Epidemio-Clinical Profile of Ametropia in Patients Aged 3 To 18: Case of the Sainte Yvonne Ophthalmological Clinic

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ABSTRACT

Introduction: Ametropia is a major public health problem due to its impact on children's learning and social development. Early detection and appropriate management can prevent visual and functional complications. This study aims to determine the frequency, epidemiological and clinical characteristics, and management of ametropia in children aged 3 to 18 years at the Sainte Yvonne Eye Clinic.

Methodology: This was a cross-sectional descriptive study conducted over a six-month period, including all patients aged 3 to 18 years with ametropia. Data were collected from medical records and ophthalmological examinations and analyzed using SPSS software.

Results: Of 2,500 patients, 1,300 were children, of whom 186 had ametropia, giving a hospital frequency of 14.3%. The mean age was 11.4 years, with a predominance in the 11-15 age group (37.6%) and a predominance of girls (64.5%). Myopia was the most common (47.1%), followed by astigmatism (31.2%) and hyperopia (22.0%). Decreased visual acuity (94.1%) was the main symptom. The majority of patients had optical correction, with 69.9% having spherical lenses and 29.6% having cylindrical lenses.

Conclusion: This study highlights a significant frequency of pediatric ametropia, with a high proportion of myopia. The predominance among school-aged children underscores the importance of early screening and parental awareness. Strengthening awareness and screening campaigns and improving access to optical care are essential to limit visual complications and ensure better academic and social development for children.

Keywords
Ametropia, children, Sainte Yvonne Eye Clinic.

Introduction
Sight is one of the five senses that allow humans to connect with the world around them. It is a sensory function that provides information about the shape, size, color, and mobility of the environment [1,2]. The eye operates on the principles of refraction. Normal vision results from the focusing of light rays precisely on the retina. Ametropia is the absence of sharpness in the vision of the eye, which reflects a defect in the retinal focusing of the image of an object located at infinity [3-5]. Ametropias, including myopia, hyperopia, and astigmatism, are abnormalities of ocular refraction that result in blurred vision. According to the World Health Organization (WHO), uncorrected refractive errors are a major cause of visual impairment worldwide [6,7]. They are the most common causes of decreased visual acuity and constitute one of the primary reasons for consultation in ophthalmology;

which can be a source of visual impairment and blindness. The prevalence varies according to studies, age group and examination method [1,8-10]. Globally, uncorrected refractive errors are responsible for 43% of visual impairment. A study published in the British Journal of Ophthalmology reports that the prevalence of myopia in children and adolescents increased from 24% in 1990 to 36% in 2023. Projections estimate that this rate will reach 40% by 2050, affecting more than 740 million young people [11]. In North America, the prevalence of high myopia is approximately 4.5% in the United States, and the prevalence of myopia in children and adolescents has increased to worrying levels [12]. This trend is attributed to factors such as increased screen time and decreased outdoor activities [13]. In Europe, studies have shown a similar increase in myopia in young people, with rates comparable to those observed in North America [14]. Urban lifestyles and academic pressures are considered contributing factors [15]. In Asia, particularly in China, an "epidemic" of myopia is observed, with rates reaching up to 80% in young adults [11]. This rise is largely attributed to environmental and behavioral factors [16]. In Africa, data on the prevalence of ametropia are limited. However, a systematic review conducted in French-speaking sub-Saharan Africa found that the prevalence of refractive errors was approximately 9.2%, with presbyopia (10.7%) predominating, followed by astigmatism (9.3%), hyperopia (5.2%), and myopia (4%) [17]. However, a study conducted at the Graben University Clinics in the Democratic Republic of Congo revealed a frequency of ametropia of 11.47%, with astigmatism representing 47.86% of cases, followed by myopia (38.90%) and hyperopia (13.24%) [18].

In the Democratic Republic of Congo (DRC), in addition to the study mentioned above, a research conducted in Lubumbashi showed that hyperopia was the most common ametropia in children with strabismus, affecting 42.71% of patients [19]. Another study in Kamina found that 13.5% of children aged 0 to 16 years had refractive errors, with a predominance of myopia [20]. Finally, an additional study in Lubumbashi showed that hyperopia was the most common ametropia, affecting 65.35% of the eyes examined, followed by astigmatism (64.04%) and myopia (22.81%) [21].

