1.7% respectively. Similar results were reported by another Sri Lankan study [4] revealed that the prevalence of visual impairment, low vision and blindness of population aged forty years and above was 20.7%, 19.89% and 0.83% respectively. The definition of the visual impairment of the study [3] is similar to the current study. The above study [3] had reported the same prevalence of blindness but low prevalence of visual impairment which had been assessed using a slit lamp examination with dilation of pupil. The prevalence of visual impairment and blindness reported by a study done in India was 8.09% and 1.84% respectively [11]. Another study [12] done in India in 2002, reported prevalence of visual impairment and blindness among population aged 50 years and above as 18.7% and 4.1%. However, the definition used by former study was visual impairment of both eyes [12]. Another community based study [13] carried out in 2014 in a rural area of North India reported that the prevalence of visual impairment was 24.5% and blindness was 5% among the aged 50 years and above. The study [13] was used the same definitions of visual impairment and blinding as in the current study. Another study [14] reported that the prevalence of visual impairment and blindness in tribal arrears of India were 16.9% and 2.3% respectively. Another study [15] in India found that the prevalence of low vision and blindness among aged above 17 years were 20.1% and 3.6% respectively. Another study [10] reported that the prevalence of visual impairment, low vision and blindness was 6.43%, 5.25% and 1.18% in underserved Iranian villages without restriction of any age group.

The present study revealed that prevalence of visual impairment was 42.4% and low vision was 37.7% and blindness was 4.7% of the population aged ≥ 60 years. One study [6] reported that the prevalence of visual impairment was 68.1%, low vision was 51.8% and blindness was 16.3% in the same age category of the Gampaha district in 2006. The criteria used to define blindness were different in the above study. The study [6], blindness was defined as visual acuity < 6/60 in the better eye whereas the present study as visual acuity < 3/60 in the better eye. A population based study conducted in China [16] reported that the prevalence of visual impairment among ≥ 60 years was 27.5%. The differences of prevalence can be explained by either difference of true prevalence or use of different definitions of visual impairment. Further WHO has revised the categorization of visual impairment, therefore the comparison of prevalence should be done with caution. However the definition of blindness has not been changed [17].

We found that overall prevalence of best corrected visual impairment, best corrected low vision and best corrected blindness was 11%, 8.3% and 1.7% respectively. Another Sri Lankan study [4] reported that prevalence of best corrected low vision was 5.3% and the prevalence of best corrected blindness was 0.83%. Both studies have used same criteria for definition of visual impairment. But prevalence of low vision of the former study [4] was lower than the present study. Another study [5] carried out in rural villages of Kandy district in 2006 had revealed the prevalence of best corrected visual impairment among the same age group was 5.9%. According to the above study [5] prevalence of low vision and blindness with best correction was 4.8% and 1.1% respectively. The prevalence of best corrected visual impairment and blindness in a study done in India was 10% and 3% respectively [12]. Another study [14] conducted in India reported that prevalence of best corrected visual impairment and blindness were 6.2% and 2.1%. The definition which is based on best corrected visual acuity, substantially underestimate the total visual impairment due to exclusion of uncorrected refractive errors [18]. Therefore the use of presenting visual is most appropriate for defining visual impairment.

We found that age ≥ 60 years and low monthly income were associated with visual impairment. Our findings are consistent with two other studies [13,19] that older age was independently associated with visual impairment. However they [13,19] also found that lower educational level, instead of lower monthly income was associated with visual impairment.

We recruited the study population using a probability sampling technique from the larger health administrative area. However, generalizability of the

results to Sri Lanka will be done with restrained. Visual acuity was measured in the field in different locations, not in a healthcare institution where the environment is static. Even though we tried to assess uniformly, this may affect the validity of the results. We collected and analysed data on nine years ago and the definition of visual impairment has now been changed, will be another limitation.

Conclusions

Visual impairment was a public health problem among adults aged ≥ 40 years in the MOH area Mahara. Aged ≥ 60 years and low monthly income were associated with visual impairment.

