

Visual Impairment and Associated Factors among Secondary School Students of Assosa Zone, West Ethiopia

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Abstract

Background: Visual impairment is a major health issue that imposes a great burden to all nations globally. Ethiopia is one of the developing countries in Africa, with poor health service coverage especially eye health care and is believed to have one of the world's highest rates of blindness.

Objective of the Study: To assess prevalence of visual impairment and associated factors among high school students of Assosa zone, South West Ethiopia.

Materials and Methods: Institutional based cross-sectional study design was used to assess prevalence of visual impairment and its associated factors among high school students of Assosa zone, South West Ethiopia using multi stage sampling. Data was fed into Epidata 4.4.2.win 64 and exported to SPSS version 20. Binary Logistic Regression (bivariate and multivariate analysis with backward LR) was used to identify the associated factors to visual impairment. Data expressed in percentage, mean, \pm SD and P-value \leq 0.05 considered as a statistically significant. Data presented with text, tables.

Results: In the present study, response rate was 97.6%. Among 492 randomly selected high school students, 249 (50.6) were females. The mean age was 17.27 (SD \pm 1.14) with minimum and maximum age of 14 and 31, respectively. Majority of participants 453 (92.1%) were urban residents. In this cross-sectional study, the prevalence of visual impairment accounts for 10.4%.

Conclusion: School type, spending on cell phone, duration of reading books, not participating in sport and no history of seeking eye were factors associated with visual impairment.

Keywords: Visual Impairment; Assosa Zone; South West Ethiopia

Introduction

It has been estimated that 75 - 90% of all learning in the classroom comes to the students either wholly or partially via the visual pathway [1].

Visual impairment is a significant loss of vision. If early diagnosis and treatment are used, visual impairment can be corrected easily [2].

Visual impairment is a major health issue that imposes a great burden to all nations globally [3]. Visual impairment in children is a severe worldwide public problem. It can be detrimental to child's ability to learn [4].

The Vision 2020 strategy for the elimination of avoidable visual impairment and blindness includes the correction of refractive errors [5]. Refractive errors (REs) are common in children and is the most common cause of visual impairment globally and the second most common cause of treatable blindness [6].

Myopia is an important health issue in Asia and is associated with long hours of reading and screen time with use of computers and video games [7].

Visual impairment is caused by cataract, glaucoma, uncorrected refractive errors, age-related macular degeneration and corneal opacity. It is also associated with the quality of health service and the socioeconomic status of the people [8]. Uncorrected Refractive Error is one of the leading cause of amblyopia that exposes children to poor school performance [9].

Statement of the problem

Globally, greater than 18 million people who are visually impaired are younger than 15 years. In all, 26 million people living in Africa are visually impaired. It has an impact on the development and prosperity of different countries. Visual impairment is more common in developing countries [2].

According to World Health Organization estimation 153 million people with visual impairment were due to uncorrected refractive errors. Out of these 8 million are blind and 145 have low vision. Children account for 13 million and adults account 45 million. 90% of these visually impaired are living in low- and middle- income countries. The impact of blindness due to refractive errors in children would place a greater socio- economic burden on society more than the impact of cataract blindness in old age [10].

A meta-analysis in United States showed most of low vision case were due to uncorrected refractive errors [11].

A study in Southern China showed the prevalence of uncorrected, presenting, and best-corrected visual acuity 20/40 or worse in the better eye was 22.3%, 10.3%, and 0.62%, respectively. Refractive error was the cause in 94.9% of eyes and myopia accounts 73.1% [5].

A study in Germany showed that those with mild or moderate/severe vision impairment reported significantly poorer vision-specific functioning and emotional well-being [12].

A study in Iran showed that 14.9% of the studied schoolchildren were myopic [3]. A study in India showed that the prevalence of cases of RE was 94 (19.5%). Of these cases, (97.9%) of them had myopia [6]. 26 million people living in Africa are visually impaired. 12 million school age children are affected by refractive error [8].