Ametropia is a major public health problem, particularly among children. The consequences of non-correction affect education, social participation, and future economic productivity. Despite global recognition of the impact of ametropia on children's visual health, there is a notable gap in specific data regarding its epidemiological and clinical profile in the DRC, particularly in Lubumbashi. This lack of data hinders the implementation of effective screening, prevention, and management strategies adapted to the local context. It is in this context that the present study will aim to determine the epidemiological and clinical profile of ametropia in patients aged 3 to 18 years attending the Sainte Yvonne Eye Clinic in Lubumbashi.

Methodology
We conducted a cross-sectional descriptive study spread over a period of 4 months and 7 days, from October 1, 2024 to February 7, 2025 at the Sainte Yvonne eye clinic. We carried out a non-probability convenience sampling with a sample size of 186 patients. Included in the study were patients aged 3 to 18 years with a diagnosis of ametropia during the study period and who did not present transparent media disorders. The doctors of the ophthalmology department of the Sainte Yvonne clinic carried out the consultation and the various ophthalmological examinations. All patients benefited from a complete anamnesis and an ophthalmological examination: the anamnesis revealed information concerning age, sex, functional signs, consultation time, history and habits of the patients. The ophthalmological examination included: visual acuity with Léa in the very young, Snellen in the older ones, intraocular pressure, a motor assessment to determine the presence of a deviation, the rest of the examination was carried out with a slit lamp. Cycloplegia was carried out using tropicamide eye drops plus phenilephrine, atropine and cyclopentolate in patients under 13 years old and atropine in patients with refractive strabismus.

Analyses were performed using IBM SPSS version 23 software. For qualitative variables, data were expressed as absolute frequency and percentage. For quantitative variables, we used the mean, standard deviation, minimum and maximum. The Chi-square test and the Student t-test were used with the p-value at the significance level of 0.05. Free and informed written consent was presented to patients, parents or guardians and we obtained an agreement to participate by signing said consent. We obtained prior approval from the Medical Ethics Committee of the University of Lubumbashi number: UNILU/CEM/022/2024.

Results
Frequency
During the period of our study, the number of patients consulted at the Sainte Yvonne ophthalmology clinic was 2500, of which 1300 were children, all diagnoses combined, there were 186 patients with ametropia, i.e. a hospital frequency of 14.3% (Figure 1).
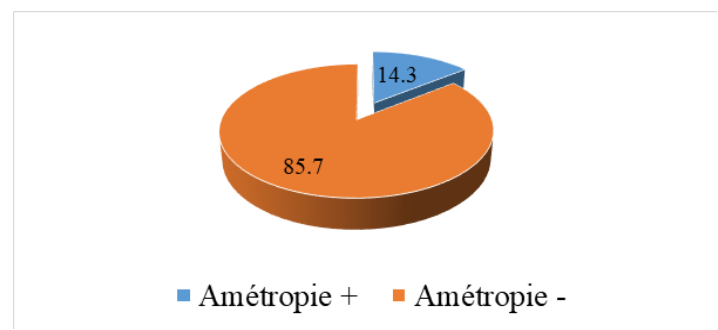

Figure 1: Frequency of ametropias.

Sociodemographic Characteristics of Ametropes
According to the present study, the youngest patient was 3 years old and the oldest was 18 years old. The age group of 11 to 15 years predominated with 37.6% (Table I). The mean age was 11.4 ± 4.1 years. There was a female predominance with 64.5% (n = 120) compared to 35.5% (n = 66) of boys. The sex ratio M/F was 0.55.

Table 1: Distribution of patients according to age.

