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Clinical Forms of Astigmatism at The University Hospital of Brazzaville

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Introduction

Astigmatism, or cylindrical ametropia, is an optical defect that occurs when the cornea or the lens has an irregular shape, preventing light rays from being focused on the retina. It causes visual blur of varying intensity and affects the majority of the population. Astigmatism is commonly associated with myopia and hyperopia [1]. A global and regional systematic review and meta-analysis estimated that cylindrical ametropia is the most frequent refractive error [2]. In Côte d'Ivoire, astigmatism accounts for 64.04% of ametropias [3]. In Congo, a study of refractive errors in 432 children found that astigmatism was the most frequently observed refractive error, at 80.6% [4]. However, to date, no specific study has been conducted on cylindrical ametropias. Moreover, astigmatism occupies a major place among refractive errors and can occur at any age. We undertook this study to describe the epidemiological and clinical features of astigmatism at the University Hospital of Brazzaville.

Patients and Methods

A descriptive cross-sectional study was conducted in the Ophthalmology Department of the University Hospital of Brazzaville on a series of patients with ametropia from 1 January to 31 June 2025. The target population consisted of individuals with regular astigmatism. Patients aged 5 to 79 years who had undergone a complete ophthalmologic examination with objective refraction using a TOPCON AR-8900 automatic refractometer under cycloplegia with cyclopentolate were included, according to the following protocol: three instillations at 0, 5, and 10 minutes, with refraction measured between 45 and 60 minutes after the first drop. Children under 5 years of age were excluded because of the difficulty in determining refraction due to a lack of specific equipment. Patients with an organic eye disease likely to influence refraction and those who had undergone cataract surgery were also excluded. Informed consent was obtained from all patients. Sampling was systematic and non-probabilistic, including all patients who met the inclusion criteria during the study period. The study variables were social (age and sex) and clinical (functional signs, visual acuity, objective refraction under cycloplegia using the autorefractometer, and type of astigmatism).

All patients with a diagnosis of ametropia after the ophthalmologic examination were referred to the investigating physician. After obtaining informed consent, the investigator reassessed the patient through an interview and clinical examination, then classified patients according to their ametropia. Astigmatism was considered from 0.50 diopters upward. For bilateral astigmatism, both eyes were included; for unilateral astigmatism, only the astigmatic eye was considered. Data were collected on standardized forms, entered using CSPro 7.4 software, and analyzed with SPSS 25 public health software. Tables and figures were generated using Microsoft Excel 2016. Statistical analysis included a descriptive phase of the study population. For quantitative variables, we calculated the mean and standard deviation. Eight age groups were considered. Frequencies of qualitative variables were compared using the chi-square test. A p value ≤ 0.05 was considered statistically significant.

Results

During the study period, among 256 patients with static ametropia, 197 had astigmatism, giving a frequency of 76.9% (Figure 1). Twenty-three had unilateral astigmatism (11.6%): twelve in the right eye and eleven in the left. Our sample consisted of 69 men and 128 women, for a sex ratio of 0.53. The mean age was 38.06 ± 18.2 years; the median age was 41 years, with extremes of 5 and 79 years. Astigmatism was most frequent in the 40-49-year age group (Figure 2). Among the functional signs, decreased visual acuity was present in more than half of cases (Table 1). Visual acuity ranged from 3/10 to 10/10, and the 8/10 to 10/10 range was the most frequent (Table 2). Hyperopic forms were largely predominant (Table 3), and myopic astigmatism was most common in the 60-69-year age group (Figure 3). With regard to the axis or orientation, with-the-rule (direct) astigmatism was the most frequent (Table 4).

Table 1: Distribution of patients by reason for consultation.

Reason for Consultation	Number (n)	Percentage (%)
Decreased Visual Acuity (DVA)	102	51.8
Headache	24	12.2
Renewal of Spectacles	19	9.6
Ocular Pain	17	8.6
Itching	16	8.1
Photophobia	8	4.1
Red Eye	6	3.1
Tearing	5	2.5
Total	197	100

Table 2: Profile of uncorrected distance visual acuity.

Uncorrected Distance Visual Acuity	RE n	RE %	LE n	LE %	BE n	BE %
1/10 to 3/10	38	20.6	33	17.7	71	19.1
4/10 to 7/10	63	34	58	31.2	121	32.6
8/10 to 10/10	84	45.4	95	51.1	179	48.3
Total	185	100	186	100	371	100

(RE = Right Eye; LE = Left Eye; BE = Both Eyes)

Table 3: Frequency of forms according to refractive power of the meridians.

