



Prevalence of myopia among teenagers attending University of Ilorin Secondary School, Ilorin, Kwara State, Nigeria

O. M. Ojo*, C. C. Nwachukwu, and A. E. Ige

¹Department of Optometry and Vision Science, Faculty of Life Sciences, University of Ilorin, Nigeria.

ARTICLE INFORMATION

ABSTRACT

MS No. JOBAS_2026_019

Received: 15/01/2026

Revised: 28/02/2026

Accepted: 29/03/2026

Published: 31/03/2026

Keywords:

Myopia
Refractive error
Teenagers
Visual acuity

*Corresponding author:

ojo.om@unilorin.edu.ng

Tel: +2347032063614

ORCID:

0009-0002-7141-3630

ISSN: 3121-8210

Myopia is a significant and growing public health concern, with its prevalence increasing disproportionately among younger age groups. This study aimed to determine the prevalence of myopia among teenagers attending the University of Ilorin Secondary School, Ilorin, Kwara State, Nigeria. A cross-sectional, school-based study was conducted among 218 teenagers aged 13 to 17 years (mean age: 14.59 ± 0.9 years). Ocular examinations included visual acuity assessment, ophthalmoscopy, and objective refraction by retinoscopy. Myopia was defined as a spherical equivalent refraction (SER) of ≥ -0.50 DS and was further classified as low (< -3.00 D), moderate (-3.00 D to -6.00 D), or high (> -6.00 D). Data were analysed using IBM-SPSS version 23.0. Results were expressed as frequencies and percentages, and the Chi-square test was used to assess associations at a significance level of $p < 0.05$. The overall prevalence of myopia was 18.81% ($n = 41$). Females exhibited a significantly higher prevalence of myopia (68.29%) compared to males (31.71%), and this difference was statistically significant ($\chi^2 = 4.343$, $p = 0.037$). Low-degree myopia was the most common form, accounting for 95.12% of myopic participants. The prevalence of myopia was highest among 14 years old participants (27.91%). Approximately one in five teenagers in this study population had myopia, with females being the most affected. These findings underscore the need for large scale, population-based surveys to establish the full magnitude of myopia among Nigerian adolescents and to guide targeted public health interventions.

1.0 Introduction

Myopia, commonly known as short-sightedness or near-sightedness, is one of the most prevalent refractive errors worldwide and a leading cause of visual impairment [1]. It is defined by the World Health Organization (WHO) International Classification of Disease (ICD-10) as a refractive condition in which parallel rays of light entering the eye are brought to focus anterior to the retina when accommodation is relaxed, resulting in blurred distance vision. This typically occurs when the axial length of the eye is longer than normal or when the refracting surfaces of the eye have a shorter focal length than required [2,3].

Myopia is not merely a refractive inconvenience; it constitutes a significant public health burden. High myopia, in particular, is an established risk factor for sight-threatening complications including glaucoma, pre-senile cataract, retinal detachment, and myopic choroidal neovascularisation [3]. Moreover, the condition imposes considerable socioeconomic costs through expenditure on optical correction and its negative impact on educational attainment, occupational choices, and quality of life [4, 5]. In 2015, an estimated 480 million people globally were blind or visually impaired due to inaccessibility of corrective spectacles [6].

The global prevalence of myopia is increasing at an alarming rate, with projections suggesting that approximately 50% of the population of the world will be myopic by 2050 [1]. This rise has been reported to be highest in East and South-East Asian countries; however, epidemiological transitions in sub-Saharan Africa are also attracting increasing attention [7]. Multiple aetiological factors have been implicated, including genetic predisposition, prolonged near-work activities, reduced time spent outdoors, and the widespread adoption of digital devices associated with urbanisation [8, 9].

Despite the growing global concern, data on the prevalence of myopia in Nigerian adolescents remain scarce. Available studies from sub-Saharan Africa report a wide range of prevalence estimates: 11.9% in Ethiopia [9], 1.7% in Ghana [10], and 2.7% in Nigeria [11]. The relatively low figures reported for this region may reflect true epidemiological differences, methodological variations, or under-detection due to limited screening infrastructure.

Early detection of myopia is critical for preventing progression to high myopia and its associated complications. Given the limited evidence base in Nigeria, this study was conducted to determine the prevalence and pattern of myopia among teenagers attending the University of Ilorin Secondary School, Ilorin West, Kwara State, thereby contributing to the body of evidence needed for policy formulation and targeted interventions.

