Research Article

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Demographic and Clinical Characteristics of Myopia in Children at The University College Hospital, Ibadan

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ABSTRACT

Background: *Myopia is becoming a disease of public health importance, gradually attaining a global epidemic. For this reason, it is important to provide local data for eye health planning. This study aimed to describe demographic and clinical characteristics of myopia in children in Ibadan and to contribute to eye health planning and interventions.*

Methods: *This was a descriptive retrospective study conducted at the paediatric ophthalmology clinic. The clinical records of children aged 1 to 15 years, who received a myopia diagnosis (spherical equivalent ≥ -0.5 diopter) between January 2018 and December 2022 was retrieved. The data collected were demographic information, ophthalmic and medical histories, degree of myopia, presenting complaints, and compliance with follow-up visits. Data analysis was conducted using IBM SPSS version 20; IBM.*

Results: *The case notes of 542 children were reviewed and 212 of them were retained according to the study inclusion criteria. The frequency of myopia in this study was 39.1%. Children aged between 8 and 15 years were in the majority and represented 74.06%. Visual impairement was the commonest complaint (93.3%) followed by photophobia (28.3%). The majority of children (71%) had low myopia. Posterior segment findings of a large pale optic disc and tigroid retina were seen in 5.2% and 4.7% respectively.*

Conclusion: *Myopia is a common refractive error among children attending our clinic. Low myopia was more common and a few children had posterior segment anomalies associated with myopia.*

Keywords

Myopia, Refractive errors, Children, Africa.

Introduction

Myopia is a refractive error in which distant rays of light entering the non-accommodating eye are brought to a focus in front of the retina, rather than precisely on it. Myopia is a major cause of visual impairment or blindness due to complications related to its progression and severity. These sight-threatening complications include retinal detachment, choroidal neovascularization, glaucoma, cataract and many more [1].

Myopia is increasingly taking on the appearance of a global epidemic. In 2020, the World Health Organisation (WHO) declared myopia as a global emergency due to its high and increasing global prevalence [2]. Epidemiological data from 2016 indicated that myopic individuals comprised 22.9% of the global population and projections for 2030 estimate that the number of myopes may

reach approximately 2.5 billion worldwide. In addition, Holden's forecast studies project that by 2030, 50% of the global population will be nearsighted [3]. Furthermore, myopia is increasingly becoming a socioeconomic burden, with an annual loss of nearly 268 million dollars, thus standing out as a pressing global public health issue [4]. Notably, there are significant disparities in the prevalence of myopia in children based on ethnic origin. Studies have shown a higher prevalence of Myopia in east Asian countries including Singapore and Taiwan, where rates can exceed 85 % in some regions [5]. In Africa, a review and meta-analysis study conducted by Ovenseri-Ogbomo et al. [6] found the prevalence of myopia in African children to be at 4.7%. For instance, in Ibadan, the study conducted by Olusanya et al. [7] reported a frequency of children with myopia in the eye clinic of University College Hospital, Ibadan (UCH) to be 23%. With the increasing prevalence in myopia projected over the years, periodic studies are important to contextualised prevalence and provide current local information. Thus this study aims to describe demographic and clinical characteristics of myopia in children in Ibadan in order to provide relevant data for eye health planning and interventions.

Materials and Methods

This was a descriptive retrospective study conducted at the paediatric ophthalmology clinic of the University College Hospital, Ibadan, a referral tertiary center in the Southwest Nigeria. The unit consists of three consultants, two clinic days and one surgery day every week. Other eye care personnel working in this center include optometrists, ophthalmic nurses and dispensing opticians.

The study included all children aged 1- 15 years with a diagnosis of myopia seen at the eye clinic from January 2018 and December 2022. Those with incomplete records were excluded from the study. Regarding the sampling approach, this study adopted an exhaustive sampling strategy, encompassing all patients who met the specified inclusion criteria. The data collection process involved recording demographic information, ophthalmic and medical histories, as well as details regarding family ophthalmology history. The degree of myopia, the presenting complaints, posterior segments findings, and compliance with follow-up visits were carefuly recorded.

Objective and subjective refractions, with or without cycloplegia, were documented, including specific details about the type of cycloplegic agent used. All children below age of 5 years and those with an orthoptic disorder whatever the age had cycloplégie.

