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Prevalence and Associated Factors of Visual Impairment among Adults in Gish Abay Town, North West Ethiopia

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Abstract

Clinical Relevance: The human being understands 75% to 90% of our environment through our vision. Inability to develop this normal visual development, visual impairment, can affect our daily performance and results considerable social, psychological, and economic implications for the patients, their caregivers and for the country at large.

Purpose: The purpose of this study was to determine prevalence and associated factors of visual impairment among adults in Gish Abay town, North West Ethiopia.

Methods: A community-based cross-sectional study was conducted on 660 adults who were selected using systematic random sampling from April to May 2018. Data were entered into Epi Info version 7 and were analyzed by SPSS version 23. Visual examinations were done with Snellen visual acuity and ocular pathology assessments were done by optometrists. Binary and multivariable logistic regression was used to determine factors associated with visual impairment. Variables with P-value <0.05 were considered statistically significant.

Result: A total of 626 participants were included in the study with a 94.8% response rate. The median age of participants was 33 years (IQR: 24 to 51 years). The prevalence of visual impairment was 6.7% (95% CI: 4.3-9.8). The main cause of VI were uncorrected refractive error (62%) followed by cataract (19%). The prevalence of low vision was 2.3% and blindness was 0.8%. Positive family history of ocular disease (AOR: 4.9; 2.85, 8.99), age ≥ 52 years (AOR: 4.85; 3.09, 7.21), history of ocular trauma (AOR: 2.55; 1.05, 7.36), no formal education (AOR: 2.32; 1.28, 5.63) and television viewing distance of ≤ 2 meter (AOR: 2.03; 1.29, 5.01) were factors positively associated with visual impairment.

Conclusion: The magnitude of visual impairment in adults in the study area is significant. Population based screening program especially for refractive error is recommended to minimize the burden of visual impairment in the study area.

Keywords: Visual impairment; Associated factors; Adults; Ethiopia

Abbreviations

VI: Visual Impairment

Background

Visual Impairment (VI) is outlined as a purposeful limitation of the eye(s) or the visual system and might manifest as reduced visual sense or contrast sensitivity, visual field loss, photophobia, diplopia, visual distortion, visual perceptual difficulties, or any combination of the higher than. Vision impairment ranges in severity from delicate visual loss to total absence of light perception [1]. Globally, at least 2.2 billion individuals have vision impairment. In a minimum of one billion – or nearly half – of those cases, vision impairment may are prevented or has nevertheless to be addressed [2].

Uncorrected refractive errors and cataracts are the leading causes of visual impairment and blindness worldwide. The bulk of individuals with vision impairment and blindness are over the age of fifty years; but, vision loss will have an effect on people of all ages [2].

The human creature understands 75% to 90% of our environment through our vision [3]. Therefore, visual impairment will have an effect on our daily performance and other functions, like ability to soundly participate in sports, self-confidence and future careers. It has extensive social, psychological, and economic implications for the patients, their caregivers and for the country at large.

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Vision impairment poses a vast international monetary burden with the annual global costs of productivity losses associated with vision impairment from uncorrected myopia and presbyopia alone calculated to be US $244 billion and US $25.4 billion [3].

Sight is a vital indicator of health and quality of life [4,5]. Individuals with impaired vision could also be at increased risk of injuries [6]. Visually impaired aged persons are at increased risk of falls and fractures [7,8].

The prevalence of VI in USA (age >12 years) were 6.4% [9], German (0.42%) [10], China 17.17% (>18 years) [11]. Another study in China confirmed the prevalence of VI 10.8% and blindness as 2.29%, with best-corrected VA, the prevalence of visual impairment was 5.30%, and 1.93% for blindness [12].

The prevalence of VI in South Indian Andhra Pradesh state was 14.3% [13], Iranian adults (7.6%) [14], Saudi Arabia (13.9%) [15], (23.5%) [16], Ghana (22.7%) [17], Upper Egypt (38.8%) [18] and in Southern Sudan among aged ≥ 5 years was 11.8% [19].