2.0 Materials and Methods

2.1 Study design and setting

This was an observational, cross-sectional, school-based study conducted at the University of Ilorin Secondary School, Ilorin West, Kwara State, Nigeria, in December 2021.

2.2 Study population and sampling

A total of 218 teenagers between the ages of 13 and 17 years participated in the study, comprising 117 (53.67%) females and 101 (46.33%) males. All students within the specified age bracket who were present on the day of examination and consented to participate were included.

2.2 Ocular examination procedures

Prior to examination, participants were briefed on all procedures to be conducted. The ophthalmic examination protocol included the following:

2.2.1 Visual acuity (VA)

Distance visual acuity was assessed monocularly and binocularly at 6 metres using the Snellen letter chart. Participants were categorised as having good vision ($VA > 6/9$) or reduced vision ($VA \leq 6/9$).

2.2.2 External and internal examination

External ocular examination was performed using a penlight. Internal examination was carried out by direct ophthalmoscopy.

2.2.3 Objective refraction

Retinoscopy was performed using a trial lens set to determine the objective refractive state of each eye. Non-cycloplegic retinoscopy was used throughout the study.

Refractive error categories were defined based on the spherical equivalent refraction (SER = sphere + $\frac{1}{2}$ cylinder) as follows: Emmetropia: $SER < +0.25$ D; Myopia: $SER \geq -0.50$ DS (further classified as low myopia: < -3.00 D; moderate myopia: -3.00 D to -6.00 D; high myopia: > -6.00 D); Hyperopia: $SER \geq +0.50$ DS; Astigmatism: ≥ 0.25 DC.

2.3 Ethical considerations

Ethical approval was obtained from the Ethics Committee of the Department of Optometry and Vision Science, University of Ilorin. Written permission was granted by the school principal, and informed consent was obtained from all participants and/or their guardians prior to examination.

2.4 Data analysis

Data were entered and cleaned using Microsoft Excel 2016. Descriptive statistics (frequencies and percentages) were computed for all variables. The Pearson Chi-square test of independence was used to assess the association between categorical variables, with statistical significance set at $p < 0.05$. All inferential analyses were performed using IBM-SPSS Statistics for Windows, Version 23.0 (IBM Corp., Armonk, NY, USA).

3.0 Results

A total of 218 teenagers were examined; 117 (53.67%) were female and 101 (46.33%) were male (Figure 1). The age of participants ranged from 13 to 17 years, with a mean age of 14.59 ± 0.9 years. The largest age group was 14-year-olds ($n = 86$; 39.45%), followed by 15-year-olds ($n = 74$; 33.94%), 16-year-olds ($n = 35$; 16.06%), 13-year-olds ($n = 21$; 9.63%), and 17-year-olds ($n = 2$;

0.92%) (Figure 2). The age by gender distribution is presented in Figure 3.

Among the 218 participants, 172 (78.90%) had good distance vision ($VA > 6/9$), while 46 (21.10%) had reduced distance vision ($VA \leq 6/9$) (Figure 4). The distribution of presenting visual acuity by gender and age is summarised in Tables 1 and 2, respectively. Among females, 87 (74.36%) had good vision and 30 (25.64%) had reduced vision. Among males, 85 (84.16%) had good vision and 16 (15.84%) had reduced vision. The highest frequency of reduced vision was recorded in the 14-year-old age group (11.01%), while 17-year-olds showed no cases of reduced vision.

The pattern of refractive error among the 218 participants is displayed in Figure 5. Emmetropia was the most common finding ($n = 123$; 56.42%). Hyperopia was the most prevalent refractive error ($n = 46$; 21.10%), followed by myopia ($n = 41$; 18.81%) and astigmatism ($n = 8$; 3.67%).

Among the 41 myopic participants, low myopia (< -3.00 D) was the predominant category ($n = 39$; 95.12%), followed by moderate myopia ($n = 2$; 4.88%). No participant was found to have high myopia (> -6.00 D) (Table 3).

The prevalence of myopia varied across age groups. The highest prevalence was recorded among 14 years old (27.91%), followed by 15 years old (14.86%) and 16 years old (14.29%). The lowest prevalence (4.76%) was observed among 13 years old, and no myopia was recorded in 17 years old participants (Table 4).