The objective refraction was obtained by retinoscopy while the subjective refraction was performed for older verbal children. The visual acuity was obtained with appropriate charts and methods for age. The anterior segment was assessed with a torch light for young and older children who were uncooperative and by the slit lamp biomicroscope for older children. Funduscopy was performed by the binocular indirect ophthalmoscope.

Children were scheduled for follow up appointments at three months after prescription of spectacles to assess spectacle adaptation. Thereafter subsequent appointments were annual. Myopia, for the purpose of this study, was defined as a spherical equivalent of ≥ -0.5 diopter (D), patient. For the degree of myopia patients were classified in 3 groups: low myopia (-0.5 D to -3 D), moderate myopia (-3 D to -6 D) and high myopia (-6 D and above). Analysis was conducted using the Statistical Package for Social Science version 20 (IBM SPSS version 20; IBM), and descriptive and summary statistics were computed for relevant variables.

Ethical approval and clearance were obtained from the ethics review committee of University and College Hospital of Ibadan under number UI/EC/23/0694 before the commencement of the study. The study abided by the tenets of declaration of Helsinki for studies involving human subjects, human material and data.

Results

Rate of Myopia

Within the study period, 542 patients met inclusion criteria and 212 had myopia giving a frequency of 39.1%. The rate of children who had cycloplegia refraction was 9.2 % (n=50).

Distribution by Age and Gender

The mean age was 9.8±3.4 years. A notable age-based disparity within the studied pediatric population was observed. There was a predominance of older children, specifically those aged between 8 and 15 years, constituting 74.1% (n = 157) of the total cohort. In contrast, the younger age group, spanning from 1 to 7 years, accounted for 25.9% (n = 55) of the myopia cases. With regard to gender, 116 (54.7%) were females, and males accounted for 45.3% (96).

Family Ocular History

Table 1: Distribution of myopic children according to their family ocular history.

Variable	Frequency	Percentage
Non-spectacle-wearing parents	174	82.1
Both parents using spectacles	5	2.3
Mother using spectacles	12	5.6
Father using spectacles	21	9.9
One or more sibling using spectacles	22	10.3
History of glaucoma in the family	5	2.3

Presenting Complaints of Children

Visual impairment was the most common presenting ocular complaint at presentation, reported by 198 (93.4%) of the children.

Table 2: Presenting complaints.

Presenting Complaints	Frequency	Percentage
Visual impairment (blurry/poor vision)	198	93.4
Photophobia	60	28.3
Itching eyes	38	17.9
Eye pain	27	12.7
Headaches	21	9.9
Eye redness	15	7.1
Excessive eye watering	13	6.1
Spectalces renewal	8	3.7

Classification of Myopia According to The Degree of Myopia

Low myopia was observed in 151(71%) of the children. The mean spherical equivalent for right eyes was -2.49 ± 3.1 D and -2.63 ± 3.1 D for left eyes.

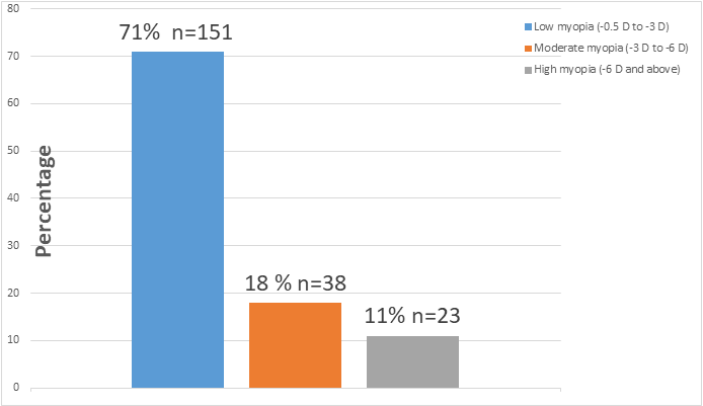

Figure 1: Classification of children according to the degree of myopia.

Distribution of Patients According to Posterior Segment Findings

The most common posterior segement findings were disc pallor in 11 (5.2 %) and Tigroid retina 10 (4.7 %).