Positive family history of VI [20,21], duration of television/ mobile exposure and distance from television [20,22] and lower family monthly income [11,23], colorblindness [2,242] older age [11,12,20,24-27], lower educational status [11,12,28], rural dwellers [11,28], unemployment [11,28], gender [11,12,27] were the most consistently reported factors associated with VI.

In Ethiopia, the eye problem is among the major public health challenge. It poses huge economic and social impacts for the affected individuals, the society, and the nation at large [29]. The national prevalence of blindness and low vision based on presenting vision in the better eye was 1.6% and 3.7% respectively. The major causes of low vision were cataract (42.3%), refractive error (33.4%), trachomatous corneal opacity (7.7%), other corneal opacity (5.9%) and macular degeneration (4.6%) [29]. The prevalence of VI among adults in Debre Birhan town was 16.8% and Older age, illiterates, previous eye trauma, large family size and family history of eye problem were positively associated with visual impairment [30].

The large proportion of VI in Ethiopia (91%) is due to avoidable causes either preventable or treatable [29]. However, if it's not detected early, it's going to cause irreversible visual defect. When visual loss is present at a younger age, especially in adults of working age, the adverse impact is felt over the remaining years of life. Therefore, the main aim of this study was to determine the prevalence and associated factors of VI among adults in Gish Abay town, North West Ethiopia.

Methods

Study setting and population

A community based cross sectional study was employed to determine the prevalence of VI and associated factors among adults in Gish Abay town from April to May 2018. Gish Abay town, which is located 463 km from Addis Ababa, is the capital of Sekelaworeda in West Gojjam administrative zone. All adults aged ≥ 18 years who lived at Gish Abay town for at least 6 months were included in the study.

Sample size determination

Sample size was determined with single population proportion formula.

$$n = (Z_{\alpha/2})^2 \, p(1-p)/d^2$$

Where (n= Sample size, Z= the value of z statistic at 95% confidence level =1.96, P: Proportion of visual impairment =50% =0.5 (Since no community based study conducted on the presenting visual acuity was, 50% proportion was used), d: Maximum tolerable error (marginal error) 4%=0.04, n=600). By adding 10% non response rate, the final sample size was estimated at 660.

Sampling technique and procedure

A systematic random sampling technique was used to select households using the sampling fraction. The sampling fraction was determined by taking the ratio of households (8,883) to the sample size, i.e. 13. Finally, one eligible adult was selected from each household using a simple random sampling/lottery method if more than one adult was living in the house.

Operational definition

Visual impairment: VI was defined as presenting distance visual acuity worse than 6/12 to No Light Perception (NLP) in either eye. It was further classified into:

- Mild -Visual acuity worse than 6/12 to 6/18
- Moderate -Visual acuity worse than 6/18 to 6/60
- Severe -Visual acuity worse than 6/60 to 3/60
- Blindness -Visual acuity worse than 3/60

Family ocular disease was defined as history of ocular problems in any first-degree relative (parents and grandparents).

Eye trauma

Self-reported previous history of any trauma to the eye.

Data collection tool and procedure

Data were collected by qualified optometrists using standardized check list and physical examinations. Optometrists measured visual acuity including pinhole vision by Snellen's E charts at 6 meter. Adults with a visual acuity of less than 6/12 in one or both eyes underwent ocular examination. Torchlight, direct ophthalmoscope, and handheld slit lamp bio-microscope were used to examine anterior and posterior ocular pathologies. All study participants who had VI were linked to the referral hospital for appropriate management and follow up.

Data management and analysis

Data analysis was carried out using SPSS version 23. Bivariate logistic regression model was used to estimate the odds ratios with their 95% Confidence Interval (CI) and to test the significant associations between the associated factors and visual impairment. Finally, those factors with p-value of less than 0.05 were considered as statistically significant.

Ethics approval and consent to participate

Ethical clearance was obtained from University of Gondar; Ethical Review Committee and a letter of permission were obtained from Gish Abay Administrative Office. Permission was also gained from each household head before contacting study participants. Written informed consent was obtained from each study participant. This study was conducted in accordance with the Declaration of Helsinki.

