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Prevalence of low vision among adults in Galle District, Sri Lanka

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ABSTRACT

Introduction: The global initiative to prevent avoidable blindness in the world has taken several measures to accomplish their theme "Vision 2020 – Right to Sight". However, visual problems still remain among the least priority in preventive care. Visual impairment is common after 40 years of age. Thus, it is important to identify the problem of low vision in the community where majority can be easily identified and corrected with minimum cost. This study was aimed to determine the prevalence of low vision among adults aged 40 - 60 years in Galle District, Sri Lanka.

Methods: A Community based cross sectional study conducted in Galle District among adults aged 40 - 60 years. Multistage cluster-sampling method was adapted to select subjects from both urban and rural areas in the district. An interviewer administered questionnaire was administered to collect their demographic and social information followed by checking the visual acuity (VA), using the Snellen chart in the standard manner.

Results: A sample of 708 people recruited and the majority (30.8%, n=218) were in the 40-44 years age group with a mean age of 49.0 (SD 6.2) years. There were 52.3% (n=370) females in the study sample with a male, female ratio of 1 : 1.09. Of the study sample, 88.9% (n=630) were from the rural sector. The prevalence of low vision and blindness for the uncorrected VA was 37.1% (n=263) (CI 95% 33.5 - 40.7) and 0.6% (n=4) (CI 95% 0.56 - 0.65) respectively. Thus the total with visual impairment in the study sample was 37.7% (n=267). When considering the presenting VA, the prevalence of low vision and blindness was 28.1% (n=199) (95% CI: 24.8 - 31.4) and 0.4% (n=03) (95% CI: 0.37 - 0.43) respectively. The total visual impairment of the study sample was 28.5% (n=202). Among all people with visual impairment, 24.3% (65/267) have already corrected their defects.

Conclusions and Recommendations: The prevalence of uncorrected low vision among adults aged 40 - 60 years in Galle district was approximately thirty seven percent. Majority of people with visual impairment have not corrected their defects. Therefore, the policy makers and the health planners have to look into this problem to address the correctable proportion with low vision in this population.

Keywords: *Adults, low vision, Sri Lanka*

Introduction

"Vision 2020 – Right to sight" is the theme of global initiative to prevent avoidable blindness in the world. Sight is a gift given by nature to everybody healthy when they are born but can lose it due to many reasons. According to previous studies, many causes of blindness are avoidable or correctable by recognizing the problem at the correct time and providing simple interventions and modifying relevant risk factors.

The first global estimation of visual impairment done in 1975 indicates that 28 million people were

blind. The estimates done in 1996 reveal that there were 45 million people who were blind and another 135 million with low vision. Among those who were blind, 60% were due to refractive errors and cataract. When these data are projected to the 2020 world population, it has been estimated that this will be doubled in 2020. Out of all treatable eye diseases and treatable causes of blindness, it has been estimated that 75% of all blindness in the world could have been prevented .

Sri Lanka is lacking data regarding the magnitude of visual problems in the community except for a few individual studies conducted on this. The census population and housing survey conducted by the Department of Census and Statistics, Sri Lanka have looked into disabilities in seeing as self-reported by participants. It reports that 41.0 per 10,000 population in Sri Lanka have some sort of disability either due to total blindness, blindness in one eye or due to weak vision. Out of the total male population, 46.6 per 10,000 and out of the total female population 48.7 per 10,000 are having difficulty in seeing. Galle District Department of Census and Statistics reports that 47.7 per 10,000 population in Galle district have difficulty in seeing. The prevalence of blindness in Sri Lanka was nearly 0.5% according to the survey conducted by Eye Care Sri Lanka in 20 districts. They have found that 66% of total blindness was due to cataract .

First national Steering Committee for the Prevention and Control of Blindness in Sri Lanka was established in year 2001 following the launching of "Vision 2020 – Right to Sight" global programme. The national eye care plan was laid down in 2004 in line with vision 2020 priorities .

In Sri Lanka the data on low vision has not being reported and therefore not published in the Annual Health Bulletin. Some patients with these problems are managed at out-patient clinics and at private sector. These data are usually not recorded. It is important to identify the problem of low vision in the community, out of which refractive errors that can be corrected easily and cheaply. Knowing the magnitude of the problem will support the health planners and managers to launch their activities at grass root level to address the needy people in the community in order to achieve the goals of vision 2020. Therefore, this study was designed to determine the prevalence of low vision among adults aged 40 - 60 years in the Galle district.

