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Prevalence of Refractive Errors in Urban and Rural School Children in Ethiopia - A Comparative Survey

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Abstract

Background: Uncorrected refractive error is an important cause of childhood visual impairment. Prevalence and risk factors in refractive error among urban and rural students are unclear in Ethiopia. This study was conducted to determine the prevalence and risk factors for refractive errors in schoolchildren in urban and rural settings in Ethiopia.

Methods and Analysis: A school based cross-sectional survey using multi-stage randomization technique. Six to sixteen-year-old school children from elementary schools from a rural area and urban area in Ethiopia were included. All children underwent a comprehensive questionnaire and eye examination.

Results: A total of 1,114 children aged 6 - 18 years were included; 6.9% of them had visual impairment, with uncorrected refractive errors accounting for 90% of cases. The prevalence of refractive error in urban settings was 10.2% and 4.5% in rural settings (OR 2.39, 95% CI 1.46 - 3.9, P < 0.001). The prevalence of myopia was more common in urban students than rural ones (7.2% vs. 1.2%; OR 6.10, 955 CI 2.58 - 14.43, P < 0.00001). Myopia was significantly associated with females, older children, children from urban schools, and children spending prolonged hours of near-work activity. Most children who had refractive error during examination and needed spectacles did not have the necessary spectacles.

Conclusion: Visual impairment due to uncorrected refractive error is a public health problem among school-age children in Ethiopia. Routine and effective school eye health strategies are required to eliminate this treatable cause of visual impairment.

Keywords: *Prevalence; Refractive Error; Risk Factors; School Eye Heath; Urban-Rural Disparity; Visual Impairment*

Introduction

Refractive error (RE) happens when parallel light rays from infinity pass through the eye's dioptric power when accommodation is at rest and focus either in front of or behind the retina [1]. Uncorrected refractive error (URE) is the most common cause of visual impairment worldwide and the second leading cause of treatable blindness [2,3].

Children are more vulnerable because URE increases the risk of ocular diseases [4], interferes with binocular vision [5] and significantly lowers learning and intellectual capacity [6,7].

Myopia significantly impacts the quality of life [8,9] and can result in children performing poorly in school if it is not treated [10,11].

Studies show that the prevalence of RE varies widely around the world and project that, in the absence of control measures, myopia will significantly increase, affecting almost 5 billion people by the year 2050 [12]. According to estimates by the Vision Loss Expert Group, URE is the main cause of vision impairment, accounting for 48.9% of cases worldwide and 62.9% of cases in South Asia [13]. At least 826 million people have a distance- or near-vision impairment that could be addressed with an appropriate pair of spectacles [14]. According to estimates, 12 million of the projected 19 million visually impaired children globally have URE [15].

Refractive error has been highlighted in the Global Initiative, Vision 2020, for the elimination of preventable blindness [16,17]. Studies have shown that genetics play a role in myopia development [18]. Additionally, growing evidence shows that myopia development in children is strongly influenced by lifestyle variables such as time spent outdoors, intense near-vision activity [19-24] and a younger population [25]. The development of myopia has been linked to urban living as a significant environmental component. Studies from several countries comparing children's refractive error in urban and rural regions have shown this [7,26-29], while RE-related vision impairment was 2.1% [30]. In 2015, the prevalence of refractive error and visual impairment due to refractive error in sub-Saharan Africa was 12.6% and 3.4%, respectively [31].

The pooled prevalence of visual impairment due to RE was 6% in Ethiopia, and various studies conducted in different parts of the country showed that visual impairment due to refractive error is between 1.9% and 11% [32-34]. There are no nationwide screening programs for vision problems in Ethiopia's schools [35,45]. However, the 2006 National Survey report found that uncorrected refractive problems were the cause of 11.4 percent of blindness [36]. The prevalence and risk factors of REs in urban and rural schoolchildren in Ethiopia are still unclear.