Posterior segment findings	Frequency	Percentage
Large and pale optic disc	11	5.2
Tigroid retina	10	4.7
Tilted optic nerve Peripapillary atrophy	6	2.8
Chorioretina atrophy	6	2.8
Temporal crescent	4	1.9
Posterior staphyloma	4	1.9
Lattice degeneration	4	1.9
Tessellated fundus	3	1.4
Lacquer cracks	3	1.4
Macula hole	2	1.0

Distribution of Patients According to Ocular Abnormalities Associated with Myopia

Ocular co-morbidities seen in these children included strabismus in 4.7% (n=10) of patients, amblyopia in 3.7% (n=8) of cases, glaucoma in 2.3 %(n=5), nystagmus in 1.9% (n=4), oculocutanoeus albinism in 1 %(n=2) and aniridia in 1% (n=2) and cataract in 0.47 %(n=1).

Follow-up

Among the children under examination, 51.9 % (n=110) attended the initial appointment for myopia follow-up. On the other hand, 48.1% (n=102) did not attend any follow-up visits.

Discussion

Myopia Prevalence Among Children in Nigeria

In our study involving 542 children, 212 exhibited myopia based on the inclusion criteria. The frequency of myopia in the current study is 39.1%. This result aligns with previous studies conducted in Nigeria, such as the by Ahuama [8] in Abia state, where a myopia prevalence of 31.05% was observed among children aged between 7 to 17 years. Another study carried out by Madihat et al. [9] reported that myopia accounted for 33.81% of visual impairment and Abdullahi [10], found myopia frequency of 36.4% among children aged 5 to 15 years.

The consistency in myopia rates across these studies and our own may be attributed to the similarities in study participants. All these studies involved Nigerian children who share noticeable similarities in sociodemographic characteristics, lifestyle, and environmental parameters. This homogeneity increases the reliability of the observed myopia rates and shows the importance of our findings in the context of similar demographic and environmental contexts. It should also be noted that the use of cycloplegia in these studies, like our own, in young children and those with pré-existing orthoptic abnormalities, may explain the similaritiy of the rates of myopia. However, some studies carried out in the same population have reported a low rate of myopia. For instance, Olusanya et al. [7] conducted a study at University College Hospital in 2019 and found a myopia rate of 23.2% in children with refractive errors. Similarly, Lawan [11] and Ogbonna [12] reported rates of myopia in children at 19% and 24.88%, respectively. In these different studies, the observed rates are probably lower than our finding due to differences in the definition of myopia used. Specifically, unlike our study, which defined myopia based on spherical equivalent, these studies did not use the same criteria. Consequently, a portion of myopic subjects in those studies may have been classified among individuals with astigmatism. Nevertheless, it is evident that myopia persists as the most prevalent refractive error among Nigerian children, as illuminated by Aguwa's study [13] which also identified myopia as the predominant refractive error in tertiary school students across the six geopolitical regions of Nigeria, accounting for a substantial 54% of all the refractive errors.

Age and Gender Correlations in Myopic Children

Majority (74.1%) of myopic children were aged above 8 years. In addition, the mean age of 9.8 ± 3.4 years in this study suggests that myopic children are more likely to be in the older age category. Several previous studies carried out in Nigeria and elsewhere noted an increase in the rate of myopia in children with age. Maciej [14] in Poland found a mean age of 11.0 years in a study involving children aged from 6 to 16 years. Likewise, Tricard et al. [15] in a study which involved children in France found the mean age to be 11.3 ± 3.8 years. In Nigeria, Akinbinu et al. [16] reported the mean age of myopic children as 11.14 ± 1.9 years. In a cross-section of school children, Atowa et al. [17] in Aba noted that the risk of developing myopia was higher in the older age group. In that study, children between 8 and 11 years had a 1.3% prevalence of myopia, and those who were between 12 and 15 years old had a myopia prevalence of 4.3%. Thus, these different studies, including the current one, have demonstrated a relationship between age and the frequency of myopia.

