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#### REFRACTIVE ERRORS AND SCHOOL PERFORMANCE IN BRAZZAVILLE, CONGO

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### ABSTRACT

**Background:** Wearing glasses before ten years is becoming more common in developed countries. In black Africa, for cultural or irrational reasons, this attitude remains exceptional. This situation is a source of amblyopia and learning difficulties.

**Objective:** To determine the role of refractive errors in school performance in Brazzaville.

**Design:** Case-Witness study.

**Subjects:** The cases' group was formed by pupils with a record of school delay and actual pupils.

**Results:** Fifty two records were selected 26 cases vs 26 witnesses (52 Cases' eyes vs 52 witnesses' eyes), the mean age was  $14 \pm 2.40$  years vs  $11.50 \pm 1.80$  years ( $p < 0.001$ ). The prevalence of visual loss was 50.00% vs 1.92% (OR = 833, 95% CI 207 - 455,  $p < 0.001$ ). Hyperopia (62.74%) was the main diagnosed ametropia.

**Conclusion:** Refractive errors largely determines pupil performance in schools in Brazzaville, Congo. The routine use of glasses if necessary can reverse this trend.

### INTRODUCTION

Refractive errors are usually easy to diagnose, particularly in adults, even in conditions of lack of medical equipment in poor regions of the world. While it is now common to see a child under one year with glasses in major Western cities (developed countries), wearing glasses before the age of ten years is still an exception in major cities in sub-Saharan Africa. Indeed, in Africa the diagnosis of refractive errors in children often remains a challenge for several reasons. Lack of equipment, refractive device adapted to the size of children, are often added to irrational or cultural reasons. Parents do not easily accept the idea that their child wears glasses, so the tests for the diagnosis of causal ametropia are inappropriate for them. This long-term generating amblyopia affects children leading to difficulties (1-3). A Chinese study (1) showed that the learning curve of children with ametropia slowed than that of children without ametropia. We did not find any African data on this subject. This investigation aimed to determine the place of refractive errors in school performance in Brazzaville.

### MATERIALS AND METHODS

This is a Case-Witness study, conducted over two months (January-February 2013) on the basis of records of two groups of pupils of the class of CM2,

of the same private school in Brazzaville. In Congo-Brazzaville the class of the CM2 is culminating in an examination, the Certificate of Primary Elementary Study. These records were established in September 2012 as part of the annual review that this school realizes for its pupils in examen class. This study was conducted at the Clinique Medicale de Brazzaville. We defined the pupils in school unsuccessful than those with at least two years delay in school. The Case group was formed by pupils with at least two years delay classes resumed before the class of CM2. The Witnesses group was formed by pupils of the class of CM2 without school delay. The exclusion criteria for Cases and the Witnesses were:

- Wearing glasses,
- The existence of an ocular pathology and / or severe general disease,
- The existence of a non or poorly controlled seizures because of the use of Cyclopentolate eye drops at 0.50% as cycloplegic,

Two parameters were evaluated and compared in the two groups:

- Far visual acuity (VA) without correction measured by Snellen's scale,
- The different types of ametropia diagnosed after cycloplegia,

Normal vision corresponds to visual acuity without correction equal to 10/10. The decrease of AV was called:

- Moderate when it was between 5/10 and 9/10,
- Severe when it was less than 5/10.

The cycloplegia was made with the eye drops of Cyclopentolate at 0.50%. The protocol was as follows: 1 drop was instilled 3 times in eyes, 0 minutes, 5 minutes and 10 minutes. Retinoscopy was made 60 minutes after the first instillation. Were retained, simple refractive errors with an absolute value greater than or equal to 0.75 diopters (D) and mixed with a spherical equivalent refractive error in absolute value greater than or equal to 0.75D. The simple ametropias were represented by myopia, hyperopia and astigmatism. Ametropia were called mixed when one of the first two were associated with astigmatism. The eye was the sample unit. Refractive errors and

ametropia were synonymous. The Chi-Square test ( $\chi^2$ ), odds ratios (OR) and their 95% confidence intervals (95% CI) were used as statistical tests. Probability (p) was considered significant whenever its threshold was less than 0.001.

