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Refractive Errors Among Children at the Teaching Hospital of Bouaké (Central Côte d'Ivoire), from 2012 to 2016

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Abstract

Purpose: Contribute to a better understanding of refractive errors (or ametropias) among children in Côte d'Ivoire, at the epidemiological and clinical levels.

Material and methods: Retrospective, cross-sectional descriptive study of medical records of children aged from 0 to 15 years received in ophthalmology consultation from January 1, 2012 to December 31, 2016. Whatever the reason for consultation, the clinical examination highlighted an error in the refraction. Out of a total of 3,568 cases, 435 were selected.

Results: The average age of patients was 12 years ± 0.6 (samples of 5- and 15-years extreme values) and children aged from 12 to 15 years represented 66.21% (n = 288). There was a female predominance with 65.29% (n = 284) and 98.39% of them were students (n = 428). The personal history of wearing corrective lenses was found in 4.83% (n = 21) while the family history of wearing corrective lenses was found in 3.91% of cases (n = 17). The most frequent reason for consultation was reduced visual acuity, but this represented only 17.45% of the reasons for consultation. It was followed by photophobia (15.10%), and headaches (13, 50%). All patients had benefited from an objective refraction study by automatic refractometry before optical correction, with documented evidence of cycloplegia with 0.5% Cyclopentolate in 53.8% of cases (n = 234).

The refractive errors had a frequency of 12.2% and astigmatism, all forms combined (simple, compound, mixed), was present in 49.42% of patients (n = 215), followed by hyperopia with 33.1% (n = 144) and myopia with 17.47% (n = 76). Refractive errors were classified as low in 96.55% of cases (n = 420) and strabismus was among 4 children, or 0.92% of the population under study. All these ametropias had benefited from an optical correction by glasses.

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Conclusion: Reducing the prevalence of uncorrected ametropia among children requires systematic screening, especially in schools. However, the low representation of children of preschool or out-of-school age contributes to an underestimation of the real prevalence of refractive errors in our conditions.

Keywords: Refractive errors; Children-Optical; Correction.

1. Introduction

Refractive errors or ametropias are conditions in the eye characterized by poorly focusing retinal images from objects located at infinity [1].

Beyond the public health problem raised by uncorrected refractive errors in low-income countries, there is a real development problem, when they affect children. In fact, the early impairment of visual function due to ametropia can permanently compromise its development through the occurrence of amblyopia [2]. This preventable amblyopia would then be an obstacle to the child's education, since there is not enough of specialized institutions for children with sensory disabilities and very often, they do not even exist in these countries [2; 3]. Children uncorrected ametropias, while being a consequence of poverty, weigh down even further.

In its initiative, adopted in 1999 and called "Vision 2020", WHO has made the fight against avoidable blindness a priority. To achieve that, it identified five priority areas, namely, cataracts, glaucoma, onchocerciasis, trachoma and blindness among children, including uncorrected refractive errors and low vision. As for childhood blindness, its prevalence worldwide is 0.3 per 1,000 children in developed countries.

In developing countries, it is 1.2 per 1000 children, 4 times the number of blind people in low-resource countries in comparison with the developed countries. As far as ametropia is concerned has a prevalence of 2 to 10% worldwide according to the WHO [4], but with great disparities depending on the country, series, evaluation methods and targeted age groups [5; 6; 7; 8; 9]. In Africa, studies on refractive errors among children in the general population are rather rare; they are most often in hospitals or carried out in schools [8].

In Côte d'Ivoire, Kouassi and his colleagues demonstrated a variable frequency of refractive errors depending on whether they were evaluated without cycloplegia or after cycloplegia, ranging from 21.40% to 63.1% on a population of 271 school children aged from 9 to 16 [10].

Given the disparity of data regarding the prevalence of ametropias among children, what is the real their weight as part of the causes of ocular morbidity among children in Côte d'Ivoire, and more specifically in the region of Bouaké, central Côte d'Ivoire? The purpose of this study was to contribute to a better understanding of epidemiological and clinical characteristics of refractive errors among children in Côte d'Ivoire.