A study in South Korea shows the prevalence of myopia among 19 years old males was 96.5% and myopic refractive error was associated with academic achievement [13]. A study in China showed that the prevalence of visual impairment was 42% and among the children with visual disability 98.7% was due to refractive error [14].

Eye Health care in Ethiopia is poor and believed to have one of World's highest rate of blindness. 80% of blindness and visual impairment is avoidable and refractive error is second leading cause of low vision (33.4%) and blindness (7.8%) in Ethiopia. In a study done

in Debarke and Kola Diba towns of northern Ethiopia, the prevalence of visual impairment due to refractive errors in school children was 7.6% [10].

A study in Debre Markos showed overall prevalence of refractive error was 43 (10.2%). Myopia was found among the most dominant 5.47% followed by astigmatism 1.9% and hyperopia 1.4% in both sexes [9].

A study in Arada sub city, Addis Ababa showed the prevalence of visual acuity impairment (VA) of $\leq 6/12$ on either eye was 5.8%, VA $< 6/18$ on either eye was 1.1%, and VA $< 6/18$ on the better eye was 0.53% [1].

Significance of the study

Visual impairment is common in high school students as they involve in reading a lot for national examinations. But they may not be aware of it. Visual impairment can affect school performance and other functions, such as ability to safely participate in sports. Most cases of visual impairment and blindness can be treated and corrected. So that this study will assess the prevalence of visual impairment and associated factors and study participants will be advised and linked to responsible bodies for proper management. It may also be used as a baseline for further research and used as an input for policy makers.

Objective of the Study

General objective

To assess magnitude of visual impairment and its associated factors among students in selected high schools of Assosa zone, Benishangul Gumuz region.

Specific objectives

To determine the magnitude of visual impairment among students in selected high schools of Assosa zone

To identify factors associated with visual impairment.

Materials and Methods

Study area and period

The study was conducted in high schools (9 - 12) found in Assosa zone, Benishangul-Gumuz Region, has a latitude and longitude of $10^{\circ}04'N$ $34^{\circ}31'E$, with an elevation of 1570 meters. Assosa-the main town of the region is located 661 km away from Addis Ababa to the west. The 2007 estimated population of Assosa zone was 310,822, of whom 158,932 are men and 151,890 women. There are eight high schools, one General hospital, 13 Health centers and 16 medium clinics in Assosa zone during study period.

Currently, according to Assosa zonal education department, the number of high school students in Assosa Zone is 24,346.

Institutional based cross sectional study design was used to assess the magnitude of visual impairment and associated factors among selected high school students of Assosa zone Benishangul Gumuz region.

Source and study population

Source population

Those students in selected high schools of Assosa zone.

Study population

Those randomly selected students.

Inclusion criteria

- High school students in Assosa Zone.

Exclusion criteria

- Students having recent history of ocular trauma and active ocular infection especially on the cornea and crystalline lens will be excluded from the study.

Sample size determination and sampling technique

Sample size

Sample size was calculated based on study conducted in Gondar in 2016 taking the prevalence of visual impairment as 12%. Therefore, with single population proportion formula sample size will be:

$$n = (Z\alpha/2)^2 \cdot p \cdot q/d^2 \text{ with 95\% confidence interval}$$

Where n = required sample size

$$Z\alpha/2 = \text{Critical value at } 0.05 = 1.96$$

p = Prevalence of visual impairment which is 12%

q = Negative prevalence of visual impairment which is 88%

d = Margin of error taking 4%

n = 240 with 2 design effect

n = 480 adding 5% non-response rate

n = 504.

Sampling technique

Multi stage sampling technique was used to select study participants in Assosa zone high schools, Benishangul Gumuz region. Three schools out of eight high schools were selected using simple random sampling method after a list of high schools (9 - 12) obtained from the Assosa zonal education department. In the three randomly selected high schools, there were a total of 4123 students. Then systematic random sampling method with proportional allocation was applied to three randomly selected (Assosa government school (2349), Assosa private (702) and bambasi (1072) high schools to select required sample size 357.