Acknowledgements

We are grateful to the study participants, data collectors and the Postgraduate Institute of Medicine, University of Colombo.

Author Contributions

CA participated in the design of the study, performed the statistical analysis, interpreted the data and drafted the manuscript. CH participated in the design of the study, coordinated data collection and drafted the manuscript. Both of us read and approved the final version of the manuscript.

Conflict of Interests

The authors declare that they have no competing interests.

Funding

Self-funded.

References

1. http://apps.who.int/classifications/apps/icd/icd10online2007/
2. World Health Organization (2012) Global data on visual impairments 2010. WHO/NMH/PBD/12.01.
3. World Health Organization (2013) Universal eye health: A global action plan 2014-2019. World Health Organization, Geneva, Switzerland, 28.
4. Abeydeera AP (2007) Prevalence, major causes of blindness and low vision in an adult rural community in Sri Lanka. The Journal of College of Ophthalmologist of Sri Lanka 13: 36-41.
5. Edussuriya K, Sennanayake S, Senaratne T, Marshall D, Sullivan T, et al. (2009) The prevalence and causes of visual impairment in central Sri Lanka the Kandy Eye study. Ophthalmology 116: 52-56.
6. Nanayakkara SD (2006) Vision related quality of life among elders in Gampaha district and associated risk factors for age related cataract. MD theses, University of Colombo.
7. (2001) Census of population and housing Gampaha District. Department of Census and Statistics, Ministry of plan and implementation, Sri Lanka.
8. Keeffe JE, Lovie-kitchin JE, Maclean H, Taylor HR (1996) A simplified screening test for identifying people with low vision in developing countries. Bull World Health Organ 74: 525-532.
9. http://apps.who.int/classifications/icd10/browse/2010/en#/H53-H54
10. Hashemi H, Yekta A, Jafarzadehpur E, Doostdar A, Ostadimoghaddam H, et al. (2017) The prevalence of visual impairment and blindness in underserved rural areas: a crucial issue for future. Eye 31: 1221-1228.
11. Nirmalan PK, Thulasiraj RD, Maneksha Y, Rahmathullah R, Ramakrishnan R, et al. (2002) A population based eye survey of older adults in Tirunelveli district of south India: blindness, cataract surgery, and visual outcomes. Br J Ophthalmol 86: 505-512.
12. Dandona R, Dandona L, Srinivas M, Giridhar P, Presad MN, et al. (2002) Moderate visual impairment in India: The Andhra Pradesh eye disease study. Br J Ophthalmol 86: 373-377.
13. Malhotra S, Vashist P, Kalaivani M, Gupta N, Senjam SS, et al. (2018) Prevalence and causes of visual impairment amongst older adults in a rural area of North India: A cross sectional study. BMJ Open 8: e018894.
14. Singh N, Eeda SS, Gudapati BK, Reddy S, Kanade P, et al. (2014) Prevalence and causes of blindness and visual impairment and their associated risk factors, in three tribal areas of Andhra Pradesh, India. PLoS ONE 9: e100644.
15. Rao CR, Shetty RS, Narayanan SS, Kini S, Kamath V, et al. (2018) Prevalence of visual impairment in adults aged 18 years and above in a rural area of coastal Karnataka. International Journal of Health Allied Sciences 7: 31-36.
16. Zhu M, Tong X, Zhao R, He X, Zhao H, et al. (2013) Visual impairment and spectacle coverage rate in Baoshan district, China: Population-based study. BMC Public Health 13: 311.
17. http://apps.who.int/classifications/icd10/browse/2016/en#/H54
18. Dandona L, Dandona R (2006) Revision of visual impairment definitions in the International Statistical Classification of Diseases. BMC Med 4: 7.
19. Marmamula S, Khanna RC, Rao GN (2016) Unilateral visual impairment in rural south India-Andhra Pradesh Eye Disease Study (APEDS). Int J Ophthalmol 9: 763-767.