Female subjects constituted the majority (54.7%) in this study. This outcome aligns with findings from previous studies that have

identified gender as a potential risk factor for the onset of myopia. For instance, Maciej [14] conducted a study involving 2470 boys and 2405 girls, that revealed a higher prevalence of myopia in older girls (7 to 13 years old) compared to boys of the same age. The prevalence was notably higher among girls at 8.30%, as opposed to 5.71% in boys (p=0.015). Furthermore, Ovenseri-Ogbomo et al. [6] also indicated a higher prevalence of myopia in females (5.3%) in comparison to males (3.7%).

Similarly, Akinbinu [16] observed a higher prevalence of myopia among females, reporting a prevalence of 4.3% for female subjects versus 3.3% for males in their study. Another investigation conducted by Okukpon [18] in Nigeria, focusing on teenagers with high myopia, noted that females exhibited a smaller corneal curvature with greater corneal power than their male counterparts. This anatomical characteristic appears to pose an additional risk for female subjects in developing myopia. On the other hand, some previous studies have reported results that are contrary to our study findings. Specifically, Marr et al. [19] conducted a study where males were found to be predominant myopic. It is important to note that this particular study exclusively focused on children with higher myopia, occasionally associated with syndromic cases such as Marfan's syndrome, Noonan syndrome, and Stickler syndrome. In another study conducted among 117 school children, Atowa et al. [17] reported no difference in myopia prevalence by gender. These variations in gender prevalence across studies underscore the need to contextualize the epidemiology of myopia and its potential associations with specific subgroups.

Family History and Genetic Considerations

Furthermore, 2.3% of myopic children, in this study cohort, had both parents as corrective spectacle users, while 15.5% had one parent as a spectacle user. These findings are limited as the nature of refractive errors for which they wore spectacles was unknown. Prior studies have reported different prevalence of parental myopia in children with myopia. According to a report by Alvarez-Peregrina et al. [20], both parents were myopic in 18.1% subjects while 46 .7% had one myopic parent.

Similarly, Marr et al. [19] demonstrated a positive family history of ocular abnormalities in the first-degree relatives of 44% of children with myopia, and 29% prevalence of simple myopia among these family members. Studies conducted in China and Poland have indicated that if both parents are myopic, the likelihood of children developing myopia in childhood increases [21]. Genetic studies on myopia have highlighted the substantial role genetics play in the early onset of myopia. For instance, it has been demonstrated that monozygotic twins have a 75% to 90% chance of having a similar refraction, compared to 30% in dizygotic twins [22].

Presenting Complaints

The predominant presenting complaint among children in this study was visual impairment (blurry or poor vision), evident in 93.4% of them. Photophobia and itchy eyes served as motivations for consultation in 28.3% and 17.9% of the children, respectively. These rates of presenting complaints align with a previous study conducted by Olusanya [7], where 71% of children with refractive errors reported poor vision as the primary complaint, and 18% experienced itching eyes. This concordance between both studies may be attributed to similarity of the study setting.

In a study conducted by Otuka et al. [23] in Aba, blurring of vision emerged as the most common complaint in 23.5% of cases, with eye itching reported in 15.7% of cases. Similarly, a study in Yemen by Tawfik et al. [24], involving participants aged between 0 and 30 years, revealed that decreased vision was a prevalent reason for the presentation of myopic subjects in 53% of cases. While visual impairment may not necessarily be the initial complaint in myopic children, it undoubtedly emerges as a primary concern for parents, especially during their children's learning phases. This underscores the significant impact that myopia, particularly its effects on vision, has on both the affected children and their caregivers.

Degree of Myopia

In this study, a notable proportion (71%) of the children exhibited low myopia, while 11% presented with high myopia. The mean spherical equivalent for the right eye was recorded at 2.49 ± 3.1 D, and for the left eye, it was 2.63 ± 3.1 D. The rate of low myopia was more pronounced among children in this cohort. These findings align with results from Olusanya et al. [7], which reported 76.6% prevalence of mild myopia and 10.1% high myopia. Similarly, Alvarez-Peregrina et al. [20] observed 88.8% of participants with low myopia and 2.2% with high myopia. Another congruent study by Verkicharia [25] indicated 65% prevalence of mild myopia and 7% of high myopia. The resemblance in results across these studies may be attributed to their geographic settings, as they were conducted in Africa and Europe, where the prevalence of high myopia is relatively lower than in Asian countries [5].

