WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 8, Issue 12, 182-189. Research Article ISSN 2277– 7105

REFRACTIVE ERRORS: EPIDEMIOLOGICAL PROFILE IN CHILDREN IN MADAGASCAR

[1]*Rakotoarisoa Rivo Tahiry Rabetafika, [2]Randrianarisoa Hoby Lalaina, [3]Raharimantsoa Onja Lalaina, [4]Miray Louis De Gonzague, [5]Rasamindrakotroka Miora Tantely and [6]Raobela Lea

[1]Doctor of Medecine, Ophthalmologist, Ophthalmology service of Universitary Hospital Center of Anosiala, Antananarivo, Madagascar.
[2,3]Doctor of Medecine, Ophthalmologist, Ophthalmology service of Universitary Hospital Center Joseph Ravoahangy Andrianavalona, Antananarivo, Madagascar.
[4]Doctor of Medecine, Ophthalmologist, Ophthalmology service of Universitary Hospital Centre of Tambohobe Fianarantsoa, Antananarivo, Madagascar.
[5]Doctor of Medecine, Biologist, Biology service of Universitary Hospital Centre Joseph Ravoahangy Andrianavalona, Madagascar.
[6]Doctor of Medecine, Ophthalmologist, Professor on Ophthalmology, Chief of service at Universitary Hospital Centre Joseph Ravoahangy Andrianavalona, Antananarivo, Madagascar.

Article Received on
13 Sept. 2019,
Revised on 03 Oct. 2019,
Accepted on 24 Oct. 2019
DOI: 10.20959/wjpr201912-16154

***Corresponding Author**
Rakotoarisoa Rivo Tahiry Rabetafika
Doctor of Medecine, Ophthalmologist, Ophthalmology service of Universitary Hospital Center of Anosiala, Antananarivo, Madagascar.

ABSTRACT

Background: Refractive error can lead amblyopia in children. The aim of study is to evaluate epidemological status of refractive error in children. **Methods:** It was a cross-sectional, descriptive study done in two Antananarivo Madagascar schools. The population study was children aged 6 to 12 years old. Children had cycloplegic instill before refraction measure. Refraction was measured with automatic refractometer Topcon RM-A3000B. Ametropia have been classified as myopia, hyperopia, simple astigmatism and mixed astigmatism. Finally, slit lamp and fundus examination has been done to exclude any organic pathology that induced visual impairement. Percentage comparison was done by the Chi-2 test (2). Data analysis was done with Excel 2010 software and EPI-info 7.1. **Results:** 414 students were examined. Mean age was 9.02 years old. The male gender was seen for 52.20% in our series. 13.50% had refractive error. Simple astigmatism and hyperopia were the most frequently observed, respectively 30.40% and 30.02%. **Conclusion:** Refractive error is a frequent in children. A systematic examination before primary school is necessary to avoid amblyopia.

KEYWORDS: Refractive error, ametropia, hyperopia, astigmatism, children, amblyopia.

INTRODUCTION

Refractive error is the first reason for ophthalmic consultation in children.[1] The functional signs appear when the optical system does not focus the image of an object on the retina.[2] Uncorrected refractive error is a source of severe visual impairment such as amblyopia in children.[3,4] The aim of our study is to determine the epidemiological profile of refractive error in children aged 6 to 12 years old.

METHODS

This is a cross-sectional, descriptive study done in two Antananarivo Madagascar schools during 5 months, from December 2018 to May 2019. The population study was children aged 6 to 12 years old.

Children who were present at school at time of consultation and had parental consent are included in our study. Children who had an organic ocular pathology were excluded in our study.

The variables studied were: age, gender, type of refractive error: myopia, hyperopia, simple astigmatism, mixed astigmatism.

Personal data was collected for each child. For each child, we had instilled cycloplegic drop before refraction measure. Cycloplegia was obtained after three instillations of a drop of 0.5% cyclopentolate hydrochloride. Each drop was instilled every 10 minutes. Refraction was measured with Topcon RM-A3000B automatic refractometer, 30 minutes after the last drop. Ametropia have been classified as myopia, hyperopia, simple astigmatism and mixed astigmatism. Finally, slit lamp and fundus examination has been done to exclude any organic pathology that induced visual impairement.

Percentage comparison was done by the Chi-2 test (2).

We used Excel 2010 software and EPI-info 7.1 for statistical analysis. Test was statistically significant for p-value inferior of 0.05. Ethics and Respect of confidentiality's information were being done during the study. The small number of schools included in the study was the main limitation of the study. A multi-center study in several regions of Madagascar would be ideal.