## RESULTS

A total of 52 files were retained, 26 Cases vs 26 Witnesses (52 Cases' eyes vs 52 Witnesses' eyes). The average age was  $14 \pm 2.40$  years vs  $11.50 \pm 1.80$  years ( $p < 0.001$ ). The distribution of refractive error between the two groups is shown in Table 1. Table 2 shows the decrease of VA without correction in both groups. Table 3 shows the different refractive errors diagnosed after cycloplegia.

**Table 1**

*Distribution of refractive errors between two groups of pupils (Cases vs Witnesses) seen at the Clinique Médicale de Brazzaville in September 2012*

	Ametropia (Effective)	Ø Ametropia (Effective)*	Total
Cases' eyes	51	1	52
Witnesses' eyes	1	51	52
Total	52	52	104

OR = 160.71, 95%CI = [84 - 155],  $p < 0.001$

The overall prevalence of refractive errors was 50.00%, and for each group 98.07% VS 1.92% ( $p < 0.001$ ).

\*Ø Ametropia = without ametropia

**Table 2**

*Distribution of uncorrected visual loss between two groups of pupils (Cases vs Witnesses) seen at the Clinique Médicale de Brazzaville in September 2012*

	M. VL (Effective)	S. VL (Effective)	Ø VL (Effective)	Total
Cases' eyes	9	42	1	52
Witnesses' eyes	1	0	51	52
Total	10	42	52	104

OR = 833, 95% CI = [207 - 455],  $p < 0.001$

The overall prevalence of visual loss was 50.00%, and for each group: 98.07% VS 1.92% ( $p < 0.001$ ).

M. VL = moderate visual loss, S. VL = severe visual loss, Ø VL = without visual loss

**Table 3**

*Distribution of refractive errors diagnosed after cycloplegia between two groups of pupils (Cases vs Witnesses) seen at the Clinique Médicale de Brazzaville in September 2012*

	Simple Ametropia	Effective	Frequency %	Mixed Ametropia	Effective	Frequency %
Cases' eyes						
(51 eyes)	Hyperopia	32	62.74	Astigmatism-H	10	19.61
	Myopia	3	5.88	Astigmatism-M	6	11.77
Total		35	68.62		16	31.38
Witnesses' eyes (1 eye)	Astigmatism	1	100		0	0
Total		1	100		0	0

Astigmatism - H = Astigmatism and Hyperopia association

Astigmatism - M = Astigmatism and Myopia association

## DISCUSSION

We used the eye drops of Cyclopentolate at 0.50% for an objective refraction in this work. In children, the realization of refraction without cycloplegia is a source of significant measurement error (3). Many cycloplegia protocols are described. However, there appears to be consensus around the use of Cyclopentolate eye drops at 0.50% (3, 4). This protocol can be done in consultation because it is short and simple, suitable for a large number of patients such that made in this survey. It is true that certain serious complications related to this protocol are described, intestinal necrosis and convulsion (5, 6). These complications remain exceptional interest especially children less than a year and appear when Cyclopentolate eye drops at 0.50% is associated with Phenylephrine eye drops at 2.25%.

The average age of Cases was significantly higher than that of Witnesses, which is due to the fact that Cases had a school delay. It is recognized that children with uncorrected refractive errors are a time of understanding that can be relatively longer than that of children without ametropia. A Chinese study on myopia in schools confirms this reasoning (1). It demonstrates that the learning curve is slower in children with myopia.

Hyperopia was the main diagnosed ametropia. This result differs from that of Castagno VD on three aspects (7). According to this author hyperopia is more common in white children especially those living in rural areas, the prevalence of hyperopia in children decreases with age. This prevalence is around 3% between 9 and 14 years. The methodology can probably explain this difference. This is an international meta-analysis which involved many schools and thousands of pupils randomly selected.

We do not compare the two eyes of each Case about the eventual degree of anisometropia. A survey conducted by Xiao O shows that the anisometropia is the leading cause of amblyopia (2). The same survey shows that amblyopia usually develops around the age of 5 when the causal refractive error is not corrected. Hence the need for glasses as soon as the

diagnosis is made. The study by Maqsd MA goes in this direction (8). It shows that the effectiveness of wearing glasses to improve visual acuity, decreased significantly after the age of 7 years.

In conclusion, ametropia occupies a significant place in school unsuccess in Brazzaville. When the child is in perfect health, without social or environmental factor that can explain his school difficulties, ametropia must be systematically sought. The physician's role is to explain to the parents the necessity of early wearing glasses for their child.

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