Posterior Segment Findings and Ocular Abnormalities

In this study, less than a quarter (21.2%) of the children had abnormal posterior segment findings. The most prevalent fundus changes were disc pallor and tigroid retina. Others include chorioretinal atrophy and temporal crescent. These findings align with a study by Kanako where a 16.3% prevalence of chorioretinal atrophy was identified among 46 myopic children studied [26].

High myopia tends to correlate with an increased susceptibility to fundus changes, as evidenced by numerous studies involving children with high myopia. In india, Christina [27] reported that 53.68% of participants exhibited fundus changes, with 90.20% presenting with tessellated fundus and 87.2% displaying temporal crescent. Similarly, in Singapore, Chameen et al. [28], employing retina photography data for 1227 myopic children, found that 37% of subjects had a tilted optic disc. In this study, the spherical equivalent used as the selction criterion of myopia was -3.6D. Junjie's research in China [29], focusing on children with high myopia (mean SE = -8.4 ± 2.2D), demonstrated a higher prevalence of fundus changes. These collective findings underscore a robust correlation between high myopia and the occurrence of posterior segment findings, emphasizing the need for targeted investigations in populations with varying degrees of myopia.

The present study disclosed a strong correlation between high myopia and posterior segment findings. A substantial majority, 93.9% of the children exhibited isolated myopia, while 6.1% demonstrated myopia associated with one or more ocular abnormalities. Strikingly, none of the cases exhibited systemic abnormalities. Ocular anomalies were observed in a few children. in most cases it was strabismus and amblyopia. These results are different from those reported in a previous study by Marr et al. [19] where 32% exhibited amblyopia associated with myopia, and 17% displayed strabismus. The variance may be attributed to the lower incidence of high myopia in our study, as high myopia tends to be more amblyogenic and frequently leads to ocular abnormalities such as strabismus or nystagmus.

Another study conducted by Sujatha [30] in India had reported cataracts and strabismus in 13.33% of the children studied. Mitchell [31] also observed glaucoma in 4.2% of children with low myopia and and 4.4% in moderate to high myopic eyes compared to eyes without myopia where glaucoma was found in 1.5%. It was shown that there is a strong relationship between myopia and glaucoma after adjusting for known risk factors of glaucoma. High myopia has been associated with POAG; however, direct and convincing evidence is still lacking. In a multicentered cross-sectional study including 250 subjects, Jabbar et al. [32] evaluated the refraction, the optic disc ratio, and the visual field defects for all the subjects. The frequency of glaucoma was indicated by the presence of visual field defects and glaucomatous optic disc, and the conclusion was that the glaucoma risk increased for the patients with high myopia.

Follow-up Patterns

In the present study, about half of the children attended their initial follow-up appointment after receiving a prescription, whereas 47.6% did not present for follow-up. Notably, the rate of myopia follow-up in children in this study is observed to be low.

This observation aligns with the findings of a study by Chande et al. [33], which noted that children arrived at the hospital for follow-up after an average duration of almost 2 years. Given the progressive complications associated with childhood myopia, regular follow-up becomes imperative to promptly evaluate any changes in the fundus. That may require therapy. The identified low follow-up rate may be attributed to the circumstance where corrective spectacles enhance vision, and in the absence of complaints from children, parents may perceive less urgency for follow-up until spectacles renewal is required.

Highlighting the significance of professional's eye care in this context, their role is crucial. Practitioners should adeptly and insistently communicate, in understandable terms, the benefits of regular follow-up for myopic children. This communication serves not only to underscore the importance of ongoing monitoring but also to empower parents with the knowledge necessary for the holistic eye care of their children.

Conclusion

Myopia was observed in more than a third of children with refractive errors in this study. Notably, older children exhibited higher myopia frequency than their younger counterparts, and females displayed a higher myopia rate than males. Visual impairment emerged as the most common complaint prompting parents of the children to seek clinical intervention. The majority of children presented with simple myopia and a normal fundus. Finally, only a small proportion of patients attended follow-up appointments as scheduled. This situation poses challenges for practitioners in assessing myopia progression and evaluating the overall effectiveness of their management strategies. Addressing barriers to follow-up and implementing strategies to enhance patient adherence are crucial for optimizing myopia care and mitigating the long-term consequences associated with unmanaged myopia.

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