The study participants were informed about the purpose of the study and their right to refuse and withdraw from the study at any time. Confidentiality was also maintained by excluding identifiers and using codes. VI-related information was given orally for all study

participants after completion of the interview.

Results

A total of 626 participants were included in the study with a 94.8% response rate. The median age of participants was 33 years with interquartile range (IQR: 24 to 51 years). Among the study participants 340 (54.3%) were females. A majority 290 (46.3%) of the participants had no formal education. Around 104 (16.6%) adults had self-reported history of ocular trauma and 11.0% (69) of adults had positive family history of eye diseases (Table 1).

Prevalence of visual impairment

The overall prevalence of visual impairment among adults in this study was 6.7% (95% CI: 4.3-9.8). Greater than half of the participants (54.8%) had monocular VI. Of those adults with VI, 29 (69%) had moderate VI, 9 (21.4%) had severe VI and around 4 (9.5%) adults had a visual impairment under blindness category (Table 2).

The most common cause of VI were refractive error 26 (62%), cataract 8 (19%), strabismus 4 (9.5%), glaucoma 3 (7.1%) and age-related macular degeneration 1 (2.4%). Cataract was the leading cause of bilateral visual impairment followed by refractive error.

Factors associated with visual impairments

In the multivariable analysis after adjusting for sex, ethnicity, and income level and chronic diseases: Age, distance from television, ocular trauma, positive family history of ocular diseases and educational status had statistically significant association with visual impairment.

The odds of VI among adults aged ≥ 52 years were nearly five times greater than those adults aged 18 to 24 years.

Adults with positive history of ocular trauma were 2.55 times to develop VI than those without trauma. The odds of developing VI among adults without formal education were 2.32 times greater than those highly educated (collage and above) individuals.

Adults with positive family history of ocular diseases were nearly five times greater than those without in having VI.

Adults who viewed television at a distance of 2 m or less were two times greater in developing VI than those at a greater distance.

Discussion

The overall prevalence of visual impairment among adults aged ≥ 18 years in this study was 6.7% (95% CI: 4.3-9.8). This finding is lower than the reports from Debre Markos (36.5%) [31], Debre Berhan (16.8%) [30], South Sudan (11.8%) [19], Hong Kong (32.8%) [32], Bangladesh (13.8%) [33], Andhra Pradesh state of India (14.3%) [13], Delhi of India (11.4%) [34], China (17.17%) [11], Egypt (38.8%) [18], Ghana (22.7%) [17], Saudi Arabia (25.2%) [16], (13.9%) [15], Southern Mexico (14.1%) [35].

This discrepancy might be due to hospital-based studies in Debre Markos (36.5%) and in some studies like in Egypt (38.8%), Ghana (22.7%), Bangladesh (13.8%), Hong Kong (32.8%) and India (11.4%), (14.3%) they conducted the study on adults greater than 40 years of age. Previous studies showed that older age associated with higher VI [11,12,20,24-27].

This finding is higher than reports from Kenya (2.4%) [36], Sokoto state of Nigeria (1.9% bilateral), South Korea (4.1%) [28] and Iran (2.5%) [37]. This might be due to VI were assessed in above studies from young age groups and they consider bilateral best corrected visual acuity which underestimates the magnitude of VI.

The prevalence of visual impairment in this study is in line with the studies done in Bahir Dar (8.7%) [20], Cape Town South Africa (7.2%) [38], Atakunmosa, South Western Nigeria (7.4%) [39], Malaysia (9.2%) [40], Mahabubanagar district of India (8.4%) [41], Iran (7.6%) [14], Botucato, Brazil (7.4%) [42]. This discrepancy might be due to similar socio-demographic and socio-economic

Table 1: Socio-demographic and socio-economic characteristics of the study participants in Gish Abay Town, Northwest Ethiopia, June 2018 (n=626).