Methods

A community based cross sectional study was conducted in Galle District of Southern Province, Sri Lanka to determine the prevalence of low vision among adults aged 40 - 60 years in 2011. Galle District has a population of 990,487 belonging to a mixed ethnicity in a land area of 1617 km^2. Majority (87%), of the population reside in rural areas with urban to rural ratio of 1 **:** 8. Thirty four percent of population belongs to the age category of 40 - 60 years .

The sample size was calculated using formula [$n = Z^2_{1-\alpha/2}\ P(1-P)/d^2$] for the descriptive study. According to previous studies done in the Galle district, the prevalence of low vision was 28.8%. Therefore, a prevalence of 30% was used as the anticipated population proportion of low vision in this study. Z score of 1.96 corresponding to an alpha error of 5%, P value of 0.3 and absolute precision (d) of 0.05 considered.

Since cluster-sampling method was adapted the calculated sample size (n=323) was multiplied by the design effect to overcome effects of clustering. This is usually estimated using the results of previous studies of similar design and subjects. Due to the unavailability of previous information about the degree of homogeneity the design effect was taken as two. Further, to compensate for dropout rate another 10% was added to the sample . Accordingly, the total sample size was 711. Since data was collected from 36 equal clusters (20 study subjects from each cluster) the recapitulated final sample size was 720.

Adults between 40 - 60 years who have been residing in the Galle district for a continuous period of three months or more from the date of data collection were included into the study from the selected households. If a single house had more than one family, all families were included into the study and all eligible individuals in a single household were included. Any person who was found to be bed bound among those who fulfilled criteria given under the inclusion criteria was excluded as it was difficult to measure the visual acuity (VA) in them.

To ensure the proportional representation of the urban and rural subjects in the sample, selection of 36 clusters was done at the level of Grama Niladari (GN) divisions located in both areas proportionate to the urban / rural population proportion in the Galle district. In the field, the starting point for recruitment of eligible subjects from a cluster was done by going to the office of the GN in the particular cluster and selecting the direction randomly. All households on either side of the road in that direction was screened for eligible individuals until the required sample size of 20 people were selected.

The principal investigator and six pre-intern medical officers as data collectors and the area GN comprised the field team. The data collectors were trained at the Community Ophthalmology Centre, Faculty of Medicine, University of Ruhuna by a Community Ophthalmologist to refresh their knowledge onVA checking, basic eye examination and on identification of cataract using torch light. Community Ophthalmologist rechecked fifty percent of the study subjects in the field to assess the reliability of field examination and diagnosis. Difficult cases were referred to the Community Ophthalmology Centre for specialist opinion and people with cataract were referred to the Teaching Hospital Karapitiya for necessary treatment.

After obtaining the informed consent an interviewer administered questionnaire was administered. Then the visual acuity was measured using the Snellen chart in the standard manner. Presenting VA was assessed using a standard Snellen chart of numbers (non-illuminating type) at 6 meters. For those who are illiterate tumbling E type of Snellen chart was used. Whenever possible the VA was assessed in good light, outdoors in a seated position. Each eye was tested while the opposite eye was covered. Person was asked to read from top line first and then the next line below. Once a person has started a line, he or she should finish by guessing at all 5 letters on that line. Once at least three letters are missed on a line and all letters on that line have been attempted, then the person has completed that VA measure.

The study participants were grouped into four categories namely normal vision, mild visual defect, low vision and blind, according to their VA level in the better eye (Figure 1), and the VA was measured with and without correction. Following definitions used by World Health Organization were used in this study.

