

## Refractive errors diagnosed after ophthalmological examinations during physical skills (Case of the University of Lubumbashi, academic year 2019-2020)

Mpia Epombe Florent<sup>1\*</sup>, Kanku Mbuyi Joseph<sup>1</sup>, Twite Badye Francine<sup>1</sup>, Tabu Yekoli Léonard<sup>1</sup>, and Chenge Borasisi Gaby<sup>1</sup>

<sup>1</sup>(Department of Ophthalmology/ University of Lubumbashi, Democratic Republic of Congo)

### Abstract:

**Background:** Student candidates in recruitment years of study must undergo certain clinical tests, including visual acuity, which is carried out in the ophthalmology department of the university teaching hospital of Lubumbashi. The aim of this work was to determine the frequency of accidentally discovered refractive errors in those who registered for the 2019-2020 academic year.

**Materials and Methods:** descriptive study with retrospective collection of the files of patients attended to at the ophthalmological center of the university teaching hospital of Lubumbashi for physical fitness tests and referred for consultation for reduced visual acuity, from august 1<sup>st</sup> to october 31<sup>st</sup>, 2019.

Patients with visual acuity less than or equal to 9/10 in at least one eye had undergone a complete ophthalmologic examination including in addition to visual acuity, the biomicroscopic test, refraction, fundus test, and intraocular pressure measurement.

**Results:** A total of 11980 applicants were attended to for the physical fitness test, of which 145 had presented a decrease in visual acuity less than or equal to 9/10 in at least one eye, i.e. a hospital frequency of 1.2%.

The average age was  $19.7 \pm 1.9$  years old, with extremes of 17 and 25, and a male to female sex ratio of 1.07. Regarding the township of residence, 32.64% of patients came from Lubumbashi township, 25% from Kampemba township, 22.92% from Annex township and 19.44% from other townships in the city.

Out of the 290 eyes tested, the average uncorrected visual acuity was  $0.57 \pm 0.33$ , with extremes of 1.0 and nihil visual acuity; 262 eyes presented refractive errors, a frequency of 90.3%. Astigmatism of any type was the most frequent refractive error with 52.4%, myopia came second with 36.6%, of which around 10.3% was moderate to malignant. The frequency of amblyopia was 7.59%.

**Conclusion:** The frequency of refractive errors among candidates for registration with the University of Lubumbashi for the 2019-2020 academic year was low. Attention was drawn to the presence of moderate, malignant myopia and amblyopia. For better academic performance, we suggest that the academic authorities require an annual report after each period of physical fitness test by departments that have tested the students, to facilitate the care of candidates diagnosed as ill and to guide the unfit to adapted sectors.

**Key Word:** Amblyopia; Astigmatism; Hyperopia; Myopia; Physical fitness; Refractive error.

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### I. Introduction

Refractive error reflects a defocused retinal image of an object located at infinity<sup>1</sup>. Uncorrected refractive errors are the most common cause of moderate to severe visual impairment worldwide, and particularly in Sub-Saharan Africa<sup>2,3</sup>.

A worldwide estimate indicates that 122.5 million people suffer from visual impairment due to uncorrected refractive errors<sup>4</sup>. This fact has a major social and economic impact, including a limitation of educational and learning opportunities<sup>5</sup>.

Uncorrected refractive errors are a major public health problem and preventive actions are needed to manage it<sup>6</sup>. They can be responsible for school failures, academic, and even significant socio-professional handicaps.

In developing countries, loss of vision due to ametropia does not appear to be a major concern requiring an ophthalmologic consultation, as the life-threatening prognosis is not at stake<sup>7</sup>. This is even more so as low-income families are often not able to afford the costs of a specialist consultation plus the cost of glasses as this must be borne by the patient<sup>8</sup>.

The aim of this work was to determine the frequency of accidentally discovered refractive errors in student applicants for recruitment promotions at the University of Lubumbashi who were received in the 2019-2020 academic year.