Variable

Dependent variable

Visual impairment.

Independent variable

- Age
- Sex
- Religion
- School type
- Income

- Parental education status
- Familial myopia
- Type of work
- Working distance
- Television, mobile exposure, medical visit.

Operational definitions

- Blindness: Snellen chart reading (6/60) or refractive field loss of 10° relative to the point of fixation.
- Visual impairment: Snellen chart reading (6/9-6/60).
- Refractive error: An optical defect of the eye that prevents light from being brought to a sharp focus on the retina.
- Astigmatism: An irregularity on the surface of cornea (optical lens defect).
- Hyperopia: Refractive error, also known as far sighted-ness, where visual acuity is good at far and poor at near.
- Myopia: On the basis of the American Academy of Optometry myopia <-3.00 D is low myopia, -3.00 D to -6.00 D is medium, and >-6.00 D is high myopia.

Data collection procedure

Data collection tools adapted from reviewing different literatures. Semi-structured questionnaire was used to collect relevant information based on the study objectives. Two ophthalmic nurses for data collection/interviews and two optometrists for eye examination were assigned. In each school, the principal prepared two separate rooms to conduct the medical test. The first was used to screen and examine refractive errors by an optometrist through the auto refractor test, Snellen chart reading and retinoscopy checkup.

Data processing and analysis

Data was checked, cleared and feed into Epi-data (version 4.4.2.0.win.64) and then exported to SPSS (version 24) software for statistical analysis. After complete entry of all the data, soft copy was checked with its hard copy to see the consistency. The study employed descriptive analysis to determine magnitude of visual impairment. Binary logistic regressions (bivariate and multivariate with Backward LR) was used to identify associated factors to visual impairment. In Bivariate analysis, Variables who had P-value less than 0.25 were entered into multivariate analysis. Data expressed in mean, \pm SD, texts, tables, figures, charts and $P < 0.05$ was considered as a statistically significant.

Data quality management

Questionnaire, which contains socio-demographic and behavioral characteristics, was translated to local language Amharic then back to English for its consistency. One day training on the contents of the questionnaire, data collection techniques, and research ethics was given for data collectors. Any doubts/question in the method that they going to undertake was clarified.

Questionnaire was pre-tested in 10% of sample size in Homosha high school and some adjustment was made. The principal investigator supervised data collectors and control any kind of procedures and processes that may affect the result at each step. Working and acceptable eye examination instruments was used. During the actual data collection period, the questionnaire was checked every night for completeness.

Ethical considerations

Ethical clearance was obtained from Assosa University Institutional Review Board (IRB.) After getting letter of cooperation from schools, written informed consent form was given to each of the students aged < 18 years to be taken to their parents or guardians the day before

data collection. Students aged < 18 years were only recruited if their parents or guardians gave assent and signed the consent forms, and willing for the students to take part in the study. All study participants aged ≥ 18 years and above provided their own written informed consent. Each study participant was informed about the research, their right to abandon, the involvement at any time and confidentiality of information was maintained during data collection, analysis.

Results

Socio-demographic characteristics of study participants

In the present study, response rate was 97.6%. Among 492 randomly selected high school students, 249 (50.6) were females. The mean age was 17.27 (SD ± 1.14) with minimum and maximum age of 14 and 31, respectively. Majority of participants 453 (92.1%) were urban residents (Table 1).