2. Material and methods

This was a retrospective, descriptive study that covered a period of 5 years, from January 2012 to December

2016, at the Department of ophthalmology at the Teaching Hospital of Bouaké. The investigation was carried out during the month of July 2017. Out of a total of 3,568 children's files received during this period, 435 medical files were selected. The selection criteria were membership among those aging from 0 to 15, and the diagnosis of ametropia or refractive error at the end of the consultation, regardless of the reason for the consultation. For children who had benefited from one or more corrective lens renewals in the department, we only considered the last consultation allowing the last optical correction. When a measurement of the refraction under cycloplegia had been carried out, it had been carried out according to the protocol of 3 instillations of cyclopentolate hydrochloride (Skiacol®) per eye, spacing for 5 minutes, with a measurement of the refraction with an automatic refractometer, 45 to 60 minutes after instillation of the first drop. The optical correction was then subjectively adjusted. In addition to the refraction study, all patients had received a slit lamp examination and an eye fundus examination. The variables studied were age, sex, place of origin, activity, reason for consultation, personal and family history of wearing corrective lenses, uncorrected visual acuity from far and near, far and near corrected visual acuity, the value of the refraction (optical correction), the diagnosis made and the method of treatment. Refractive error was classified as low (<3 diopters), medium (between 3 and 6 diopters) and high (> 6 diopters) for myopia and hyperopia. For astigmatism, it was classified as weak when it was less than or equal to 0.75 diopters, medium when it was between 1.00 and 2.50 diopters, and strong when it was greater than 2.50 diopters [1]. Processing and analysis were carried out using EPI info 7 and Excel 2007 software.

3. Results

3.1 Sociodemographic aspects

The average age was 12 ± 0.6 years with extremes of 5 and 15 years and the group of 12 to 15 years old represented 66.21% (n = 288) of patients (Figure 1). A female predominance was noted with 65.29% (n = 284); in other terms a sex ratio of 0.53. Students represented 98.39% of cases (n = 428) and all patients lived in urban areas.

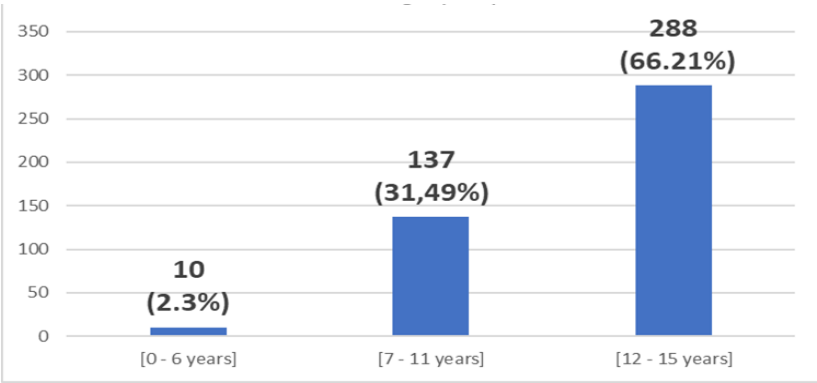

Figure 1: Age distribution of patients (N=435).

3.2 Clinical aspects

3.2.1 Overall prevalence and numbers

The prevalence of refractive errors during the period covered by the study was 12.2% out of a total of 3568 children records selected during this period, corresponding to 435 children with documented evidence of cycloplegia with Cyclopentolate 0.5% among 53.8% of cases (n = 234). Among these 435 children, those who already wore an optical correction were 21 (4.83%). This means that 414 children (95.17%) had uncorrected refractive errors during the study period and were at their first optical corrections. The children with a family history of ametropia were 17 (3.91%).

3.2.2 Reason for consultation and visual acuity without correction

Poor vision was the most frequent reason for consultation, but found among 17.45% of cases, followed by headaches (15.10%) and photophobia (13.50%). In our study, visual acuity before correction of between 8/10 and 10/10 was found among 58.16% of patients in the right eye and among 62.53% of patients in the left eye (Table I). Among 53.8% of 435 patients, there was documented evidence of performing automated refractometry under cycloplegia, with 0.5% cyclopentolate.

