New Frontiers in Ophthalmology

Research Article ISSN: 2397-2092

Epidemiological profile and determinants of refractive errors among secondary school students in the lacs prefecture, Togo

Mawuli A. K. Santos[1]*, Kossi Dzidzinyo[1], Kanfiaguin Boundja[1], Nidain Maneh[1], Kokou Vonor[2] and Koffi D. Ayena[1]

[1]Department of Ophthalmology, Faculty of Health Sciences, University of Lomé, Lomé, Togo

[2]Department of Ophthalmology, Faculty of Health Sciences, University of Kara, Kara, Togo

Abstract

Introduction: Refractive errors are a major cause of avoidable visual impairment among school-aged children, particularly in low-resource settings. Updated local data are essential to guide school eye health programs.

Methods: We conducted a descriptive cross-sectional school-based study from March 3 to April 18, 2025, among secondary school students in the Lacs Prefecture, Togo. Uncorrected distance visual acuity was assessed in all participants. Students with visual acuity <10/10 in at least one eye or letter confusion underwent objective and subjective refraction under cycloplegia. Refractive errors were defined according to international standards. Data were analyzed using SPSS version 18.

Results: A total of 18,516 students were examined, of whom 1,746 had uncorrected refractive errors, yielding a prevalence of 9.43% (95% CI: 9.01–9.85). The mean age was 15.88 ± 2.53 years, and females accounted for 69.79% of cases. Astigmatism was the most common refractive error (34.78%), followed by hyperopia (32.44%) and myopia (27.05%). Only 9.43% of affected students were wearing optical correction at the time of screening. Screen exposure was reported by 84.19% of students with refractive errors and was significantly associated with their occurrence ($p < 0.05$).

Conclusion: Uncorrected refractive errors are frequent among secondary school students in the Lacs Prefecture, with very low optical correction coverage. Strengthening school eye health programs and improving access to affordable corrective lenses are urgently needed.

Introduction

Refractive errors are among the leading causes of avoidable visual impairment worldwide and represent a major public health challenge [1,2]. Millions of children and adolescents suffer from visual impairment due to uncorrected refractive errors, resulting in adverse educational, functional, and psychosocial outcomes [1,3].

In the school setting, refractive errors may lead to reduced academic performance, visual fatigue, headaches, and progressive disengagement from learning activities [4]. In sub-Saharan Africa, these effects are often exacerbated by limited access to eye care services and optical correction, as reported in several school-based studies [5-7].

In Togo, available data on refractive errors among schoolchildren are scarce and often outdated, particularly in the Lacs Prefecture [5,8]. Furthermore, recent lifestyle changes among adolescents, notably increased exposure to digital screens, may influence the epidemiological profile of refractive errors [4]. This study aimed to describe the epidemiological profile of refractive errors and their management among secondary school students in the Lacs Prefecture, Togo, in order to provide updated evidence to inform school eye health strategies.

Materials and methods

Study design and setting

This was a descriptive cross-sectional school-based study conducted from March 3 to April 18, 2025, in public and private secondary schools of the Lacs Prefecture, located in southern Togo.

Study population

All students enrolled in secondary schools who were present on the day of screening and whose parents or guardians provided written informed consent were eligible for inclusion. Students attending specialized schools for the visually or hearing impaired and those with ocular conditions affecting media transparency were excluded.

Ophthalmological examination and definitions

Uncorrected distance visual acuity (UDVA) was measured monocularly at 5 meters using a standard optotype chart. Students with UDVA <10/10 in at least one eye or letter confusion underwent objective refraction with and without cycloplegia, followed by subjective refraction.

Cycloplegia was induced using cyclopentolate 1% (one drop every five minutes for three instillations). Autorefraction was performed 45 minutes after the last instillation using a Topcon KR-8800 autorefractometer.