We conducted this school-based study in the urban and rural areas of Ethiopia in order to better understand the prevalence of REs and the risk factor disparities among schoolchildren (6 - 16 years old) in urban and rural settings.

Subjects and Methods

Study design and setting

This cross-sectional school-based survey was conducted from April to May 2019 in selected primary schools in urban (Addis Ababa) and rural (Gurage Zone). The research was approved by the Institute Ethics Committee of the Addis Ababa University Department of Ophthalmology (Ref No. 012/19/AAUDO). All study procedures adhered to the principles outlined in the Declaration of Helsinki for research involving humans. Relevant approvals for the study were also obtained from district and sub-city education offices and school principals. Written informed consent was obtained from a parent or legal guardian of each child prior to the examination. Patients or the public weren't involved in our research's design, conduct, reporting, or dissemination plans.

Study setting and population

A total of 1413 students were selected by using the population proportion formula after adding 10% of the non-response rate. A multi-stage random cluster approach was conducted for sampling. In the first step, three woredas (sub-districts) from the rural (Gurage Zone) and three sub-cities from the urban (Addis Ababa City) were randomly selected. Addis Ababa is the capital city of Ethiopia, and the structure of the power organization of the city includes ten sub-cities, out of which Akaki Kaliti, Nifas Silk, and Yeka sub-cities were randomly selected.

Gurage Zone is located in the Southern Nations Nationalities of Ethiopia and has 15 woredas (sub-districts), out of which Abeshegie, Enemore Ener, and Kebena woredas were randomly selected. The selected sub-cities and districts were the primary sampling units (PSU).

In the second step, five (three governments and two private schools) and three government primary schools were selected from urban (Addis Ababa) and rural (Gurage Zone), respectively, by using the proportional allocation to size (PPS) method, which became the secondary sampling unit (SSU). In the third step, three classes from each selected school were randomly selected, and the sample was allocated using PPS. In the final step, all students of the selected classes aged 6 - 18 were sampled using systematic random sampling.

Field work

After receiving approval from the school administration, the names of the enrolled, age-eligible students were collected from the schools, and study consent forms were given to these children to be distributed later. Parents were encouraged to call the research team on the phone for clarifications or to show up on the days that the screening visits were scheduled to meet with the team in person. In order to not interfere with the students' everyday schedules, exams were typically held during and after school hours at times determined by the school administration.

For each selected school, between three and five visits were done in order to collect the required sample. Additionally, it was encouraged for children who already wore glasses to do so at school. Only those who agreed to have cycloplegic eye drop installations into their children's eyes were regarded as having given consent.

Interview

In this study, all participants and their parents completed a detailed questionnaire form. The questionnaire included two parts (participants' information section and parents' information section). Basic socio-demographic data, such as age, gender, habitation in urban or rural areas, educational status of the parents, average monthly income of the family, refractive error history, and medical history, was included in the first part of the questionnaire. Moreover, this questionnaire section additionally included questions on near-work activities such as the amount of time spent on studying or watching television, mobile phones, and computer activities per day, and outdoor activities such as how long the children spent in outdoor activities per day. The first part of the questionnaire was filled out by their parents.

Eye examination

The eye examination was conducted on school premises by a team comprising ophthalmologists (consultants and residents in training), experienced optometrists, and trained visual acuity assistants. Visual acuity was measured under the tree shades and well-illuminated class rooms using the Snellen E chart. The visual acuity was tested with and without spectacles for children who wore their glasses to school. Further detailed ocular examinations were performed for those with subnormal vision by an ophthalmologist. The external eye, anterior, and posterior segments of the eyes were examined using a portable slit lamp biomicroscope (Killer Ltd., UK), and the posterior segment was examined using a direct ophthalmoscope after dilatation of the pupil. Only children with visual acuity less than 6/6 in at least one eye underwent evaluation by retinoscopy. Objective refraction was performed with retinoscopy by an experienced optometrist, half an hour after the instillation of 1% cyclopentolate eye drops.