Variables	Frequency	Percentages
Gender		
Female	340	54.3
Male	286	45.7
Age (years)		
18–24	178	28.4
25–32	150	24
33–51	154	24.6
≥ 52	144	23
Religion		
Orthodox	602	96.2
Others*	24	3.8
Level of Education		
No formal education	290	46.3
Primary education	109	17.4
Secondary education	125	20
College and above	102	16.3
Type of Occupation		
Farmer	150	24
Government employee	96	15.3
Merchant	177	28.4
Housewife	87	14
Job seeker	69	11
Others**	47	7.6
Monthly Income (ETB)		
≤ 800	306	48.9
801 –1500	123	19.6
1501 –2300	70	11.1
≥ 2301	127	20.3
Distance from television		
≤ 2 meter	214	34.20%
2meter to 5 meter	220	35.10%
≥ 5 meters	192	30.70%
Chronic disease		
Yes	65	10.40%
No	561	89.60%
Duration of mobile/television exposure		
≤ 5 hours/day	451	72%
> 5 hours/day	175	28%

Notes: Others*: Muslim and Catholic; Others**: Students, driver and religious leader.

Table 2: Factors associated with visual impairment among adults at Gish Abay town, North West Ethiopia, 2018 (n=626).

Factors	Visual impairment		COR (95% CI)	COR (95% CI)
	Yes (42)	No (584)		
Age (years)				
18-24	6	172	1	1
25-32	9	141	1.82 (1.05, 4.52)	1.58 (1.23, 3.94)*
33-51	11	143	2.20 (1.49, 4.96)	2.51 (1.99, 5.67)*
≥ 52	16	128	3.58 (2.06, 5.45)	4.85 (3.09, 7.21)***
Gender				
Female	32	308	1	1
Male	10	276	0.34 (0.65, 2.54)	0.56 (0.79, 3.21)
Educational status				
No formal education	17	273	0.97 (0.63, 2.57)	2.32 (1.28, 5.63)*
Primary education	11	98	1.79 (1.09, 5.41)	3.47 (1.57, 7.83)**
Secondary education	8	117	1.09 (0.82, 2.36)	2.74 (1.42, 7.05)*
Collage and above	6	96	1	1
Ocular trauma				
Yes	29	300	2.11 (1.26, 6.38)	2.55 (1.05, 7.36)**
No	13	284	1	1
Family history of ocular disease				
Yes	33	291	3.69 (2.37, 9.51)	4.9 (2.85, 8.99)***
No	9	293	1	1
Distance from television				
≤ 2 meter	17	197	1.57 (1.09, 4.71)	2.03 (1.29, 5.01)**
2 meter to 5meter	15	205	1.33 (0.63, 5.21)	1.22 (0.91, 3.52)
≥ 5 meter	10	182	1	1
Chronic diseases				
Yes	19	340	0.59 (0.21, 2.63)	1.00 (0.19, 3.41)
No	23	244	1	1

Notes: *p ≤ 0.05; **p ≤ 0.01; ***p ≤ 0.001; 1.00= reference

characteristics. The average age of the participants in current study (33 years) were similar to the study in South western Nigeria (32.8 years), Iran (37 years) and (38 years) in Boutucato, Brazil and all of the above studies were done based on presenting visual acuity.

Positive family ocular disease was found to be an important factor for VI as supported by different studies [20,21]. This might be due to transmission of genetic factors from visually impaired parent to their offspring.

Older age was another factor which was significantly associated with VI [11,12,20,24-27]. This might be due to as age increases there will be degeneration of ocular tissues which accompanied by development of age-related ocular diseases like age related macular degeneration, cataract and glaucoma. VI was positively associated with history of ocular trauma [30]. This might be due to trauma related deformity of the globe, infection and inflammation, absence of or dislocation of the tissue like dislocated lens.

Distance from television were another factor in this study which is positively associated with VI [20,22]. This might be due to the fact that myopic adults' watches television and other things clearly at a closer distance than actual. Adults with no formal education were another factor which is significantly associated with VI [11,12,28]. This might be due to lack of awareness or knowledge of the different treatment options of VI in illiterates and considering VI as a will of God.

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Authors' Contribution

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agree to be accountable for all aspects of the work. All authors read and approved the final manuscript. All authors contributed equally.

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