## II. Material And Methods

This is a cross-sectional descriptive study with retrospective data collection carried out at the university teaching hospital of Lubumbashi from august 1<sup>st</sup> to october 31<sup>st</sup>, 2019, concerning student applicants from recruitment years of study received in the ophthalmology department of university teaching hospital of Lubumbashi and referred for consultation for reduced visual acuity.

Patients with visual acuity less than or equal to 9/10 in at least one eye had undergone a complete ophthalmologic test, comprising in addition to visual acuity, biomicroscopic test, refraction, fundus test, and measurement of intraocular pressure.

Student applicants with visual acuity of 10/10 in both eyes were not included.

We used patient files and ophthalmology service registers for data collection.

Visual acuity was measured for each patient in a monocular 5 meters away in a photonic environment, using a MONOYER scale. The patients then underwent a complete ophthalmologic test with automatic refractometry using the CHAROPS CRK-7000 refractometer.

The statistical analysis of the parameters under study, namely age, sex, place of residence, visual acuity, and refractive errors, was carried out using Excel 2013 software and Epi Info 7. The frequency of refractive errors was calculated with a 95% confidence interval.

## III. Result

A total of 11.980 applicants were received for the physical fitness test, among whom 145 had presented a reduction in visual acuity less than or equal to 9/10 in at least one eye, i.e. a hospital frequency of 1.2%. The average age was  $19.7 \pm 1.9$  years, with extremes of 17 and 25, and a male-to-female sex ratio of 1.07.

Regarding the township of residence, 32.41% of subjects came from Lubumbashi township, 25.52% from Kampemba township, and 22.76% from the Annex township. A number of 28 applicants (19.31%) came from the other townships of the city (Kenya, Kamalondo, Ruashi townships).

Out of the 290 eyes tested, the average uncorrected visual acuity was  $0.57 \pm 0.33$ ; 262 eyes presented refractive errors, i.e a frequency of 90.3%. All types of astigmatism represented a frequency of 524%, followed by myopia with a frequency of 36.6%, of which about 10.3% were moderate to malignant. The frequency of amblyopia for all ages was 7.59%.

Table 1 shows the distribution of applicants according to their place of residence.

**Table no 1:** Distribution of candidates according to municipality or place of residence  
95% confidence interval

Municipality or Place of residence	Frequency	Percentage (%)
Annexe	33	22,76 (16,21-30,45)
Kampemba	37	25,52 (18,65-33,42)
Lubumbashi	47	32,41 (24,88-40,68)
Other municipalities	28	19,31 (13,23-26,69)
Total	145	100

Table 2 shows the prevalence of different refractive errors and amblyopia according to age.

**Table no 2:** Frequency of refractive errors and amblyopia according to age  
95% confidence interval

Refractive errors	AGE (years)		Total
	17-19	20-25	
Benign myopia	35,33% (27,71-43,55)	16,43% (10,71-23,62)	26,21%

Moderate myopia	6% (2,78-11,08)	7,86% (3,99-13,62)	6,90%
Malignant myopia	2% (0,41-5,73)	5% (2,03-10,03)	3,45%
Astigmatism	44% (35,91-52,33)	61,43% (52,84-69,53)	52,41%
Amblyopia	7,33% (3,72-12,74)	7,86% (3,99-13,62)	7,59%
Hyperopia	2,67% (0,73-6,69)	0	1,38%

Table 3 shows the prevalence of different refractive errors and amblyopia according to sex.