Age group	Effective	Percentage
≤ 5 years	12	6.5
6 to 10 years old	68	36.6
11 to 15 years old	70	37.6
> 15 years old	36	19.4
Total	**186**	**100.0**

Clinical and Ophthalmological Characteristics of Ametropes

The dominant functional sign was the decrease in visual acuity found in 175 patients or 94.1% (Table 2). The majority of strabismus or 95.7% were convergent (Table 3). There were 65.1% of patients who had no particular history, however, we noted 24.2% of patients with a notion of wearing glasses in the family (Table 4). The majority of patients had an uncorrected visual acuity between 9/10 and 4/10 in the right eye (54.3%) and in the left eye (58.6%). After correction, most patients or 89.2% had a visual acuity of 10/10 in both eyes (Tables 5 and 6). The average consultation time was 2.8 ± 2 years, 45.2% had a consultation time of 1 to 2 years (Table 7). Spherical glasses were frequently used, at 69.9% (Table 8).

Table 2: Distribution of patients according to functional signs.

Functional signs	Effective	Percentage
Decreased visual acuity	175	94.1
Photophobia	118	63.4
Tickling	110	59.1
Watering eyes	82	44.1
Ocalalgia	74	39.8
Eye deviation	23	12.4
Headaches	108	58.1
Secretion	10	5.4
Nystagmus	3	1.6
Diplopia	54	29

Table 3: Distribution of patients according to types of strabismus.

Strabismus	Effective	Percentage
Convergent	22	95.7
Divergent	1	4.3
Total	23	100

Table 4: Distribution of patients according to history.

Background	Effective	Percentage
Glasses wearer	13	7
Concept of wearing glasses in the family	45	24.2
Pseudophakia	5	2.7
Sickle cell disease	1	0.5
Prematurity	1	0.5
None	121	65.1
Total	186	100

Types of Ametropia

Myopia was predominantly ametropia with 47.1%, followed by astigmatism (31%) and hyperopia 21.9% (Figure 2). According to severity, low myopia was the most common with 80.7%, severe hyperopia represented 95.1% and low myopic astigmatism (70.7%) (Tables 9,10 and 11).

Table 5: Distribution of patients according to visual acuity right eye.

Visual acuity right eye	Without correction n (%)	With correction n (%)
10-10	45 (24.2)	166 (89.2)
9/10 to 4/10	101 (54.3)	16 (8.6)
≤ 3/10	40 (21.5)	4 (2.2)
Total	186 (100)	186 (100)

Table 6: Distribution of patients according to visual acuity left eye.

Visual acuity right eye	Without correction n (%)	With correction n (%)
10-10	37 (19.9)	166 (89.2)
9/10 to 4/10	109 (58.6)	16 (8.6)
≤ 3/10	40 (21.5)	4 (2.2)
Total	186 (100)	186 (100)

Table 7: Distribution of patients according to consultation time.

Deadline	Effective	Percentage
< 1 year	13	7
1 to 2 years	84	45.2
3 to 4 years	52	28
5 to 6 years old	26	14
> 6 years	11	5.9
Total	186	100

Table 8: Distribution of patients according to care.

Glass type	Effective	Percentage
Spherical	130	69.9
Cylindrical	55	29.6
Compounds	1	0.5
Total	186	100

Table 9: Distribution of patients according to the degree of severity of myopia and hyperopia.

Severity	Myopia n (%)	Hyperopia n (%)
Weak	71 (80.7)	39 (95.1)
Average	6 (6.8)	1 (2.4)
Severe	11 (12.5)	1 (2.4)
Total	88 (100.0)	41 (100.0)

Table 10: Distribution of patients according to the degree of severity of astigmatism.

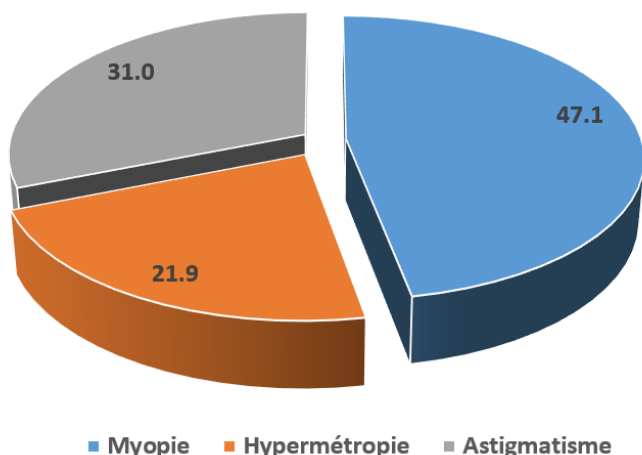| Severity	Effective	Percentage
Low myopic astigmatism	41	70.7
Average myopic astigmatism	1	1.7
Severe myopic astigmatism	3	5.2
Low hyperopic astigmatism	8	13.8
Average hyperopic astigmatism	1	1.7
Severe hyperopic astigmatism	3	5.2
Mixed astigmatism	1	1.7
Total	58	100