Female teenagers were more affected by myopia than their male counterparts (23.93% vs. 12.87%). The relationship between gender and myopia was assessed using the Pearson Chi-square test of independence, which revealed a statistically significant association ($\chi^2 = 4.343$, $df = 1$, $N = 218$, $p = 0.037$) (Table 5).

4.0 Discussion

This study investigated the prevalence and pattern of myopia among teenagers at the University of Ilorin Secondary School, Nigeria. The overall prevalence of myopia was 18.81%, affecting nearly one in five participants. This finding reflects the growing burden of myopia among adolescents in sub-Saharan Africa and confirms the need for systematic vision screening programmes in Nigerian schools.

The prevalence observed in this study is comparable to findings from Ireland (19.9%) [12] and Equatorial Guinea (15.2%) [13], suggesting that myopia among Nigerian urban adolescents may be approaching levels previously reported in higher-prevalence settings. Our findings exceed those reported by Belete *et al.* [9] in Ethiopia (11.9%), Ovenseri-Ogbomo and Assien [10] in Ghana (1.7%) and Atowa *et al.* [11] in Nigeria

(2.7%), as well as estimates from Saudi Arabia (3.54%) [14] and Tanzania (5.6%) [15]. However, the prevalence in this study was lower than that reported in Ghana (54.12%) [16], Nigeria (23.4%) [17], the United Kingdom (32%) [18], and California, USA (41.9%) [19]. These variations likely reflect differences in study populations, inclusion criteria, geographic and environmental factors, sample design, and refraction methods (cycloplegic versus non-cycloplegic).

The age-related pattern of myopia prevalence in this study, with a peak at 14 years, is consistent with published literature suggesting that myopia frequently manifests during early to mid-adolescence, coinciding with increased academic demand and near-work activities [20, 21]. The absence of myopia among 17 years old participants in this sample may reflect the small number in this age group rather than a true epidemiological trend, and should be interpreted cautiously.

This study revealed a significant difference in myopia prevalence between females (23.93%) and males (12.87%). This finding is consistent with reports from India [22] and China [23, 24], where female gender was significantly associated with higher myopia prevalence. In contrast, other studies have found no statistically significant gender differences [11, 25], or have reported higher prevalence in males [14, 16, 26]. The gender-related difference observed in this study may be attributable to differences in near work habits and outdoor activity between males and females, as well as cultural factors influencing lifestyle of females in many Nigerian communities tend to engage in more indoor and sedentary activities, which are known risk factors for myopia onset and progression [16].

Low myopia accounted for the overwhelming majority of cases (95.12%), with no participants classified as having high myopia. This finding is consistent with other studies conducted in Africa, where low myopia predominates [11,14,16], and may suggest that myopia in this population is largely in its early stages, reinforcing the case for early detection and monitoring.

A key methodological consideration in this study is the use of non-cycloplegic retinoscopy for objective refraction. Cycloplegic refraction is the gold standard for refractive error assessment, particularly in younger populations where accommodation may lead to over estimation of myopia. The use of non-cycloplegic refraction in this study may therefore have slightly overestimated the true prevalence of myopia.

In conclusion, myopia affected 18.81% of the teenagers studied, with low degree myopia being the predominant form and females being more significantly affected than the males. The condition is of growing public health concern given its

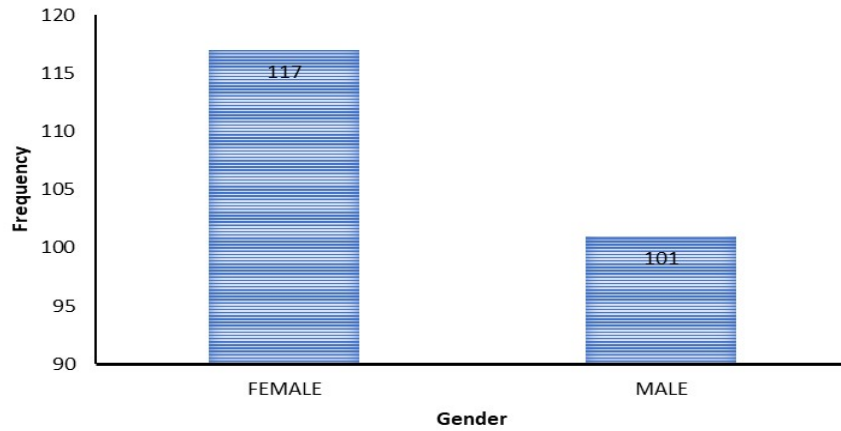


Figure 1: Gender distribution of the teenagers attending University of Ilorin Secondary School, Ilorin, Nigeria