Characteristics		Frequency	Percentage
Age	14 - 18	466	94.7
	19 - 23	25	5
	24 - 28	0	
	> 28	1	0.2
Sex	Male	243	49.4
	Female	249	50.6
Religion	Orthodox	321	65.2
	Muslim	126	25.6
	Catholic	8	1.6
	Protestant	37	7.5
	Others	0	0
Number of family	≤ 4	319	64.8
	> 4	173	35.2
Parent marital status	Married	477	97
	Unmarried	2	.4
	Widowed	7	1.4
	Divorced	6	1.2
Parent occupation	Gov.t employee	179	36.4
	Farmer	45	9.1
	Merchant	258	52.4
	NGO	1	0.2
	Daily laborer	4	0.8
	Other	5	1
Parent educational status	No formal education	45	9.1
	Primary school	37	7.5
	Secondary school	263	53.5
	Diploma and above	147	29.9
Residence	Urban	453	92.1
	Rural	39	7.9

Table 1: Socio-demographic characteristics of selected high school students of Assosa Zone, West Ethiopia from April 1, 2021 - November 30, 2021.

Out of 492 selected study participants, 414 (84.1%) were from government school the remaining 78 (15.9%) were from private school. 91.3% of study participants have television in their house. 95.1% of study participants use cell phone. 2 (0.4%) of study participants are unable to read books. 56.3% of them have participation in sports. 93.9% of study participants had no history of seeking to eye care/ screening (For details table 2).

Characteristics		Frequency	Percentage
School type	Gov.t	414	84.1
	Private	78	15.9
TV in the house	Yes	449	91.3
	No	43	8.7
TV distance to watch	≤ 2	92	18.7
	> 2	357	81.3
Duration of TV watch/day	< 3	404	90.8
	≥ 3	45	9.2
Mobile usage	Yes	468	95.1
	No	24	4.9
Duration on mobile/day	≤ 3	429	87.6
	> 3	39	12.4
Reading books	Yes	490	99.6
	No	2	0.4
Duration of reading books/day	≤ 2	399	81
	> 2	93	19
Reading medicine instructions	Yes	462	93.9
	No	30	6.1
Difficulty from dim light to bright light	Yes	51	10.3
	Sometimes	48	
	No	393	79.8
Hx of seeking eye	Yes	462	93.9
	No	30	6.1

Table 2: Behavioral and clinical characteristics of selected high school students of Assosa Zone, West Ethiopia from April 1, 2021 - November 30, 2021.

We found School type, spending more time on cell phone and books, not participating in sport and no history of seeking eye were factors associated with visual impairment (For details table 3).

Discussion

In the present study visual impairment accounts 10.4%, of which 9.1% are myopic and remaining 1.3% are hyperopia and astigmatism, which is similar to study conducted in Southern China (10.3%), Iran (14.5%) and Debre Markos (10.2%) [3,9,14].

Characteristics	N (%)	COR (95% CI)	Visual	Impairment	
			P-value	AOR (95% CI)	P-value
Sex					
Male	243	1			
Female	249	0.931 (0.5, 1.663)	0.81		
Parent marital status					
Married	477	1			
Unmarried	2	4.5 (0.816, 25.6)	0.084		
Widowed	7	1.2 (0.118, 13.2)	0.853		
Divorced	6	2 (0.223, 14.4)	0.423		
Parent occupation					
Gov.t employee	179	1			
Farmer	45	11 (1.7, 75.2)	0.01	0.12 (0.1, 96)	0.53
Merchant	258	1.2 (0.18, 8.1)	0.84	0.02 (0.1, 41)	0.32
NGO	1	2 (0.21, 13.1)	0.52	0.03 (0.1, 24)	0.3
Daily laborer	4	5.9 (0.9, 38)	0.059	5 (0.1, 23)	0.41
Other	5	2 (0.11, 35.1)	0.63	0.13 (0.2, 12.1)	0.5
Parent education					
No formal edu.	45	7.5 (2.9, 19.06)			
Primary sch	37	0.26 (0.13, 0.55)	0.000	4.4 (.058, 339)	0.5
Secondary sch.	263	1.13 (0.39, 3.2)	0.000	3 (0.13, 72.2)	0.49
Diploma and above	147	1	0.823	8.5 (0.88, 83.1)	0.064
Residence					
Urban	453	1			
Rural	39	9.5 (4.6, 19.6)	0.000	2.9 (0.03, 281)	0.647
Sch. Type					
Gov.t	418	1			
Private	78	5.7 (3.1, 10.7)	0.000	2.8 (6.8, 11.9)	0.003**
TV in the house					
Yes	449	12.2 (.747, 199.4)			
No	43	1	0.08	1.7 (0.7, 4.3)	0.71
Tv distance					
≤2m	92	17.1 (7.4, 39.6)			
>2m	357	1	0.000	1.37 (0.28, 6.64)	0.694
TV stay					
≤ 3h	328	1			
> 3h	21	9.5 (3.6, 24.9)	0.000	0.096 (0.009, 1)	0.056