Definitions

1. Visual acuity was categorized as follows: 19
   a. Normal/near normal vision ≥ 6/9.5 or better in both eyes,
   b. Mild impairment in the better eye 6/12 - 6/19 in the better eye,
   c. Moderate impairment in the better eye 6/24-6/48 in the better eye,
   d. Severe visual impairment/blindness 6/60 or worse in both eyes.

2. 2 Refractive errors were considered: a) when there was subnormal vision with a non-plano power on retinoscopy, in the absence of anterior or posterior segment abnormalities; b) if the visual acuity improved with pinhole testing and c) in subjects with latent hyperopia, i.e. visual acuity of 6/6 with a +1.75 D lens.
3. Myopia was defined as a spherical equivalent (SE) refractive error of at least −0.50D or worse. Children with myopia in one eye or both eyes were regarded as myopic.
4. Hyperopia was defined as an SE of +2.0D or greater. Children with hyperopia in one eye or both eyes were regarded as hyperopic, as long as neither eye was myopic.
5. Astigmatism was investigated at cylinder values of < 0.75, >/= 0.75 to < 1.50, >/=1.50 to < 2.00, and >/= 2.00D.

Statistical analyses

Basic descriptive statistical analysis was undertaken using IBM SPSS Statistics (Version 21.0). Associations between refractive error and continuous and categorical variables were computed using Fisher's exact test and Pearson chi-square (χ^2) test, respectively. Continuous variables were compared using ANOVA. Values of $p < 0.05$ were considered statistically significant. The goodness of fit of the final model was assessed using the Hosmer and Lemeshow test (4) and the final model fitted the data well (p 0.876). Adjusted odds ratios are reported with 95% confidence-intervals; a p value of < 0.05 was considered statistically significant.-

Results

A total of 1413 children were registered for the study. However, some children did not complete the study. After excluding children with incomplete data, and children who participated but were aged above 16, there were a total of 1114 children included in the study analysis (78.8% of the eligible population). This response rate did not differ significantly between urban and rural schools.

Characteristics of the study population

There was a preponderance of female children, where 600 (53.9%) were female, versus 514 (45.1%) were male; 506 were from Addis Ababa (urban); and 608 were from the Gurage Zone (rural). The majority of the study participants (n = 753, 67.6%) were greater than 10 years of age, and the mean age at presentation was 11.67 ± 2.49 (range, 6 - 16 years). All of the students from the rural schools attended public schools. Only 32 (2.9%) of the children wore spectacles at the time of the examination. The majority of the parents of the study participants didn't finish high school. The sociodemographic characteristics of children examined in rural and urban groups were compared (Table 1).

Variable		Overall	Urban	Rural
N (Subjects %)		1114	608 (54.6)	506 (45.4)
Sex	Male	514	265 (51.6)	249 (48.4)
	Female	600	343 (57.1)	257 (42.9)
Age	Mean **± SD (range)**	11.67 ± 2.49 (6-16)	11.76 ± 2.62 (7-16)	11.59 ± 2.32 (6-16)
	6-10 Years	361	192 (53.2)	169 (46.8)
	11-14 years	691	376 (54.4)	315 (45.6)
	15-16 years	62	40 (64.5)	22 (35.5)
F/H of refractive error	Yes	33	30 (90.1)	3 (9.9)
	No	1081	578 (53.5)	503 (46.5)
Use of spectacle	Yes	25	18 (72)	7 (28)
	No	1089	590 (54.2)	499 (45.8)