RESULTS

414 students were examined. Mean age was 9.02 years old. The male gender was fund for 51.77% of ametropic versus 48.21% of female gender. Of these 414 students, after skiascopy (objective result) 13.50% had refractive error. Simple astigmatism and hyperopia were the most frequently observed, respectively 30.40% and 30.02% (Figure 1).

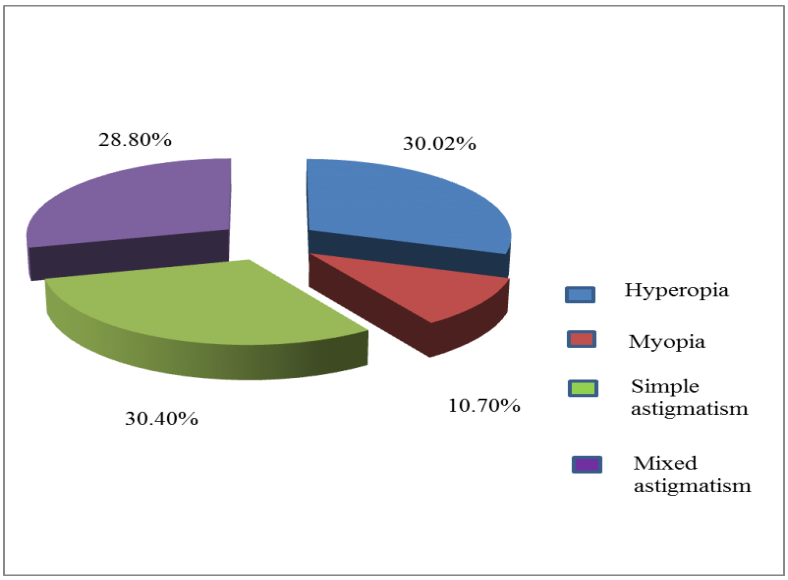

Figure 1: Type of ametropia.

DISCUSSION

In our study, the prevalence of refractive error was 13.50%. Our results are similar to those of Sounouvou et al in Benin,[5] which found among schoolchildren aged 4 to 16 a prevalence of 10.6%. Similarly, Kawuna M et al in Uganda showed a 12% rate of refractive error among 1035 students examined.[6] In the United States, the most frequently prevalence is between 15.10 to 18.50%.[7,8] Chinese studies identified only 0.96% of ametropics in many schools.[9] Ibeinmo et al. also reported a rate of 2.2% in Nigeria.[10] In Nepal, ametropia had a prevalence of 1.58% among students aged 5 to 15 years.[11] In Peru, Latorre et al. found 6.20% in their study.[12]

The difference between the results found by the different authors could be explained on the one hand by the method used (refraction under or without cycloplegic) and on the other hand by the smaller population size, ignorance of systematic consultation before the age of 2 years. Estimates of prevalence rates of refractive errors in the general population are both small and variable (heterogeneity of definitions used, age differences of the children studied, and variations in the measurement of refraction whether or not under cycloplegia).

In our context, parent doesn't accept easily that his child must wear glasses. There are two reasons for this: there are economic reasons, or cultural reasons (wearing glasses are reserved only for adults). We must inform malagasy people that it is necessary to treat earlier child. If child is treated early, he could avoid amblyopia. That's why vision screening must checked for all children before primary school. Systematic visual screening must do at 9 months old to reduce the high rate of refractive error. Correction of refractive error can improve the school performance. It is also necessary to educate parents about the need for a doctor's consultation before primary school.

In our study, the mean age was 9.02 with extremes of 6 years and 12 years. This age group is similar to that of Lian-Hong P et al.,[13] Latorre et al., and Ezegwui et al. which was respectively 8.2 years; 8, 9 years old.[12,14] Literature mentioned that as the age increases, the child is very likely to develop ametropia.[15] In contrast, an Iranian study included pupils aged 12 to 18 years.[16]

Our choice on the age group of 6 to 12 years is based on data from the literature. Indeed, from 6 years to 12 years the child acquires many new things. This will affect his brain and his eyes. At this age, the pupils have an intense school activity. It was showed that child can accommodate easily and vision discomfort is manifested lately. Also, it is strongly recommended to detect visually impaired disorders as early as possible to avoid their consequence in children at school age.

The male gender was fund for 51.77% of ametropic versus 48.21% of female gender. We didn't find statistical relation between refractive errors and gender. The same result was fund by Lian-Hong P. et al.,[12] they reported in his study that 52.48% of ametropics are boys and 47.52% of girls. In an African study,[5] however, these authors found 50% of girls and 41.90% of boys. The gendered result varies according to the authors, the high prevalence of the male gender could be explained by the fact that the schooling of boy is more solicited in certain countries including in certain regions of Madagascar and this contributes to increase the rate of boys at school.