Mobile usage					
Yes	471	2.8 (1, 8.2)	0.051	3 (0.9, 2.1)	0.43
No	21	1			
Mobile stay					
≤ 3h	431	1		0.77 (0.018, 0.324)	
> 3h	39	7.7 (3.7, 16.3)	0.000		0.000**
Duration of Reading books					
≤ 2h	399	1	0.000	0.09 (0.041, 0.0.29)	0.000**
> 2h	93	18.1 (9.2, 35.7)			
Difficulty from dim light to bright					
Yes	51	3.5 (94, 125.2)	0.000	0.6 (0.6, 4.2)	0.52
Sometimes	48	8.8 (3.5, 22.1)	0.000	1.2 (0.34, 2.31)	0.68
No	393	1			
Participating in sport					
Yes	277	9 (4.3, 22.5)	0.000	10.5 (2.7, 40.4)	0.001**
No	215	1			
History of seeking eye					
Yes	30	1	0.001	8.6 (1.35, 55.08)	0.023**
No	462	4.2 (1.8, 9.9)			

Table 3: Association of socio-demographic and behavioral characteristics to visual impairment.

However, lower than a study conducted in India (19.5%) [6], China (42%) and higher than a study conducted in Bahirdar (8.7%), Debarak and Kolladba (7.6%), Arada sub city (5.8%), Lideta sub city (4.4%) [5,9,15]. This variation may be due to difference in study area, sample size.

In our study 6.3%, 0.2%, 0.4% and 0.2% of study participants have visual acuity of right eye 6/9, 6/12, 6/18, and 6/60 respectively. 5.7%, 0.2% and 0.2% of study participants have visual acuity of left eye/9, 6/12 and 6/18, respectively. This is in line with a study conducted in mekelle [16].

In this cross-sectional study school type, spending on cell phone, duration of reading books, participating in sport and history of seeking eye before were factors associated with visual impairment. This finding is in line with study conducted in Iraq, Bahir dar, Gondar, Lideta Sub city [15,17].

Being in private school has five times getting risk of visual impairment than in government. This is in line with study conducted in Iraq and Gondar [12,17]. This may be due to different outdoor activities in private causing burden to eyes.

Spending more time on cell phone and books has more risk of getting visual impairment than those spending few hours. This is in line with a study conducted in Bahrdar [15].

In this study there is positive correlation between participating in sport and seeking eye with no visual impairment.

Recommendation

Based on the findings of this study, we recommend:

- Parents should advise study participants to seek eye screening as soon as possible, participate in sport, limit the duration they spend on cell phone and books.
- Zonal health department and zonal education department should work together to enhance eye seeking behavior, create suitable environment/school.
- Since it is cross-sectional study, we recommend researchers to conduct prospective cohort study to identify causes of visual impairment.

Limitation of the Study

- Being cross-sectional study didn't differentiate cause and effect relationship.
- There was no optimal illumination during the study this might slightly affect the result.

Conclusion

In this cross-sectional study visual impairment accounts 10.4%. School type, spending more time on cell phone and books, not participating in sport and no history of seeking eye were factors associated with visual impairment.