Parental education level	Read and write	360	104 (28.9)	256 (71.1)
	Primary school	252	104 (41.3)	148 (58.7)
	Secondary School	241	172 (71.4)	69 (28.6)
	Higher Education	261	228 (87.4)	33 (12.6)
Annual Household income	< 1000 ETB	509	164 (32.2)	345 (67.8)
	1000 - 2000 ETB	212	116 (54.7)	96 (45.3)
	> 2000 ETB	393	328 (82.7)	65 (17.3)
School type	Public	896	390 (43.5)	506 (56.5)
	Private	218	218 (100)	0 (0)
Grade	1	117	71 (60.7)	46 (39.3)
	2	96	55 (57.3)	41 (42.7)
	3	138	65 (47.1)	73 (52.9)
	4	135	61 (45.2)	74 (54.8)
	5	156	84 (53.8)	72 (46,2)
	6	128	72 (56.3)	56 (43.7)
	7	180	105 (58.3)	75 (41.7)
	8	164	95 (57.9)	69 (42.1)

Table 1: *Socio demographic characteristics of children in Ethiopia based on urban or rural location.*

Visual impairment

The majority of children (93.1%) presented with VA of normal or near normal in the better eye. The presenting and best-corrected mild visual impairment was noted in 65 (5.9%) children and 29 (2.6%) children, respectively. A total of 77 (6.9%) children had visual impairments in their better eyes. After refraction, 41/77 (53.3%) improved their vision to normal or near normal (Table 2).

	PVA, better eye n (%; 95% CI)	**BVA better eye, n (%; 95% CI)**
Normal/near normal	1037 (93.1; 91.5-94.5)	1076 (96.58; 95.7-97.8)
Mild impairment	65 (5.9; 4.0-8.0)	29 (2.6; 1.3-3.0)
Moderate impairment	9 (0.8; 0.4-1.4)	6 (0.53; .0-0.8)
Severe impairment	3 (0.3; .0-0.60)	1 (0.08; .0- 0.3)

Table 2: *The presenting and best corrected visual acuity in the better eye in primary school children in Urban and rural students in Ethiopia.*

Uncorrected refractive error was the leading cause of visual impairment in 70/77 (90%), followed by strabismus, traumatic cataract, and corneal opacity in 4 (5.2%), 2 (2.6%), and 1 (1.3%) children, respectively. The prevalence of RE-related visual impairment was 6.3%.

Visual impairment was more common in females (63.6%), children aged greater than 10 years (68.8%), students from urban areas (67.5%), and students from public schools (80.5%). In univariate analysis, visual impairment in the better eye was statistically associated with living in urban areas, with p values of 0.018 (Table 3).

		No VI	VI	OR	P-value
Sex	Male	486	28	Ref	
	Female	551	49	0.65 (0.40-1.05)	0.074
Age	≤ 10 Years	337	24	Ref	
	> 10 years	700	53	1.06 (0.64-1.75)	0.810
Residence	Urban	556	52	1.79 (1.10-2.94)	0.018
	Rural	481	25	Ref	
School Type	Private	203	15	Ref	
	Public	834	62	0.99 (0.55-1.78)	0.984
Parental Income	≤ 2000 ETB	677	44	1.41 (0.88-2.26)	0.149
	> 2000 ETB	360	33	Ref	
Parental Education	≤ Elementary School	571	40	1.13 (0.71-1.80)	0.596
	≥ High School	466	37	Ref	

Table 3: *Visual impalement among urban and rural school children in Ethiopia by baseline characteristics.*

ETB: Ethiopian Birr; VI: Visual Impairment.

Refractive error and risk factors

The age-sex-specific prevalence of refractive error was 7.6% across all age groups and genders. The prevalence of refractive error is higher in females (9%) and students from urban schools (10.2%). The prevalence of RE among private school students was higher than that of public school students (8.3% and 8.1%, respectively) (Table 4).