According to our study, we observed a prevalence of 30.02% for hyperopia of which 19.64% were between 6 to 9 years. In a study done in Australia,[15] of 1035 schoolchildren 25.40% were hyperopic. Similarly for Hashemi H et al. who reported 21.70% hypermetropia in Iran.[14] In Tunisia, out of 300 children of school age examined, the prevalence of hyperopia

was 65%.[18] However, our results differ from African studies,[19] which found only 4% of hyperopia among the 13039 students examined in 66 primary schools in Togo. In Nigeria, they found 17.5% of hyperopia.[20] In the USA, out of 3209 children examined between the ages of 12 and 19, 0.9% had hyperopia.[21] Compared with literature data, the most commonly reported refractive errors in children are hyperopia.

Our results are similar than of the literature because the majority of ametropics are hyperopia (30.02%). Hyperopic child accommodates more than emmetropia to compensate his visual impairement. By the relationship between accommodation and convergence,[22] untreated hyperopic children have a significantly higher risk of developing strabismus (multiplied by 13) and / or amblyopia (multiplied by 6).[23] That's why hyperopia more than 3 diopters in the first year of life must be corrected. To remedy this, it is necessary to insist on the necessity of early consultation to detect as early as possible the visual impairement like amblyopia in a child.

A series of studies in China found that the prevalence of astigmatism was between 3.75 and 12%.[15,17] In France, the rate of astigmatism in children among ametropics is estimated at 11%.[24] Furthermore, in our study astigmatism was the most common type of ametropia with a prevalence of 30.40% in its isolated form and 28.88% in its mixed form. Other authors have reported higher prevalences: Sounouvou I et al scored 51.50% for isolated astigmatism, 29.40% for myopic astigmatism and 16.10% for hypermetropic astigmatism on 1057 pupils examined by refractometry automatic under cycloplegia.[5]

The prevalence of astigmatism in some countries remains quite low compared to that observed in our study. This could be explained by early management of ametropia. In fact, an astigmatism greater than 1,5 dioptres can induce a unilateral amblyopia at the origin of an irreversible visual deficiency. We suggest encouraging parents to do an annual follow-up.

In our study, we observed a prevalence of 10.70% for predominantly male myopia, of which 7.14% and 3.57% female, the age group between 10 and 12 years was the most affected. Our results are similar to those of an Australian study that found 8, 40% of myopic children aged 4 to 12 years of age with ametropics.[21] According to Matsumura M. et al. the female gender predominated among myopia in 3 to 17 year olds.[22]

In a US study, (29) of 212 children aged 4-15 years, 34.4% were myopic. This is supported by an Asian study that reported a prevalence of 29.5% myopia.[15] In Algeria, Kherroubi K. et al. mentioned 29% of myopia in 5 to 15 year olds.[26] The prevalence of myopia was 3.3% in Ireland study.[27] Our prevalence is higher than in literature.

This diversity of prevalence between our results and literature data can be explained on the one hand by environmental factors, it increases in urban areas and decreases in rural areas. On the other hand, the genetic factor that is recognized as well in the small myopies as in the strong ones. This inheritance can be in both cases dominant or recessive. The relationship between age, gender and myopia is poorly understood.[28] One of the physiopathological hypotheses of the significant increase in myopia in industrialized countries is the excessive use of computer display screens.[29] This is not the case here because the use of computer equipment is not yet available at primary school in Madagascar. In addition, the children of the two schools in our study do not make computers at school. As a result, our rate of myopia is quite low. Thus, to prevent near-sightedness in children, teachers, parents and students need to be taught to avoid too much near-vision work and take breaks to minimize stress on the visual system.

CONCLUSION

Refractive errors are frequent in children. Our study shows that hyperopia and astigmatism were the most ametropia observed in malagasy people. A systematic consultation must be done for all children before primary school to avoid amblyopia.

REFERENCES

1. Corbé C. Troubles de la réfraction clinique et évolution spontanée. Prat., 2001; 43: 1761–4.
2. Batterbury M, Bowling B, Murphy C. Ophtalmologie. Paris: Masson, 2005; 84–5.
3. Sintayehu A, Kassahun K, Molla G. Uncorrected refractive error and associated factors among primary school children in Ethiopia. BMC Ophthalmology, Janv, 2010; 14(1): 65–6.
4. Bodoche J. Prise en charge d'un strabisme divergent. Visions internationales, Oct, 2006; 69(4): 29–33.
5. Sounouvous I, Tchabi S, Doutetien C, Sonon F, Yehouessi L, Bassabi S. Amétropies en milieu scolaire primaire à Cotonou Benin. J Fr Ophtamol, Déc, 2008; 3(8): 771–5.