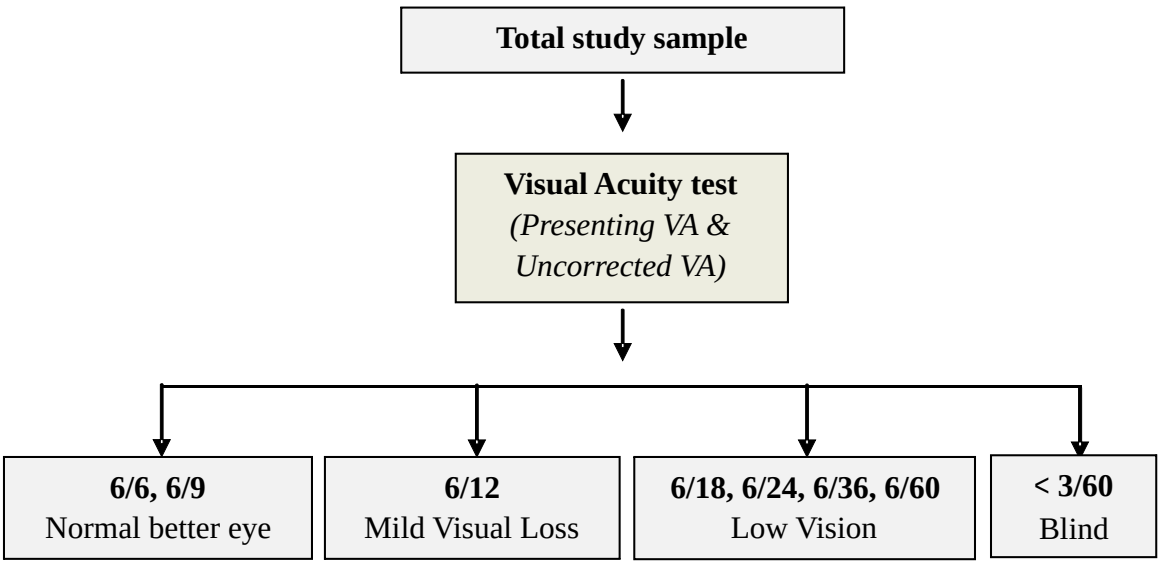

Figure 1: An outline of analysis of the study

Normal vision

Normal vision has been defined as VA of more than 6/9 in better eye (i.e. 6/6 or 6/9 in the better eye).

Low vision

Low vision has been defined as VA less than 6/18 and equal to or better than 3/60 in the better eye.

Visual impairment

Visual impairment has been defined as VA of less than 6/18 in the better eye spanning the low vision and blindness categories as defined above.

Mild visual impairment

The VA 6/12 in better eye was defined as mild visual impairment.

Blindness

Blindness has been defined as VA of less than 3/60 in the better eye or inability to count fingers at a distance of 3 meters in the better eye with or without available means of correction (with spectacles when available).

Uncorrected VA

VA measured without correction (presenting VA on those who are not wearing spectacles and VA without spectacles in those who were wearing spectacles or contact lenses).

Presenting VA

VA measured with spectacles in those who are wearing spectacles or contact lenses (may not be the best corrected VA) and VA without spectacles in those who are not wearing spectacles or contact lenses.

Statistical analysis was done using Epi Info (TM) 3.4.3 database and statistics software for public health professionals from the Centers for Disease Control and Prevention and the SPSS 15.0 software.

Ethical approval was obtained from the Ethics Review Committee, Faculty of Medicine, Galle. Permission was obtained from the relevant administrative and health authorities. Informed consent obtained from all participants and were given the option to withdraw from the study at any time. The obtained data was handled as grouped data preserving the confidentiality.

Results

The study sample enrolled was 708 persons aged 40 - 60 years, which is within the sample size calculated with non-responders. All subjects gave their consent to participate in the study and the non-response rate was nil.

The distribution of basic demographic characteri--stics of the respondents is presented in Table 1. When comparing the study sample with Galle District census and population statistics, a significant deference in the distribution were found between age groups ($p<0.01$) and ethnicity ($p<0.01$) of the study sample and Galle District population. This may be due to extraction of district statistics from 2001 demographic survey on population and housing, after which age group of cohorts may have been shifted. Also, the difference in ethnicity may be due to clustering of religious and other ethnic groups in the normal geographical distribution.

Of the 708 individuals who participated, 338 were males. Majority belonged to the age group 0f 40 - 44 years and 88.4% (n=626) of the sample were married.

Among study participants 40.4% (n=286) had a monthly household income between > Rs. 5,000 to 10,000 rupees while 12.7% (n=90) had a monthly income > Rs. 20,000. Mean monthly income was Rs. 13,516.95 (SD 8729.33) while the range was 2,500 – 75,000 rupees.