3.2.3 Types of refractive errors and means of management

Out of 870 eyes, astigmatism, all forms combined, was present in 49.43% of cases (n = 430), followed by hyperopia 33.1% (n = 288) and myopia 17.47% (n = 152) (Figure 2). As for the extent of refractive error, low ametropia represented 96.55% of cases (n = 840), followed by severe ametropia (2.30%) and moderate ametropia represented 1.15% of cases.

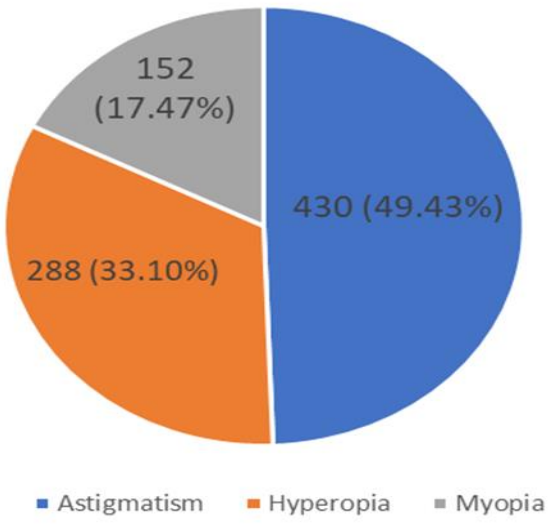

Figure 2: Distribution of eyes by types of refractive errors.

Simple myopic astigmatism accounted for 52.56% of astigmatism cases (Figure 3) and when it comes to cylinder power, low astigmatism accounted for 97.21% of astigmatism cases (n = 418). Hyperopia was low

among 100% of cases and low myopia was found among 88.16% of myopia cases (n = 134).

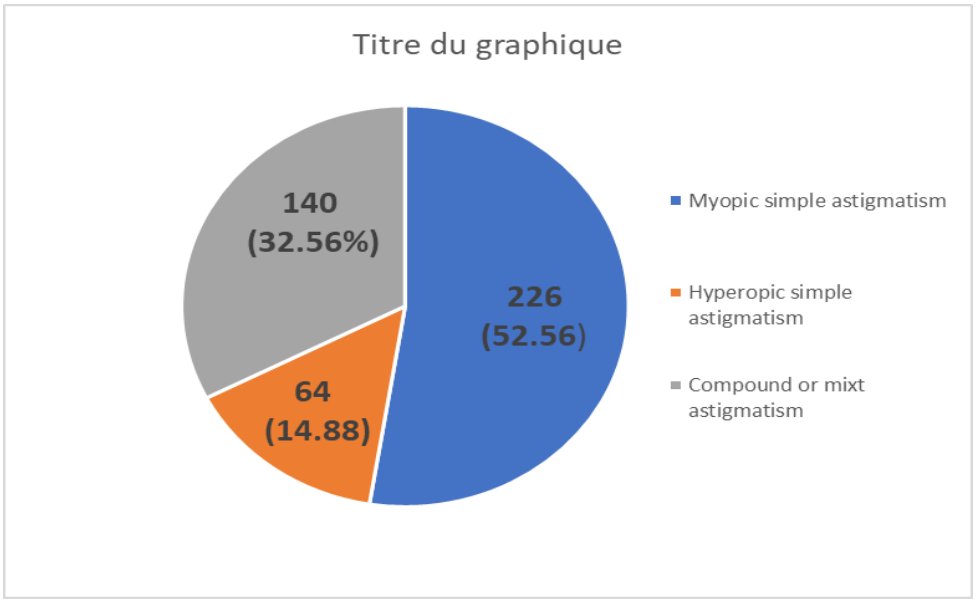

Figure 3: Distribution of different types of astigmatism (N=430).

Females were mainly found in astigmatism with 67.90% of cases (n = 292), in hyperopia with 65.30% of cases (n = 188) and in myopia with 57.90% of cases (n = 88). Convergent strabismus was associated with hyperopia among 4 patients.

All patients benefited from optical lens correction with spectacles.