Variables	Category	Number	Myopia	Hyperopia	Astigmatism	Total Prevalence
Age in years	6	1	0	0	0	0
	7	69	3	2	0	5 (7.2)
	8	81	5	1	1	7 (8.6)
	9	75	4	3	0	7 (9.3)
	10	135	5	2	3	10 (7.4)
	11	144	5	1	3	8 (5.6)
	12	164	7	1	3	11 (6.7)
	13	159	5	1	3	9 (5.7)
	14	151	7	1	4	12 (7.9)
	15	79	6	1	3	10 (12.7)
	16	56	3	0	2	5 (8.9)
	6-16	1114	50 (4.5)	13 (1.1)	22 (1.9)	85 (7.6)
Sex	Male	514	18 (3.5)	5 (0.9)	8 (1.6)	31 (6)
	Female	600	32 (5.3)	8 (1.3)	14 (2.3)	54 (9)
Location	Urban	608	44 (7.2)	6 (0.9)	12 (1.9)	62 (10.2)
	Rural	506	6 (1.2)	7 (1.4)	10 (1.9)	23 (4.5)

Type of schools	Private	218	11 (5)	3 (1.4)	4 (1.8)	18 (8.3)
	Public	896	39 (4.4)	10 (1.1)	18 (2)	67 (7.5)
Near work duration	≤ 3Hrs	471	11 (2.3)	4 (0.8)	4 (0.8)	19 (3.6)
	> 3 Hrs	643	39 (6)	9 (1.4)	18 (2.8)	66 (10.3)

Table 4: *Age, sex, location and type of schools specific prevalence of refractive error in children in urban and rural Ethiopia.*

Myopia was the most common type of RE affecting both eyes (4.5%). This was followed by astigmatism (1.9%), and hyperopia was the least (1. 2%). Three-fourths of myopia was present among children equal to or more than 10 years old compared with those less than 10 years old, and its incidence was found to have steadily increased from 0% at the age of 6 years to 5.4% among 16-year-old children. There was a statistically significant increase in the frequency of myopia among urban compared with rural schoolchildren (7.2% and 1.2%, respectively), with a p value of 0.00001.

Hyperopia was more frequently presented among females (1.3%) compared with males (0.9%) and among students from rural schools (1.4%) than children from urban schools (0.9%). On the other hand, hyperopia is statistically associated with children aged 10 years and older (p-value = 0.008).

Only 24 (28.2%) children with significant refractive error were wearing glasses, leaving 61 others, 71.8%, with the potential to benefit from spectacles. There was a significant association between RE and urban students (p = 0.001), having a family history of RE (p = 0.001), and spending more than 3 hours on near-work activities (p = 0.006) (Table 5).

Variables	Category	Total	RE	No RE	OR (95% CI)	P-value
Address	Urban	608	62	546	2.39 (1.46-3.9)	< 0.001
	Rural	506	23	483	Ref	
Gender	Male	514	31	483	Ref	
	Female	600	54	546	0.65 (0.41-1.0)	0.063
Age group	≤ 10 years	361	26	335	1.09 (0.68-1.77)	0.710
	> 10 years	753	59	694	Ref	
Family history of RE	Yes	33	17	16	15.83 (7.66-32.69)	< 0.001
	No	1081	68	1013		
Annual Household income	≤ 2000 ETB	393	47	674	1.54 (0.98-2.39)	0.057
	> 2000 ETB	721	38	355		
Near work duration	≤ 3h	471	24	447		
	> 3h	643	61	582	1.95 (1.19-3.18)	0.006
Daily hours of outdoor activities	≤ 3h	471	78	868	0.48 (0.22-1.07)	0.055
	≥ 3h	643	7	161		
Distance from TV*	< 1m	802	55	747	0.68 (0.42-1.09)	0.108
	≥ 1m	277	28	249		
ETB=Ethiopian Birr; RE=Refractive Error						

Table 5: *Risk factors for refractive error among urban and rural students in Ethiopia.*

Discussion

This is the first comparison-based study on the region-specific prevalence of REs and its associated risk factors among urban and rural schoolchildren in Ethiopia. And one of only a few studies from sub-Saharan Africa. In sub-Saharan African countries, few studies have investigated the different associated factors for REs between rural and urban participants. This study provides reliable evidence that visual impairment is relatively common in school-aged children in Ethiopia, where 6.7% of the children have visual impairment.