	RE n	RE (%)	LE n	LE (%)	BE n	BE (%)
Hyperopic Astigmatism (A H)	98	26.42	105	28.3	203	54.72
Myopic Astigmatism (A M)	30	8.09	32	8.62	62	16.71
Mixed Astigmatism (A Mixed)	57	15.36	49	13.21	106	28.57
Total	185	49.87	186	50.13	371	100

Table 4: Distribution of Astigmatisms according to axis.

Type by Axis	n	%
WITH-The-Rule Astigmatism (WTR)	169	45.55
Against-The-Rule Astigmatism (ATR)	139	37.47
Oblique Astigmatism (OA)	63	16.98
Total	371	100

(WTR = With-The-Rule; ATR = Against-The-Rule; OA = Oblique)

Discussion

Frequency of Astigmatism

In our study, astigmatism was the most frequent ametropia, followed by hyperopia. The frequency of astigmatism can vary depending on the population studied and the diagnostic criteria used. For example, studies by Kawuma [5] in Uganda and Turaçli [6] in Turkey reported frequencies of 52% and 47%, respectively, which are lower than those reported by Makita [4] in Congo and Sounouvou [7] in Benin (80.6% and 91.9%). Methodology likely

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influenced these results. Kawuma [5] used a retinoscope, whereas in our previous and current studies and in the study by Sounouvou [7], an autorefractometer was used, which is highly sensitive for diagnosing astigmatism. In addition, some authors only consider astigmatism from 1 diopter, whereas we included patients from 0.5 diopters [8] (Table 5).

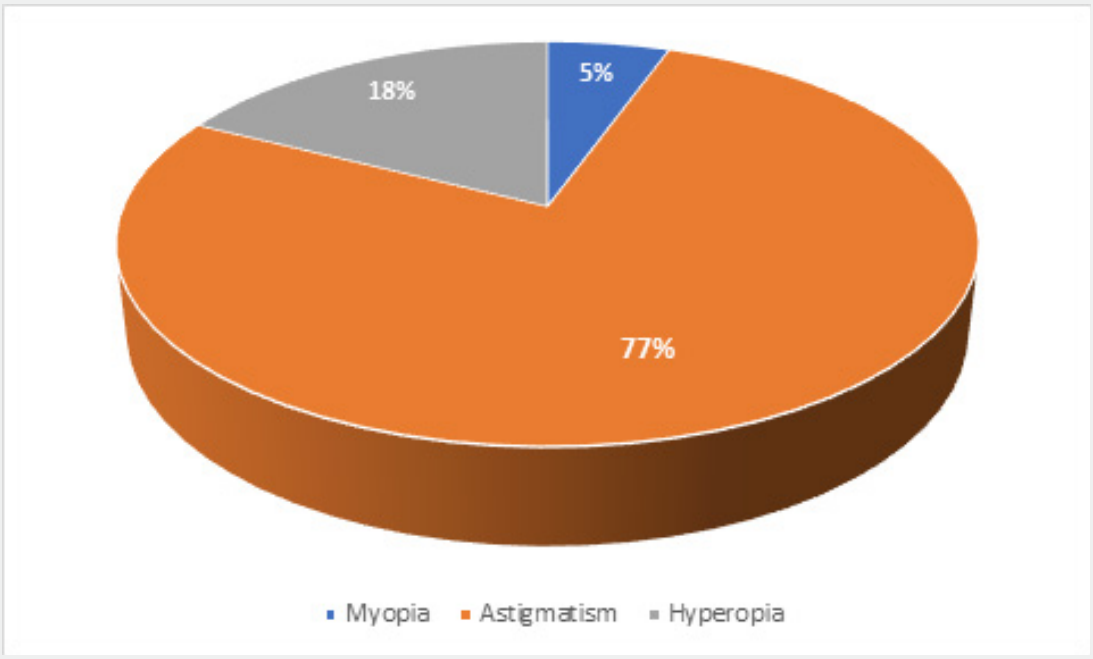

Figure 1: Different types of static ametropia.