Figure 2: Distribution of patients according to types of ametropia.

Types of Ametropia and Sociodemographic Characteristics

The mean age was 12.6 ± 3.9 years in myopes, 9.3 ± 0.53 years in hypermetropics and 11.4 ± 0.53 years in astigmatics. The majority of patients were between 11 and 15 years in myopes (42% (p=0.000), between 6 and 10 years in hypermetropics (p=0.001) and astigmatics (p=0.349) with respectively 48.8% and 44.8%.

Table 11: Distribution of patients according to types of ametropia and age.

Slices	Myopia n (%)	Hyperopia n (%)	Astigmatism n (%)
≤ 5 years	4 (4.5)	6 (14.6)	2 (3.4)
6 to 10 years old	21 (23.90)	20 (48.8)	26 (44.8)
11 to 15 years old	37 (42.0)	14 (34.1)	19 (32.8)
> 15 years old	26 (29.5)	1 (2.4)	11 (19.0)
Mean ± SD	12.6 ± 3.9 years	9.3 ± 0.53 years	11.4 ± 0.53 years
p-value	0.000	0.001	0.349

Types of Ametropia and Clinical and Ophthalmological Features

The dominant functional sign was the decrease in visual acuity found in 84 patients or 94.1% (Khi2/p: 0.562/0.453), 92.7% (Khi2/p: 0.186 / 0.666) in hypermetropes and 94.8% (Khi2/p: 0.083/0.773) in astigmatics (Table 12). All myopic and astigmatic patients had convergent strabismus (Khi2/p: 7.084/0.029 for myopia and Khi2/p: 0.649/0.723 for astigmatism). In hypermetropes, almost all strabismus or 90% were convergent (Khi2/p: 8.961/0.011) (Table 13). The notion of wearing glasses in the family was the antecedent frequently encountered in all types of ametropia (Table 14).

Table 12: Distribution of patients according to types of ametropia and functional signs.

Functional signs	Myopia n (%)	Hyperopia n (%)	Astigmatism n (%)
Decreased visual acuity	84 (94.1)	38 (92.7)	55 (94.8)
Oculalgia	34 (38.6)	16 (39.0)	24 (41.4)
Watering eyes	41 (46.6)	17 (41.5)	24 (41.4)
Photophobia	60 (60.2)	19 (46.3)	40 (69.0)
Diplopia	28 (31.8)	11 (26.8)	16 (27.6)
Tickling	52 (59.1)	25 (61.0)	39 (67.2)
Eye deviation	5 (5.7)	10 (24.4)	6 (10.3)
Headaches	51 (58.0)	27 (65.9)	31 (53.4)
Secretion	4 (4.5)	3 (7.3)	4 (6.9)
Nystagmus	2 (2.3)	1 (2.4)	0 (0.0)
Diplopia	28 (31.8)	11 (26.8)	16 (27.6)

Table 13: Distribution of patients according to types of ametropia and strabismus.

Strabismus	Myopia n (%)	Hyperopia n (%)	Astigmatism n (%)
Convergent	5 (100.0)	9 (90.0)	6 (100.0)
Divergent	0 (0.0)	1 (10.0)	0 (0.0)
Khi2/p	7.084/0.029	8.961/0.011	0.649/0.723
Total	5 (100.0)	10 (100.0)	6 (100.0)

Table 14: Distribution of patients according to types of ametropia and functional signs.