**Table no 3:** Frequency of refractive errors and amblyopia according to sex  
95% confidence interval

Refractive errors	SEX		TOTAL
	F	M	
Benign myopia	25,71% (18,71-33,78)	26,67% (19,78-34,49)	26,21%
Moderate myopia	3,57% (1,17-8,14)	10,00% (5,71-15,96)	6,90%
Malignant myopia	5,00% (2,03-10,03)	2,00% (0,41-5,73)	3,45%
Astigmatism	55,71% (47,08-64,10)	49,33% (41,08-57,61)	52,41%
Amblyopia	6,43% (2,98-11,85)	8,67% (4,70-14,36)	7,59%
Hyperopia	1,43% (0,17-5,07)	1,33% (0,16-4,73)	1,38%

#### IV. Discussion

This study carried out at the university teaching hospital of Lubumbashi among student applicants for recruitment years of study within the framework of physical fitness before their admission to the University is the first to be found in Lubumbashi city. Were received in the ophthalmology department, 11980 applicants subjected to the visual acuity test ; 145 of them presented a refractive error, distributed in the seven townships of Lubumbashi city with a strong predominance of Lubumbashi and Kampemba townships, respectively 32.41% and 25.52%.

Myopia was found in 36.6% of the subjects tested; this prevalence is superimposed on that found by Diallo O (387%) in a study of pupils aged 12 to 18<sup>9</sup>. It was quite high compared to other countries such as Iran where it was estimated at 29.3% in a study among students, in the United States (21.5% among black people), and in Mexico (24.8%)<sup>10,11,12</sup>.

This frequency was, on the other hand, lower than that found by Alsaif BA et al in a study among Saudi students (48%) and by Rim TH et al among Koreans (73%)<sup>13,14</sup>.

Although benign myopia was the most common, moderate and malignant myopia were 10.35%, respectively, with a frequency of 3.45% for malignant myopia. This frequency was higher than that reported by Diallo O (1.5%)<sup>9</sup>. On the other hand, it was comparable to that found among Saudi students (5.6%)<sup>13</sup>. Note that malignant myopia requires the adoption of rapid measures to prevent the occurrence of complications threatening vision (retinal detachment, macular hemorrhages, glaucoma).

Hyperopia had the lowest frequency among refractive errors: 1.4%, mainly in the age group 17 to 19 years. Our results are similar to those of Fotouhi A et al who found 0.6% among 18-year-old schoolchildren<sup>15</sup>.

They are lower than those of Diallo O, and Hashemi et al, who carried out studies on younger subjects and who found respectively 14.8% (with 33% in 12-year-old students) and 18.7%<sup>9,10</sup>. Our results are also inferior to those of Rim et al who found a prevalence of hyperopia of about 25% in subjects over 40 years of age<sup>14</sup>.

Astigmatism was the most common refractive error at 54.4%. This prevalence is comparable to that of Pan CW et al, and of Diallo O, who found respectively 53.4% in Chinese subjects and 46.5%<sup>11,9</sup>.

On the other hand, Hashemi H et al and Rim et al found a lower prevalence than ours with respectively 20.7% in high school students in Iran and 36.1% in the Korean population aged 40 years or over<sup>10,14</sup>.

As for sex, 51.1% of ametropic patients were male against 48.9% female. So there was no noticeable difference between women and men. Comparable results were also observed by Diallo O who found 50.7% of male ametropic patients against 49.3% of female sex<sup>9</sup>.

In a study among first year students at Tianjin Medical University, Shi et al also found that there was no noticeable difference between men and women in the prevalence of astigmatism and hyperopia, while for myopia, female students had a higher prevalence compared to male students because they spent more time reading, doing outreach work<sup>16</sup>.

Parrey et al also found almost the same overall prevalence of refractive errors in both sexes: male 49.8% and female 50.2%, but in their study, astigmatism and myopia were more marked in the female sex, i.e. 19.3% and 4.3%, against 4.3% and 2.6% for men<sup>17</sup>.

## V. Conclusion

The frequency of ametropia was low, with a non-negligible proportion of moderate to malignant ametropia and amblyopia. For better academic performance, we suggest that academic authorities require an annual report after each period of physical fitness test by department, to facilitate the care of applicants who are diagnosed as ill and to refer the unsuitable to the appropriate courses.

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