Declarations

Ethical clearance was obtained from Assosa University Institutional Review Board (IRB) and letter of cooperation from Benishangul education beuro. After getting letter of cooperation from schools, written informed consent form was given to each of the students aged < 18 years to be taken to their parents or guardians the day before data collection. Students aged < 18 years were only recruited if their parents or guardians gave assent and signed the consent forms, and willing for the students to take part in the study. All study participants aged ≥18 years and above provided their own written informed consent. Each study participant was informed about the research, their right to abandon, the involvement at any time and confidentiality of information was maintained during data collection, analysis and interpretation.

All methods were carried out in accordance with relevant guidelines and regulations.

Availability of Data and Materials

Data sets used and/analyzed during current study are available from the corresponding author on reasonable request.

Conflict of Interest

Authors declare that they have no conflict of interest.

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Author's Contribution

L.M. design the methodology, managed the budget, supervised data collectors, analyzed data, wrote and reviewed main manuscript. M.Y. and D.G. supervised data collectors, reviewed the manuscript. S.M. and W.D wrote and reviewed the manuscript, prepared tables.

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Bibliography

1. Darge HF, *et al.* "The Prevalence of Visual Acuity Impairment among School Children at Arada Subcity Primary Schools in Addis Ababa, Ethiopia". *Indian Journal of Ophthalmology* 1 (2017): 10-17.
2. Aniza I, *et al.* Prevalence of Visual Acuity Impairment and Its Associated Factors Among Secondary School Students in Beranang, Selangor 12.1 (2012): 39-44.
3. Norouzirad R, *et al.* "The prevalence of refractive errors in 6- to 15-year-old schoolchildren in Dezful, Iran". *Journal of Current Ophthalmology* 27.1-2 (2015): 51-55.
4. Abdulameer AJ, *et al.* "Prevalence and Possible Attributes of Decreased Visual Acuity among Primary Schoolchildren in Kufa City, Al - Najaf Governorate". *Medical Journal of Babylon* 15 (2018): 57-62.
5. He M., *et al.* Refractive Error and Visual Impairment in Urban Children in Southern China (2003): 1-7.
6. Joseph N, *et al.* Proportion of Refractive Error and Its Associated Factors among High School Proportion of Refractive Error and Its Associated Factors among High School Students in South India (2016).
7. Saxena R, *et al.* Incidence and progression of myopia and associated factors in urban school children in Delhi: The North India Myopia Study (NIM Study) (2017): 1-12.
8. Press D. "Prevalence and factors associated with childhood visual impairment in Ethiopia". *Clinical Ophthalmology* 11 (2017): 1941-1948.
9. Markos Sewunet SA, *et al.* "Uncorrected refractive error and associated factors among primary school children in Debre". *BMC Ophthalmology* 14 (2014): 1-6.
10. Nebiyat K, *et al.* "Refractive errors among school children in Addis Ababa, Ethiopia". *Journal of Ophthalmology East Cent South Africa* (2015): 57-62.
11. Survey NE. Estimates of Incidence and Prevalence of Visual Impairment, Low Vision, and Blindness in the United States 21287.1 (2018): 12-19.
12. Finger RP, *et al.* The Impact of Vision Impairment on Vision-Specific Quality of Life in Germany AND 52.6 (2011).
13. Jung S, *et al.* "Prevalence of Myopia and its Association with Body Stature and Educational Level in 19-Year-Old Male Conscripts in Seoul, South Korea". *Journal of Clinical Epidemiology* 53.9 (2012): 5579-5583.
14. Congdon N, *et al.* Visual Disability, Visual Function, and Myopia among Rural Chinese Secondary School Children: The Xichang Pediatric Refractive Error Study (X-PRES)- Report 1 (2008): 2888-2894.
15. Dhanesha U, *et al.* "Prevalence and causes of visual impairment among schoolchildren in Mekelle, Ethiopia". *Cogent Med. Cogent* 5.1 (2018): 1-9.

16. Prevalence and Associated Factors of Visual Impairment Among School-Ag OPTO.
17. Optometry C. "Prevalence and associated factors of myopia among high school students in Gondar town, northwest Ethiopia, 2016". *Clinical Optometry* 9 (2017): 11-18.

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