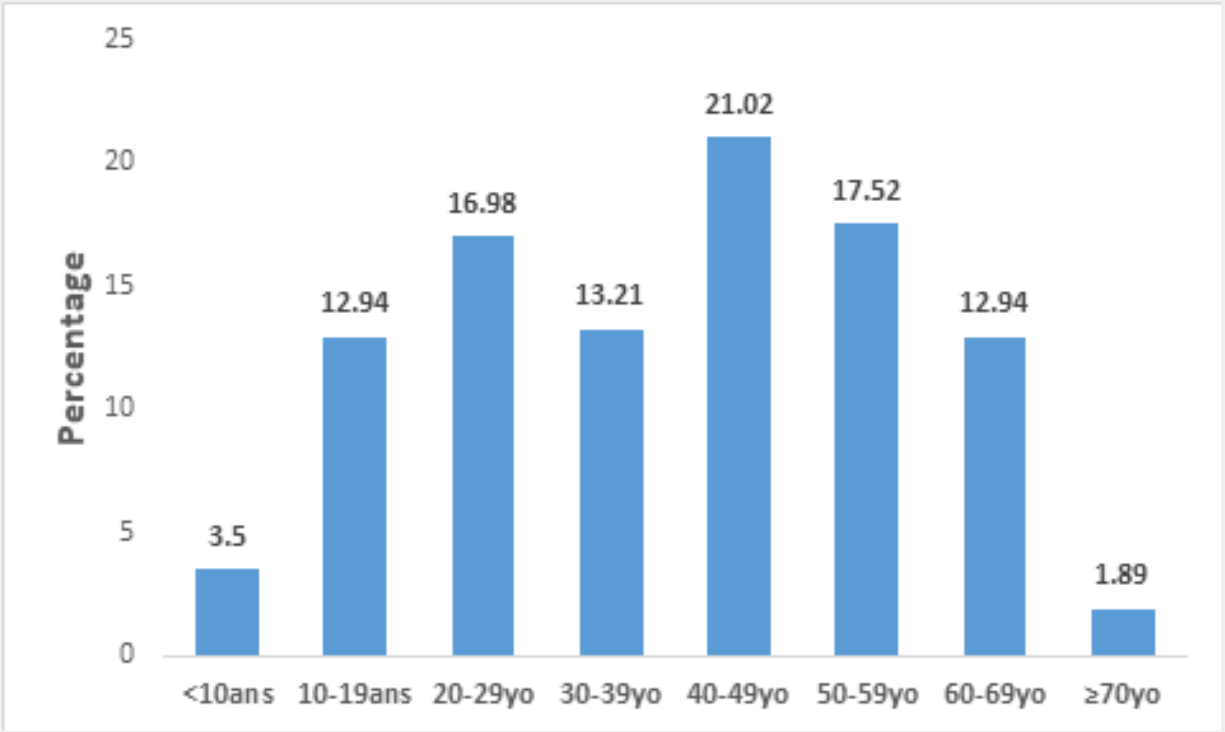

Figure 2: Distribution of patients by age group.

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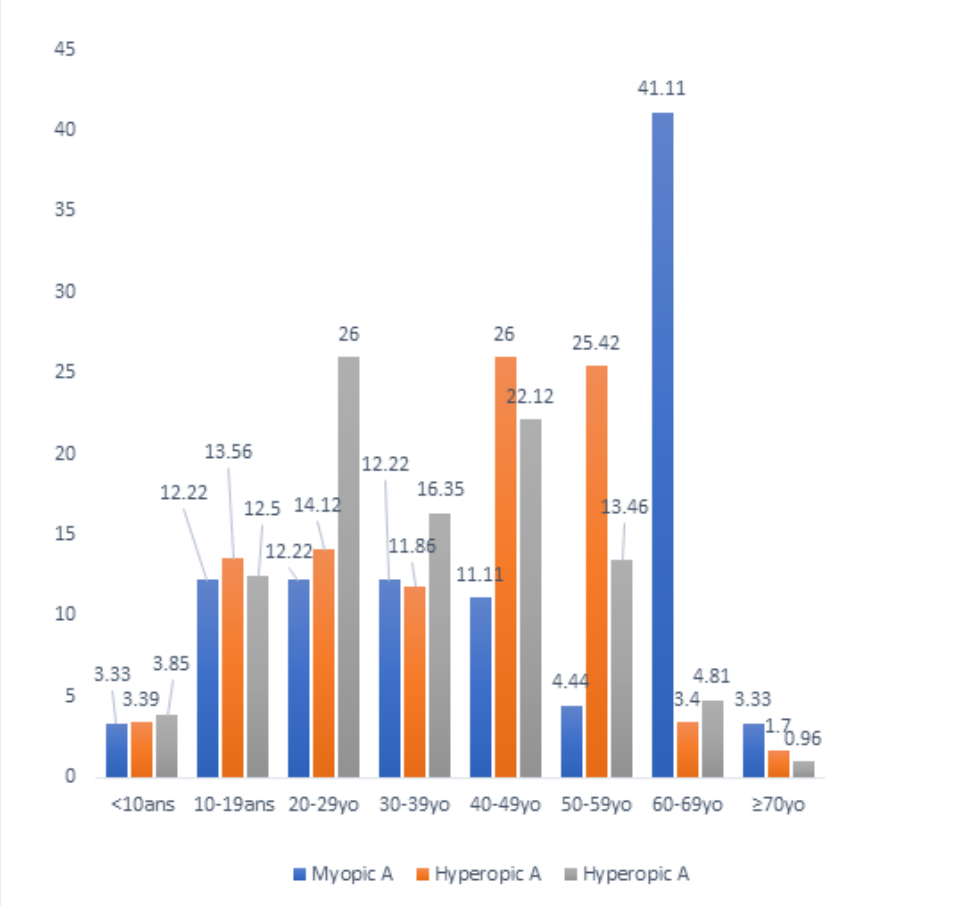

Figure 3: Diagram showing the optical forms by age.