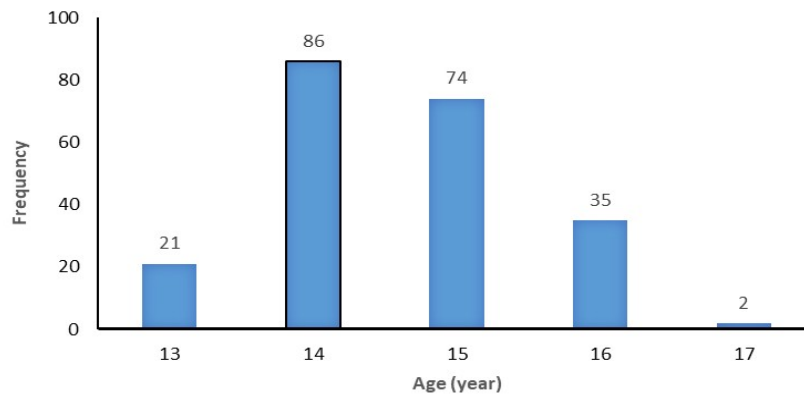


Figure 2: Age distribution of the teenagers attending University of Ilorin Secondary School, Ilorin, Nigeria

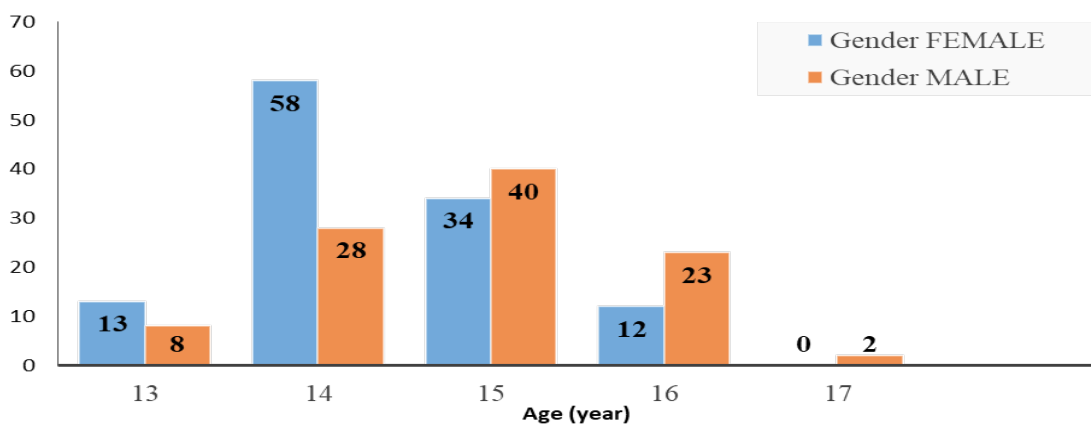


Figure 3: Age and gender distribution of the teenagers attending University of Ilorin Secondary School, Ilorin, Nigeria

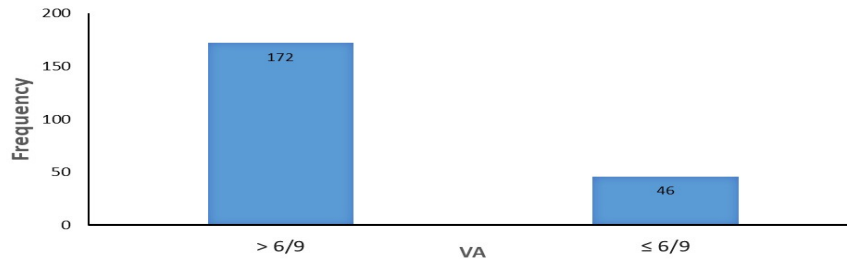


Figure 4: Visual acuity distribution of the teenagers attending University of Ilorin Secondary School, Ilorin, Nigeria

Table 1: Distribution of presenting visual acuity by gender of teenagers attending University of Ilorin Secondary School, Ilorin, Nigeria