Background	Myopia n (%)	Hyperopia n (%)	Astigmatism n (%)
Glasses wearer	6 (6.8)	4 (9.8)	3 (5.2)
Concept of wearing glasses in the family	28 (31.8)	7 (17.1)	11 (19.0)
Pseudophakia	4 (4.5)	1 (2.4)	2 (3.4)
Sickle cell disease	0 (0.0)	1 (2.4)	0 (0.0)
Prematurity	0 (0.0)	1 (2.4)	1 (1.7)
None	50 (56.8)	27 (65.9)	41 (70.7)
Total	88 (100.0)	41 (100.0)	58 (100.0)

Discussion

Frequency

During the present study, the number of patients consulted at the Sainte Yvonne eye clinic was 2,500, of whom 1,300 were children, all diagnoses combined. The hospital frequency of ametropia in patients was 14.3%. This proportion is close to the 13.5% reported by Kalamba D, et al. [22] in 2023 in their study on refractive errors in children in an urban -rural and low-income environment in Kamina, DRC.

However, some authors have reported proportions higher than ours, including Alla N. [23] in 2022 in Abidjan, Diallo S [4] in 2019 in Mali, Christina [24] in 2020 in Spain, Konate D [25] in 2024 in Benin and Tambwe H, et al., [26] in schools in Lubumbashi in 2025 who found respectively 87.54%, 46.8%, 46.3%, 27.9% and 39.8%. On the other hand, our prevalence is higher than the 2.2% reported by Koirala [27] in schools. This divergence in results between studies is probably due to methodological differences (mode of subject recruitment, random versus convenience, operational definitions of refractive errors applied and study setting: general population, hospital or school setting). However, refractive errors or refractive errors are the leading cause of visual impairment worldwide, and their proportions vary considerably between societies, partly reflecting genetic and environmental divergences [28]. High

prevalences are generally found in screening or community prevalence studies, as well as when automatic refractometry is routinely used, regardless of patients' visual acuity.

Sociodemographic Characteristics
Age
The study found that the age group most affected by ametropia was 11 to 15 years (37.6%), followed by 6 to 10 years (36.6%).

Other studies have obtained similar results to ours, including Kalamba, et al., [22], Alla N [23] and Tambwe H, et al., [26], who reported 81.4%, 69.4% and 46.3% respectively in the age groups of 11-16 years, 9-13 years and 12-14 years. Conversely, Jean M [29], in Mali in 2021, found a predominance in the 4 to 6-year age group (40.6%). Variation in methodologies could explain this difference. The mean age of our patients was 11.4 years, a figure close to the observations made by Vonor K, et al. [30], Kouassi FX, et al. [2], Sovogui MD [3] and Diallo S [4], who found mean ages of 12.7 years, 10.55 years, 12 years and 11 years respectively. These results are consistent with several studies showing that refractive errors become more frequent with school age, due to increased visual demands [31].

Sex
Female gender was predominant (64.5%), with a M/F sex ratio of 0.55, indicating a higher proportion of affected girls. This female predominance has been reported in several epidemiological studies, including those of Kalamba D. et al. [22] (65%), Paluku [32] (51.3%), Konate [25] (75.7%), Sovogui MD [3] (52.3%) and Tambwe H et al. [26] (56.8%). This suggests that hormonal and behavioral factors could influence the occurrence of ametropia [33]. On the other hand, this female predominance could be explained by the fact that girls are often more inclined to report visual disturbances and benefit from increased attention from parents. However, Christina [24] reported a male predominance (53.7%).

Clinical and Ophthalmological Features
Functional signs
The most common symptom was decreased visual acuity (94.1%), in agreement with literature data indicating that myopia, hyperopia and astigmatism are the main causes of reversible visual impairment in children [34].
Other symptoms were noted: Photophobia: 63.4%, tickling: 59.1%, tearing: 44.1%
These manifestations are also reported in the studies of He, et al., [16] on the signs associated with refractive errors.

Several other authors have reported various symptoms:
Paluku [32]: Blurred vision (35%), Oculalgia (14.1%)
Alla N [23]: Pruritus (55%)
D. Konate [25]: Visual fatigue and tearing (37.9%)

Although the clinical manifestations of ametropia can vary, the most common is decreased visual acuity, often due to a lack of convergence of the image on the macula. Regarding strabismus, 95.7% of patients were convergent, which is consistent with the observations of Cotter, et al. [35] and Yogolelo [7], indicating that esotropia is more common in children with ametropia, especially hyperopia.