The findings from our study are comparable to those from a study in Somaliland (7.6%) [37]. But higher than reports from Nigeria (3.6%) [38], Ghana (3.7%) [39], the Islamic Republic of Iran (3.5%) [40], South Africa (1,2%) [41] but lower than studies from Malaysia (10.1%) [42] and China (10.3%) [28]. Similar to a study from Hyderabad, India [43], in our study, students from urban groups had a higher prevalence of visual impairment. A mixed-methods situational analysis employing document analysis and key informant analysis in Ethiopia revealed that there is no regular and effective nationwide school screening program [44], which can be a reason for the higher prevalence of visual impairment among the study participants.

In this study, URE was the most common cause of visual impairment among children and was responsible for 90% of cases, which is comparable with studies from Bhutan (94.4%) [45], Malaysia (87.0%) [42] and the Islamic Republic of Iran (87.3%) [40]. The prevalence of RE in our study was similar to that in Ghana (7.5%) [46] and higher than that of Nigeria (2.1%) [38]. However, a higher prevalence of RE was reported in Uganda (11.6%) [47], Egypt (11.7%) [48] and Somaliland (15.7%) [37]. Discrepancies in prevalence between different studies may be related to the variation in study samples, size of the population screened, geographical distribution, race, and age of the screened population. In the present study of 85 children with refractive error, 62 (72.9%) were from urban schools. A similar finding was reported from Nigeria [38], Ghana [46], China [49] and India [50].

In our study, myopia was the most commonly reported type of RE, representing 58.8% of REs. A higher proportion of myopia was reported from Nigeria (95.8%) (38), Somaliland (58.2%) [37], India (71.6%) [7], and China (82.7%) [49]. In contrast, astigmatism was the leading type of RE among study participants in Uganda (33%) [47], Ghana (39.5%) [46] and Egypt (79.2%) [48]. In our study, the overall prevalence of myopia was 4.5%, which is comparable to a previous study in India (3.16%) [7] from Iran (3.4%) [40], northern Ethiopia (6%) [34] and Bhutan (6.64%) [45]. However, our finding is higher than studies from Nigeria (1.9%) [38], Ghana (2.2%) [46] and Egypt (2.3%) [48]. Compared to our result, a higher prevalence of myopia was reported in Somaliland (9.1%) [37] and China (82.7%) [49]. Generally, our study is in agreement with the well-documented study which states that the prevalence of myopia among sub-Saharan African children is low [22]. The findings from the present study indicate that myopia prevalence is higher among female children, children attending urban schools, and prolonged hours of near-work activity. Similar to our study, a higher prevalence of myopia among females was reported in other studies [38,43,45,51,52]. In comparison, boys spent more on outdoor activities than girls, and this can be part of the reason for the gender variation in the prevalence of myopia [19,21,23].

In our study, a higher prevalence of myopia in older children was noted, which was similar to other studies [37,38,41,48]. The increase in the prevalence of myopia, which is seen in our study and other studies elsewhere, could be attributed to increased academic and near-work with increasing ages and classes. A strong association was observed between the prevalence of myopia and prolonged hours of near-work per day. Previous studies have also confirmed a significant correlation between the prevalence of myopia and near-work activity [22,26,27,43]. Studies have shown that prolonged near work leads to myopia via initiating biochemical and structural changes in the sclera and choroid that lead to axial elongation [22]. The current study showed that the prevalence of myopia was significantly higher in children in urban schools compared to those in rural schools. Similar findings have been reported in other studies [7,38,40,49,52]. A meta-analysis reported that children from urban environments have 2.6 times the odds of myopia compared with those from rural environments. The higher prevalence of myopia among the urban school children in our study could be explained by spending prolonged time watching TV and Computer visual displays and limited outdoor activities, which might relate to the shortage of playing grounds in Addis Ababa City

[53]. The prevalence of astigmatism in the current study was 1.9%. This is lower than found in Ghana (2.9%) [46], Somaliland (3.9%) [37], the Islamic Republic of Iran (6.6%) [40], Egypt (9.2%) [48], Bhutan (9.75%) [45] and South Africa (14.6%) [41]. But higher than that of India (0.21%) [7]. In our study, similar to a study from China [49], there is no change in the prevalence of astigmatism between urban and rural students. Similar to a study from China [49], our study revealed that astigmatism is associated with near-work activity.