The social class of study subjects was calculated according to the social class categorization given by Barker and Hall. According to this 33.3% (n=236) were in Social Class III, 25.9% (n=183) in Social Class V, 22.7% (n=161) in Social Class IV and approximately 17.0% (n=123) in Social Class II. Among males 71.4% (n=241) and among females 64.0% (n=237) had an education level equal to or greater than General Certificate Examination-Ordinary Level [GCE (O/L)].

Table 1: Distribution of demographic and socio-economic characteristics

Characteristics	Study		Adult Group Population in the District*	
	No.	**%**	**No.**	**%**
Age in years				
40 – 44	218	30.8	64,868	29.8
45 – 49	163	23.0	57,076	26.2
50 – 54	152	21.5	53,033	24.4
‡ 55	175	24.7	42,725	19.6
Total	**708**	**100.0**	**217,702**	**100.0**
Mean age±SD = 49.0±6.2 years, Median = 48 in years, Min/Max = 40/60 years				
Sex				
Male	338	47.7	103,094	47.4
Female	370	52.3	114,608	52.6
Total	**708**	**100.0**	217,702	100.0
Area of residence/ Sector				
Urban	78	11.1	25,130	11.7
Rural	630	88.9	188,504	88.2
Total	**708**	**100.0**	**213,634****	**100.0**
Ethnicity				
Sinhalese	689	97.3	206,991	95.2
Tamil	3	0.4	3,942	1.8
Moor and other	16	2.3	6,571	3.0
Total	**708**	**100.0**	**217,504**	**100.0**
Religion				
Buddhist	686	96.9	206,240	94.8
Hindu	3	0.4	2,954	1.4
Islam	16	2.3	6,697	3.0
Roman Catholic/ Christian & other	3	0.4	1,811	0.8
Total	**708**	**100.0**	**217,702**	**100.0**

NS = Not significant

**Dept. of Census & statistics (Census of population & housing) 2001- Galle district*

*** Excluding the estate population*

Visual acuity in the study sample

Out of the total study sample of 708 people, 12.1% (n=86) were using spectacles or contact lenses at the time of enrollment.

The distribution of uncorrected VA and the presenting VA of the study subjects are shown in tables 2 and 3 respectively. The prevalence of low vision and blindness of the above two groups are shown in the table 4. The prevalence of low vision in the uncorrected and presenting subjects was 37.1% and 28.1% respectively. The percentage of subjects with visual impairment was 28.5% (202/708) at the presentation and 37.7% (267/708) when uncorrected indicating that only 24.3% (65/267) people with visual impairment had already corrected their defects at the time of the study.

Table 2: Distribution of uncorrected visual acuity

Uncorrected Visual acuity	Right eye		Left eye		Both eyes		Better eye	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6/6, 6/9	355	50.1	363	51.3	333	68.9	384	55.6
6/12	49	6.9	44	6.2	19	3.9	57	8.6
6/18	73	10.3	81	11.4	32	6.6	85	10.6
6/24	90	12.7	92	13.0	39	8.1	88	11.9
6/36	64	9.0	55	7.8	17	3.5	45	6.4
6/60	67	9.5	63	8.9	39	8.1	45	6.4
≤ 3/60	10	1.4	10	1.4	4	0.8	4	0.6
Total	**708**	**100.0**	**708**	**100.0**	**483***	**100.0****	**708**	**100.0**

** Subjects with different VA in both eyes (225) were not included.*

*** Percentages may not sum to 100% due to rounding error.*

Table 3: Distribution of presenting (corrected) visual acuity

Presenting Visual acuity	Right eye		Left eye		Both eyes		Better eye	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6/6 , 6/9	415	58.6	415	58.6	386	74.5	443	62.6
6/12	49	6.9	56	7.9	24	4.6	63	8.9
6/18	69	9.7	71	10.0	29	5.6	70	9.9
6/24	76	10.7	73	10.3	37	7.1	66	9.3
6/36	44	6.2	36	5.1	11	2.1	29	4.1
6/60	46	6.5	48	6.8	28	5.4	34	4.8
≤ 3/60	9	1.3	9	1.3	3	0.6	3	0.4
Total	**708**	**100.0**	**708**	**100.0**	**518***	**100.0****	**708**	**100.0**