4. Discussion

4.1 Prevalence

Uncorrected refractive errors are a real public health concern and WHO has made this one of its priorities in its fight against preventable or curable blindness. In our series, the prevalence of 12.2% was comparable to those found in various African series, especially in Kampala by Medi and his colleagues with 12% [11], and in Mali by Thera and his colleagues with 13.9% [12]. These figures are significantly lower in countries where there are early detection strategies. So, Murthy and his colleagues [13] in an urban environment in New Delhi in India and Maul and his colleagues [14] in Chile demonstrated respective prevalence of 1.5% and 4.55% of uncorrected refractive errors among children. In our study, the age group from 12 to 15 years old was the most represented with 66.61% of cases. According to Zhao and his colleagues [15], the frequency of ametropia increases with age and slowly decreases around the age of 13 years. This age group, found in many studies, would rather reveal a bias in the assessment of the distribution of refractive errors among children. In fact, the representation of this age group could quite simply be the reflection of a greater need for “good distance vision” felt by these children in school situation and sometimes revealed by learning difficulties. For us, the predominance of the female gender for each type of ametropia seems to be correlated with the predominance of

women in our sample. Even if it has been found by some other authors [10; 16].

4.2 Reason for consultation and visual acuity without correction

The reasons for consultations were dominated by poor vision but this was found only among 17.45% of cases. This indicates that poor vision felt and expressed may be a bad indicator in the screening process of refractive errors among children. All the symptoms of eye irritation, asthenopia or even headaches that are frequent or correlate with the rhythm of school activities should be investigated for refractive errors among children. The value of uncorrected visual acuity of between $8/10^{th}$ and $10/10^{th}$ among more than half of the cases confirms once again the interest of relying on cycloplegia in the study of refraction among children [10].

4.3 Types of ametropia and means of management

As for the type of ametropia, the distribution of these ametropia varies from study to study. In our series, astigmatism was the most common type with 49.43% of cases followed by hyperopia with 33.1% of cases and myopia with 17.43% of cases. Observations made by Eddrazi and his colleagues [17] demonstrate a predominance of astigmatism with 46.7% of all ametropia. In contrast to our results, studies have reported myopia to be the most common refractive error [18; 19]. This disparity can probably be explained by the variability of recruitment methods: in fact, our work consisted of a retrospective study of patients' files, while most of these authors conducted prospective studies in schools. Ametropia was low in most cases. Hyperopia was found in 33.1% of cases. It is common among children between 9 and 14 years, then it gradually decreases with age. Khalaj and his colleagues [20] found an age-related change in refractive errors ranging from hyperopia among young children to nearsightedness among older children. This finding confirms the results of Maul and his colleagues [14] who report that young age is associated with an increased risk of hyperopia, and that the older the child is, the more the risk of myopia increases. This could be explained by the growth of the eyeball and especially the increase of its anteroposterior diameter. In our series, hyperopia was found more among girls and was low in all cases. It is possible that hypermetropia of medium or even high values were ignored due to the failure of cycloplegia with some patients. In fact, we had only documented proof of this among 53.8% of the children in our series and the strabismus associated with hyperopia among 4 children, in other words (0.92% of the population under study) was probably from accommodative origin. Under our conditions, the simplest and most accessible way to manage refractive errors among children is to recommend glasses. These must be made accessible by the health systems of low-income countries because even if they are correctly corrected by health personnel, refractive errors will always remain a public health problem if the prescribed glasses are not obtained and worn by ametropic children.

5. Conclusion

The prevalence of refractive errors was 12.2% in our study. However, the low representation of preschoolers or children not attending school contributes to an underestimation of the actual prevalence of uncorrected refractive errors among children in our conditions.

Reducing the prevalence of uncorrected refractive errors requires systematic screening, especially in academic

institutions, knowing that poor vision felt and expressed by a child is a poor indicator of the existence of ametropia. Cycloplegia should be used as a rule to detect “false emmetropia” and measure the real value of the refractive error to be corrected. However, regardless of the screening strategy, the lenses on which the correction of these refractive errors exclusively depend must be available and accessible in the health systems of low-income countries.

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