Gender	Frequency (n)	Percentage (%)
Female (Total)	117	53.67
> 6/9 (Good vision)	87	39.91
≤ 6/9 (Reduced vision)	30	13.76
Male (Total)	101	46.33
> 6/9 (Good vision)	85	38.99
≤ 6/9 (Reduced vision)	16	7.34
Total	218	100.00

Table 2: Distribution of presenting visual acuity across age categories of teenagers attending University of Ilorin Secondary School, Ilorin, Nigeria

Age (years) / Visual Acuity	Frequency (n)	Percentage (%)
13 years	21	9.63
> 6/9	19	8.72
≤ 6/9	2	0.92
14 years	86	39.45
> 6/9	62	28.44
≤ 6/9	24	11.01
15 years	74	33.94
> 6/9	60	27.52
≤ 6/9	14	6.42
16 years	35	16.06
> 6/9	29	13.30
≤ 6/9	6	2.75
17 years	2	0.92
> 6/9	2	0.92
≤ 6/9	0	0.00
Total	218	100.00

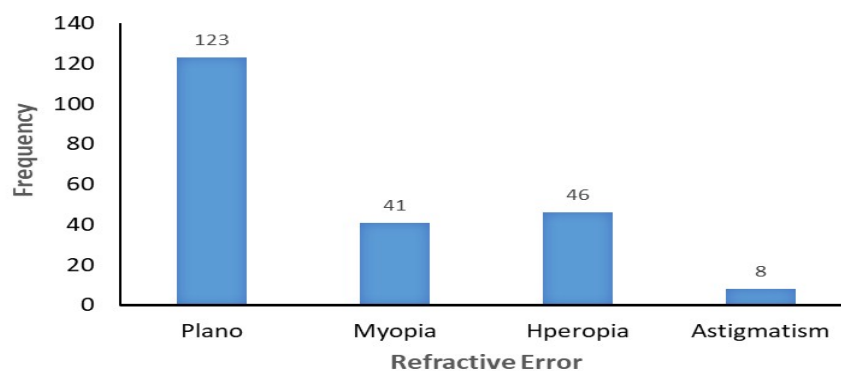


Figure 5: Pattern of refractive error among teenagers attending University of Ilorin Secondary School, Ilorin, Nigeria

Table 3: Degree of myopia among teenagers attending University of Ilorin Secondary School, Ilorin, Nigeria

Degree of Myopia	Frequency (n)	Percentage (%)
Low (< -3.00 D)	39	95.12
Moderate (-3.00 to -6.00 D)	2	4.88
High (> -6.00 D)	0	0.00
Total	41	100.00

Table 4: Prevalence of myopia by age group of teenagers attending University of Ilorin Secondary School, Ilorin, Nigeria

Age (years)	Number with Myopia (n)	Prevalence (%)
13	1	4.76
14	24	27.91
15	11	14.86
16	5	14.29
17	0	0.00
Total	41	18.81

Table 5: Pearson Chi-square test of independence for gender and myopia status of teenagers attending University of Ilorin Secondary School, Ilorin, Nigeria

Gender	Myopia Present n (%)	Myopia Absent n (%)	Chi-square (χ^2)	p-value
Female	28 (23.93%)	89 (76.07%)	4.343	0.037*
Male	13 (12.87%)	88 (87.13%)		
Total	41 (18.81%)	177 (81.19%)		

* Statistically significant at $p < 0.05$

association with serious sight threatening complications and its negative impact on quality of life, education, and career choices. The increasing prevalence among adolescents which is driven by prolonged near work, screen use, and reduced outdoor activity, highlights the urgent need for routine school-based vision screening programmes and large-scale population-based studies using cycloplegic refraction to better quantify and address the burden of myopia among Nigerian teenagers.

Future studies in this setting should incorporate cycloplegic refraction to yield more precise estimates.

Acknowledgement

The authors wish to express their appreciation to the management and students of the University of Ilorin Secondary School for the cooperation and participation they provided during this study.

Disclosure of conflict of interest

None

Disclosure of source of funding/grant

None

Authors Contributions

OMO – Conceptualization, Methodology, Resources, Supervision, Data curation, Formal analysis, Writing – review & editing; CCN - Data curation, Formal analysis, and Writing – original draft, review & editing; AEI - Data curation, Formal analysis, and Writing – original draft, review & editing.

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