** Subjects with different VA in both eyes (190) were not included.*

*** Percentages may not sum to 100% due to rounding error.*

Table 4: Prevalence of categories of vision according to uncorrected VA and presenting VA

	Uncorrected Visual Acuity			Presenting Visual Acuity		
	No.	**%**	**CI**	**No.**	**%**	**CI**
Mild visual defect	57	8.1	7.52 – 8.71*	63	8.9	8.3 – 9.6*
Low vision	263	37.1	33.5 – 40.7	199	28.1	24.8 – 31.4
Blind	4	0.6	0.56 – 0.65*	3	0.4	0.37, 0.43*
Normal	384	54.2		443	62.6	
Total	**708**	**100.0**		**708**	**100.0**	

** confidence interval for exact probability test was used*

Discussion

The magnitude of the problem of low vision has not been studied properly until the vision 2020 global initiative in 1999. The under estimation of actual situation may be due to the different definitions used in interpreting results (12). The best corrected VA in better eye as in the International Statistical Classification of Diseases (ICD) has been used to define visual impairment, low vision and blindness in many of the studies which sparse the actual number with disease (13). Therefore, the real magnitude of the visual impairment should be more than the above in reality.

This study was conducted in the age group of 40 - 60 years because visual impairment is more prevalent in this age group. The effect on occupation, household activities and on the productivity of the country is high in this age group. Other population based studies done in the world have also targeted the age group above 40 years (14). The distribution of age, sex, ethnicity and the place of residence (urban : rural) were closely represented in the study sample and the Galle district target population ensuring the accurate representativeness of the sample.

Visual acuity is the measure of resolving power of the eye, i.e. the ability to distinguish details and the shape of objects. It is the primary measure of visual function in both research and clinical settings. In this study Snellen chart was used to check VA as it is commonly used in community based studies due to wide availability and familiar to data collectors. When classifying persons with visual loss, the definitions and cut offs of VA used by the different researchers were diverse. In this study VA was measured with and without correction and classified according to the Figure 1.

In the study population 55.6% of people were normal in their better eye without correction. When considering the presenting VA, 62.6% were normal in their better eye. Only 24.3% of people in the community with visual impairment have corrected their defects by the means of spectacles or contact lenses by the time of the study. Among the rest majority could improve their vision with an intervention. But some defects could not be totally corrected and they may remain as people with uncorrectable visual impairment.

The prevalence of low vision without correction (by spectacles or contact lenses) was 37.1% in this study. A previous study done in Sri Lanka in a population above 20 years of age, revealed prevalence of low vision as 16.6%. This difference may be due to age group variation since low vision is more common after 40 years of age (5).

In this study, when considering the presenting VA, the prevalence of low vision was 28.1%. But "The Kandy eye study" done in the central part of Sri Lanka found that the prevalence of uncorrected visual impairment among inhabitants equal to or more than 40 years of age was very low (5.9%) (16).

The prevalence of blindness without correction in this study was 0.6% which is comparable to findings of a previous study in Sri Lanka (0.5%) (5) and to that reported in Singapore (0.5%) (15). In the world population, 0.85% were blind ($\leq$ 3/60) with the best corrected vision (17). The study conducted in Kandy, Sri Lanka found that the prevalence of blindness in population of above 40 years of age was 1.1% (95% CI 0.002-0.020) (16), while in the present study it was 0.4% when considering the presenting VA.

Conclusions

The prevalence rate of uncorrected low vision among adults aged 40 - 60 years in Galle district was approximately thirty seven percent. Only a quarter of of people in the community with visual impairment have corrected their defects. Among the rest majority could improve their vision with an intervention.

Recommendations

Similar studies are recommended in other parts of the country to study the magnitude of the problem and to utilize this data in planning and implementation of eye care services in the country. Detection and correction of visual defects should be done at grass root level via low vision clinics conducted at MOH level. Also people should be motivated to attend services by increasing awareness of gravity of the problem.

Limitations

The study was carried out in Galle district, Southern Province of Sri Lanka where the findings may not be generalised to the country. The study was restricted to people who speak and understand Sinhala.

Authors declare no conflicts of interests.

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