6. Kawuna M, Mayeku R. A survey of the prefalence of refractive error among children in lower primary schools in kampala District. Afr Health Sci., Aug, 2002; 2(2): 69–72.
7. Giordano L, Friedman D, Depka M. Prevalence of refractive error among preschool children in urban population: The Balt Ped Eye Disease study J Ophthalmol, Apr, 2010; 129(4): 445–54.
8. Maud E, Barroso S. Refractive error study in children: results from Florida. Am J Ophtalmol, Apr, 2000; 125(4): 445–54.
9. Resnikoff S, Parcolini D, Mariotti S. Prévalence global des déficiences visuelles dues à des défauts de refraction non corrigés en 2004. Bulletin of the world health org. Janv, 2008; 86: 63: 70.
10. Ibeinmpo O, Cinyere P. Screening for refractive error primary school children in Bayelsa state Nigeria. Pan Afr. Med J., Fev, 2013; 14: 74.
11. Pokharel P. The patterms for refractive error among the school children of rural and urban setting in Nepal. American J Ophtalmol, April, 2010; 2(4): 114–20.
12. Latorre S, Gonzalez D, Enciso O. Reducing visual deficits caused by refractive errors in school and preschool children: redults of a pilot school program in Peru. Global health action, 2014; 7: 1–6.
13. Lian–Hong P, Chen L, Ningke, Qin L, Jing F, Shang S et al. Refractive status and prevalence of refractive errors in suburban school age children. International J Med Sci., 2010; 7(2): 342.
14. Ezegwi U, Ezepue U. Causes of childhood blindness results from schools for the blind in South Eastern Nigeria. Br J Ophtalmol, 2003; 87(1): 20–3.
15. Weizhong L, Zhao F, Lixia L. refractive errors in 3 – 6 years old Chinese children. Plos one, Oct, 2013; 8(1): 1–8.
16. Hashemi H, Rezvan F, Asghar B, Beiranvand A, Omid A, HoseinY et al. Prevalence of refractive errors among high school students in Western Iran. J Ophtalmol and Vision Res., 2014; 9(2): 232–6.
17. Junghans B, Crewther S. Little evidence for an epidemic of myopia in Australian primary school children over the last 30 years. BMC ophthalmology, 2005; 5(1): 2–10.
18. Benzarti T, Loukil I, Henia C. Hypermétropie de l'enfant: épidémiologie et indication thérapeutique en Tunisie. J Fr Ophtalmol, 2005; 28(5): 7–8.
19. Nonon S, Atobian K, Banla M, Rédah T, Maneh N, Walser A. Amétropies en milieu scolaire dans la région central du Togo. Paris: Elsevier Masson, 2013.

20. Ezinne NE, Mashige KP. Refractive error and visual impairment in primary school children in Onitsha, Anambra State, Nigeria. Afr Vision Eye Health, 2018; 77(1): a455. https://doi.org/10.4102/ aveh.v77i1.455
21. Qiu M, Wang S, Singh K. Racial disparities in uncorrected and ender uncorrected refractive error in the united states. IOVS, Oct, 2014; 5(10): 6996–9.
22. Blouza A. Prise en charge de l'hypermétropie chez les enfants. J Fr Ophtalmol, Mars, 2007; 30(3): 255–9.
23. Atkinson J, braddick O, Bobier B. Two infant screening programmes : prediction and prevention of strabismus and amblyopia from video refractive screening. Eye, 1996; 10(2): 189–98.
24. Benso C, Denis D, Wary P. La refraction chez l'enfant: épidémiologie et evolution. J Fr Ophtalmol, Oct, 2004; 27(8): 943–52.
25. Junghans B, Crewther S. Little evidence for an epidemic of myopia in Australian primary school children over the last 30 years. BMC ophthalmology, 2005; 5(1): 2–10.
26. Kherroubi K, Lazreg S, Barkat A. Amétropies de l'enfant en milieu scolaire en Algérie. J Fr Ophtalmol, 2005; 28(4): 1–3.
27. Harrington SC, Stack J, Saunders K, et al. Refractive error and visual impairment in Ireland schoolchildren. Br J Ophthalmol, 2019; 103: 1112-1118.
28. Saragoussi J, Arné J, Colin J. Chirurgie réfractive. Paris: Masson, 2001; 531–82.
29. Morgan I, Kifley A, Rose K. Ophtalmology outdoor activity reduces the prevalence of myopia in children. J Fr Ophtalmol, 2008; 115(8): 1279–85.