Background
The majority of patients (65.1%) had no particular history, but 24.2% had a family history of wearing glasses, and 7% were glasses wearers. According to Kalamba D, et al., [22], patients wearing glasses represented 26% and those with glass wearers in their family were 21%. This suggests a genetic predisposition to refractive errors. Studies such as those of Saw et al. [36] have demonstrated that family history significantly increases the risk of developing myopia.

Visual Acuity with and without Correction
Before correction, 54.3% of patients had a visual acuity between 9/10 and 4/10 in the right eye and 58.6% in the left eye, which shows moderate vision impairment. After correction, the majority of patients achieved 10/10, confirming that ametropias are correctable with glasses, as reported by Flitcroft [37]. Before correction, Kalamba D, et al., [22], and Kouassi FX et al [2] reported 58.6% and 23.4% of patients with a visual acuity of 10/10, respectively. Practically, given that children have a significant power of accommodation, the true visual acuity to be considered should be that obtained after cycloplegia.

SUPPORT
The management showed a predominance of spherical lenses (69.9%), followed by cylindrical lenses (29.6%). According to the study of Kalamba D, et al., [22], spherical lenses were the most prescribed with a frequency of 52.9%, cylindrical lenses with 35% of patients and only 12.1% of patients had compound lenses. These results are similar to those of Zadnik [33], indicating that myopia is the most common ametropia requiring spherical corrective lenses.

Types of Ametropia
Myopia
Myopia was the majority (47.1%) and dominated by the low form (80.7%). This result is in line with global trends indicating an increase in myopia, particularly due to the increase in time spent in front of screens and the reduction in time outdoors [31]. Our proportion of myopia is higher than those reported by Paluku K [32], Kalamba D, et al., [22] and Diallo S [4] who found 38.9%, 29% and 2.9% respectively. and lower than the proportion of Tambwe H, et al., [26] (68.5%). Our rate of low myopia is in line with that of Konate D [25] (93.8%) and Tambwe H, et al., [26] (97.3%). Myopia was more observed in patients aged 11 to 15 years (44.7%) as in all ametropic children with an average age of 12 years. There was a significant association between age and myopia (p=0.002), the rate of the disease increased with age until reaching the peak between 11 and 15 years and then regressing. This same observation was made by Kalamba D et al [22] and Diallo S [4].

Hyperopia

Hyperopia represented 22.0% of patients, it was mainly low (95.1%), which is consistent with the results of Mutti et al. [28], suggesting that hyperopia decreases with age. Our hyperopia rate is close to that of Diallo S [4] (27.1%) and is lower than the 45.48% recorded by Kalamba D [22]. The average age of hyperopic patients was 9.4 years, Diallo found an average age of 14 years among these patients.

Astigmatism

Astigmatism represented 31.2% of patients, the majority was low myopic astigmatism (70.7%), consistent with the data of Konate D [25], Paluku K [32], Diallo S [4] and Kalamba D, et al., [22] who reported 47.9%, 55.5% and 47% respectively. The predominance of low myopic astigmatism was also observed in the study of Konate D [25] (99.4%).

Conclusion

Our study on the epidemioclinical profile of ametropia in patients aged 3 to 18 years at the Sainte Yvonne eye clinic highlighted a significant frequency of refractive errors in this population. Myopia was found to be the most common ametropia, followed by astigmatism. Analysis of the patients' sociodemographic characteristics showed a variable distribution according to sex and age, with a predominance of patients in school-aged children, much more so in girls. In addition, heredity is believed to be one of the risk factors for ametropia. The study highlighted that treatment is often delayed, due to a lack of parental awareness and the absence of systematic screening. Raising public awareness of the harmful consequences of early, excessive and too close use of screens, limiting the time spent working with near vision and promoting outdoor activities requiring distance vision, as well as reducing the time spent exposed to artificial light is necessary to reduce the frequency of ametropia.

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