The prevalence of hyperopia in this study was 1.2%, comparable to a study from India (1.06%) [7] and South Africa (1.8%) [41]. However, it is significantly lower than that reported in studies in Bhutan (2.17%) [45], Ghana (2.4%) [46], Somaliland (2.7%) [37], Egypt (4.5%) [48], Nepal (7%) [52] and Ethiopia (26.4%) [34]. The lower prevalence of hyperopia in our study might have been due to non-cycloplegic refraction, which could have missed many cases. The prevalence of hyperopia decreased with age and was higher in children aged less than or equal to 10 years. This finding agreed with studies in Somaliland [37] and Nepal [52]. In our study, the age-gender-adjusted prevalence of hyperopia in rural students was higher than that in urban students.

A similar result was also reported in other studies [46,49]. The higher prevalence of hyperopia among rural students can be explained by less access to activities demanding near-visual activity and nutritional changes [29,53]. In our study, a high proportion of the children who needed refractive corrections did not have them. A similar unmet need for spectacle correction has also been reported in other studies that underscore the need for a comprehensive regular school vision screening [37,38,41].

Studies have shown that parental awareness of the vision problem, attitudes regarding the need for spectacles, spectacle cost, cosmetic appearance, and the belief that wearing glasses may cause the progression of refractive error were barriers to the use of corrective spectacles [20,54].

The strengths of the study included a screening survey with a randomly selected sample of schoolchildren in urban and rural parts of Ethiopia. which ensured representativeness and the use of RESC study protocols with standardized measurement methods and definitions.

Limitations of the Study

A potential limitation of this study is that it was school-based, which may not reflect the clinical conditions of school-aged children, especially in rural areas where a significant number of children may not attend school due to poverty. In addition, severely visually impaired and blind children are unlikely to attend school.

Conclusion

In conclusion, this study captured the prevalence and risk factors of refractive error among urban and rural children in Ethiopia. The rates of prevalence of visual impairment in primary schools in Ethiopia were higher than in other sub-Saharan African countries. Uncorrected refractive error is the leading cause of visual impairments among schoolchildren. Myopia was the dominant cause of refractive error, predominantly seen in females, older children, urban schools, and children spending prolonged hours of near-work activity. Near-work activity was also associated with astigmatism, and hyperopia was associated with rural students. However, most children do not have the required spectacles for optical correction. Effective regular school eye health programs to identify children with refractive error and provide affordable spectacle remain the keys to preventing visual impairment from uncorrected refractive error.

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Statement of Ethics

The study was conducted in accordance with the Declaration of Helsinki and reviewed and approved by the Institute Ethics Committee of the Addis Ababa University Department of Ophthalmology (Ref No. 012/19/AAUDO). Written informed consent was obtained from a parent or legal guardian of each child prior to the examination. Patients or the public weren't involved in our research's design, conduct, reporting, or dissemination plans.

Conflict of Interest Statement

The authors have no financial interests to declare.

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Authors' Contributions

Drafting of the manuscript: S.T.S., B.S. and S.T. revision of the manuscript for important intellectual content: S.T.S., B.S. and S.T. conception and design of study: S.T.S., B.S. and S.T. data acquisition, analysis or interpretation of data: S.T.S., B.S. and S.T. approval of final manuscript to be published: S.T.S., B.S. and S.T. All authors have read and approved the final manuscript.

Data Availability Statement

All data generated or analysed during this study are included in this published article.

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