Table 5: Distribution According to power (Degree of Severity) of Astigmatism.

Degree of Astigmatism	n	(%)
Low (< −1)	232	62.5
Moderate (−1 to < −2)	114	30.7
High (≥ −2)	25	6.8
Total	371	100

Social Characteristics

Age

Astigmatism can affect people of all ages, children and adults. In our series, the frequency of astigmatism was low before age 10 and increased progressively up to age 49, then began to decline. A dip in the curve was observed between 30 and 39 years. This curve is similar to that reported by Leung [9] in China. However, these variations depend on the studies and sampling methods. Shih [10], who worked on schoolchildren in Taiwan, noted that the rate of myopic astigmatism increases with age, whereas the rate of hyperopic and mixed astigmatism decreases with age.

Sex

The sex ratio was 0.53, indicating a predominance of females. A similar finding was reported by Kouassi [3] in Côte d'Ivoire (sex ratio 0.76). Leung [9] in China also found a clear female predominance, with sex ratios of 0.76 and 0.75 in his series. In contrast, several studies did not find this female predominance, such as those of Chebil [11] in Tunisia and Lam [12] in Hong Kong, which reported sex ratios of 1.0. Sex therefore does not appear to influence the prevalence of astigmatism.

Clinical Characteristics

Reasons for Consultation

Decreased visual acuity was the most common reason for consultation in our study, accounting for 51.8% of cases. This rate is similar to that reported by Ebana [13] in Cameroon (52%) and Maul [14] in the United States (56.3%) [15].

Uncorrected Distance Visual Acuity

More than 50% of patients had a visual acuity of less than 8/10. According to Wolffsohn [15], uncorrected astigmatism,

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even as low as 1.00 diopter, can lead to a significant reduction in vision and, if left uncorrected, may substantially affect patients' independence, quality of life, and well-being.

Clinical Forms of Astigmatism

Of the three optical types of astigmatism presented in this work, hyperopic astigmatism was the most common, representing 54.72% of cases. It was followed by mixed astigmatism (28.57%) and myopic astigmatism (16.71%). These findings are comparable to those of Ayed [16] in Tunisia, who reported 57.75% hyperopic, 34.11% myopic, and 8.62% mixed astigmatism. In our study, all types of astigmatism were present at different ages, with widely varying proportions across age groups. We observed a marked increase in myopic astigmatism from age 60 onward, probably related to lens sclerosis, as demonstrated by Cho [17] in South Korea. With regard to meridian orientation, we found, in order of frequency, 45.5% with-the-rule astigmatism, 37.4% against-the-rule astigmatism, and 16.9% oblique astigmatism. In many studies, the frequency of these three types follows the same order and shows proportions similar to ours [11,18,19]. The predominance of with-the-rule astigmatism may explain why many patients had good visual acuity: against-the-rule astigmatism reduces distance visual acuity more than with-the-rule astigmatism [20]. In terms of astigmatic power, cylinder values ranged from-0.50 diopters to 4.25 D. Recent studies have shown that uncorrected visual acuity begins to decrease from-0.50 D of uncorrected astigmatism [21]. Mild astigmatism accounted for 62.5% of cases, moderate astigmatism for 30.7%, and high astigmatism for 6.8%. These results are comparable to those of Febbraro [22] in France and Ferrer-Blasco [23] in Spain, who reported similar rates of mild astigmatism (60% and 57%, respectively). Rabbetts [24], however, found a higher frequency of mild astigmatism (84.25%).

Conclusion

Astigmatism was the most frequently observed ametropia in this study. It affects patients of all ages, with a predominance in females. The main reason for consultation was decreased visual acuity. However, more than 48.3% of patients had visual acuity between 8/10 and 10/10. Considering meridian refractive power, hyperopic astigmatism was the most frequent type. With respect to the axis, with-the-rule astigmatism was the most common, and in terms of severity, mild astigmatism predominated. Astigmatism therefore represents a public health problem that can variably affect ocular function. Early screening and treatment are essential.

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