Correspondence to: Mawuli A. K. Santos, Department of Ophthalmology, Faculty of Health Sciences, University of Lomé, Lomé, Togo, E-mail: santosmawuli@yahoo.fr

Key words: *refractive errors, epidemiology, prevalence, school health, Togo*

Received: January 28, 2026; **Accepted:** February 18, 2026; **Published:** February 25, 2026

Table 1. Distribution of students with refractive errors by age group

	Sample (n)	Percentage (%)
(10 – 14 years)	537	31.44
(15 – 24 years)	1170	68.59
(> 24 years old)	1	0.06
Total	**1708**	**100**

Table 2. Reported ocular symptoms among students with refractive errors

	Number (n)	Percentage (%)
Decreased visual acuity	811	47.48
Eye pain	789	46.19
Headaches	406	23.77
Visual fatigue	46	2.69
Photophobia	457	26.68
Tearing	738	43.20
Tingling eyes	633	37.06
Eye deviation	10	0.58

Refractive errors were defined according to international standards as follows: Myopia was defined as a spherical equivalent (SE) ≤ −0.50 diopters (D), hyperopia as SE ≥ +0.50 D, and astigmatism as a cylindrical error ≥ 0.75 D. Refractive values between −0.50 D and +0.50 D without astigmatism were considered emmetropia.

Data collection and variables

Data were collected using an electronic questionnaire (KoboCollect® 2022). Variables included age, sex, type of refractive error, prior use of optical correction, and daily screen exposure, defined as more than two hours per day.

Statistical analysis

Data were analyzed using SPSS version 18. Categorical variables were expressed as frequencies and percentages. Associations between refractive errors and independent variables (age group, sex, and screen exposure) were assessed using the chi-square test. Statistical significance was set at $p < 0.05$.

Ethical considerations

The study protocol was approved by the Ethics Committee of the Ministry of Health of Togo and by the Ministry of Primary and Secondary Education. Written informed consent was obtained from parents or legal guardians of all participating students. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Results

A total of 18,516 secondary school students were examined during the study period. Among them, 1,746 students had uncorrected refractive errors detected through screening, corresponding to a prevalence of 9.43% (95% CI: 9.01–9.85). Objective refraction under cycloplegia was performed in 1,708 students (97.82%).

The mean age of students with refractive errors was 15.88 ± 2.53 years, with a range of 10 to 25 years. The 15–24 years age group was the most represented (68.59%) (Table 1). Females accounted for 69.79% of cases, yielding a female-to-male ratio of 2.3. Decreased distance visual acuity was reported by 47.48% of affected students. Other frequently reported symptoms included ocular pain (46.19%), tearing (43.20%), ocular itching (37.06%), and photophobia (26.68%) (Table 2).

According to the World Health Organization classification, most students did not present with visual impairment at distance visual acuity testing (89.29% in the right eye and 88.00% in the left eye) (Table 3). Astigmatism was the most prevalent refractive error (34.78%), followed by hyperopia (32.44%) and myopia (27.05%) (Table 4). Only 9.43% of students with refractive errors were wearing optical correction at the time of screening. Screen exposure exceeding two hours per day was reported by 84.19% of students with refractive errors and was significantly associated with their occurrence ($p < 0.05$).

Discussion

This study provides updated epidemiological data on refractive errors among secondary school students in the Lacs Prefecture, Togo. The prevalence of uncorrected refractive errors (9.43%) is comparable to that reported previously in the same area by Amedome, et al. (8.7%) [8], suggesting relative stability over time.

Higher prevalences reported in other regions of Togo and neighboring countries may reflect geographical differences, variations in study populations, and methodological discrepancies, particularly regarding the use of cycloplegia [5,6]. The systematic use of cycloplegia in our study likely improved the detection of hyperopia and strengthens the validity of our findings.

Female predominance was observed, consistent with several African studies [5,9,10]. However, sex was not significantly associated with refractive errors in analytical testing, suggesting that behavioral or participation factors rather than biological susceptibility may explain this finding.

Although most students did not meet WHO criteria for visual impairment, nearly half reported visual symptoms, highlighting the functional burden of uncorrected refractive errors on school performance and daily activities. Screen exposure was highly prevalent among affected students and was significantly associated with refractive errors, supporting growing concerns about increased digital device use among adolescents [3].

The very low rate of optical correction observed in this study reflects persistent barriers to eye care access, including cost, availability of optical services, and limited awareness. These findings underscore the need to strengthen school-based vision screening programs and improve access to affordable corrective lenses.

Table 3. Distribution of visual acuity in the right and left eyes according to WHO classification

	Right eye		Left eye	
	n	**%**	**n**	**%**
No deficiency	1525	89.29	1503	88.00
Light: DVA [0.5-0.3]	135	7.90	126	7.38
Moderate: DVA [0.3-0.1]	35	2.05	53	3.10
Severe: DVA [0.1-0.05]	11	0.64	26	1.52
Blindness: DVA< 0.05	2	0.12	0	0
Total	**1708**	**100.00**	**1708**	**100.00**
DVA = Distance Visual Acuity, n = Sample, % = Percentage				

Table 4. Distribution of ametropias by type

	Sample (n)	Percentage (%)
Myopia	462	27.05
Hyperopia	554	32.44
Astigmatism	594	34.78
Total	**1708**	**100**

Limitations

This study has several limitations. Selection bias may have occurred, as only students present on the day of screening were examined. Screen exposure was self-reported and may be subject to recall bias. Finally, the cross-sectional design does not allow for causal inference regarding factors associated with refractive errors.

Conclusion

Uncorrected refractive errors remain frequent among secondary school students in the Lacs Prefecture, Togo, with very low optical correction coverage. Strengthening school eye health programs, integrating routine vision screening, and improving access to affordable corrective lenses are essential to reduce the educational and quality-of-life impact of refractive errors in this population.

Conflicts of interest

The authors declare no competing interests.

Author's contributions

All authors contributed to the study conception and design, data collection, data analysis, manuscript drafting, and critical revision. All authors read and approved the final manuscript.

Acknowledgments

The authors thank the school authorities, students, and parents for their cooperation, as well as the Ministry of Health and the Ministry of Primary and Secondary Education of Togo for their support.

References

1. World Health Organization (2012) Global data on visual impairments 2010. Geneva: World Health Organization.
2. Holden BA, Fricke TR, Wilson DA, Jong M, Naidoo KS, et al. (2016) Global prevalence of myopia and high myopia and temporal trends from 2000 through 2050. Ophthalmology 123: 1036-1042. [Crossref]
3. Ayed T, Sokkah M, Charfi O, El Matri L (2002) Epidemiology of refractive errors among underprivileged schoolchildren in Tunisia. J Fr Ophtalmol 25: 712-713. [Crossref]
4. Nkashama LM, Kakumbu E, David K, Kayembe LB (2022) Impact of static ametropia on academic performance among university students in Kinshasa. J Open Soc Sci 10: 273-283.
5. Nonon Saa KB, Atobian K, Banla M, Redah T, Maneh N, et al. (2013) Refractive errors in schoolchildren in the Central Region of Togo. J Fr Ophtalmol 36: 769-774. [Crossref]
6. Sounouvou I, Tchabi S, Doutetien C, Sonon F, Yehouessi L, et al. (2008) Refractive errors in primary schoolchildren in Cotonou (Benin). J Fr Ophtalmol 31: 771-775. [Crossref]
7. Kouassi LJ, Gbe K, Coulibaly YF, Ouffoue Y, Fanny A (2018) Evaluation of refraction in school settings. Revue SOAO 1: 23-26.
8. Amedome KM, Ayena KD, Alaglo KA, Dzidzinyo K, Vonor K, et al. (2013) Prevalence of refractive errors among school children in southern Togo: The case of the Lacs Prefecture. J Rech Sci Univ Lome 15: 443-451.
9. Kra ANS, Agbohoun RP, Kouassi-Rebours AC, Soumahoro M, Koman CE, et al. (2022) Refractive errors in schoolchildren: Screening and management in Abidjan. Rev Int Sci Med Abidjan 24: 188-192.
10. Ebana Mvogo C, Bella AL, Ellong A, Metogo M, Kouam JM (2001) Static refractive errors in Cameroonian black populations. Ophthalmologica 215: 212-216.