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REFRACTIVE ERRORS IN SCHOOL-AGE CHILDREN AS DIAGNOSED AT ARTHUR DAVISON CHILDREN'S HOSPITAL EYE CLINIC DEPARTMENT

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ABSTRACT

Background: Refractive errors affect a significant proportion of the world's population, affecting both genders and all ages. As the WHO Press Release said on October 12th2005, that without an eye examination and the appropriate pair of spectacles "millions of children arelosing educational opportunities, and adults are excluded from productive working lives, withsevere economic and social consequences. Individuals and families are frequently pushedinto a cycle of deepening poverty because of their inability to see well."A total of 76 facilities offer eye health services in Zambia.In the whole of Zambia there are currently only 18 ophthalmologists, eight cataract surgeons and 19 optometrists which translates to one ophthalmologist for every 725,000 Zambians and one clinical officer for every 373,000 population. The aim of this research is to determine the proportion and frequency of the different types of refractive errors and establish the sex and age group mostly prone to refractive errors, and if possible make recommendations on how to improve the management of refractive errors in school age children.**Methods:** The survey was a retrospective study. Information was collected from the eye clinic department hospital records from January to December of the years 2013 and 2014 of children between the ages of 6 to 14 years old at Arthur Davison Children's Hospital.**Results:**A total of 507 children's eye clinic records for the years 2013 and 2014 were screened and out of them 47.5% (241) were males and 52.5% (266) were females. Refractive errors were found in 41.6% (211) of the children out of which 35.5% (75/211) were males and 64.5% (136/211) were females. Of these there were a total of 90.5% (191/211) with myopia; 2.4% (5/211) with hyperopia; 7.1% (15/211) with astigmatism, with myopia being the most prevalent refractive error.**Conclusion:**Of the 507 hospital records reviewed 41.6% of the children had refractive errors with myopia being the commonest.Myopia was more common in females (47.4%) than males (27.0%) and more prevalent in the 10 – 14 years age group (53.7%) compared to the 6 – 9 years age group (17.4%). Refractive errors are a common disorder in school-aged children, and therefore, eye screening programs are cardinal and beneficial in the early detection and proper treatment of refractive errors.

Key words: Refractive error; Myopia; Hyperopia; Astigmatism; School age children

Introduction

Refractive errors affect a significant proportion of the world's population, affecting both genders and all ages. Refractive errors are simple to diagnose, measure, and correct with spectacles. The lack of refraction and provision of spectacles in eye care services in under-served communities have significant negative consequences in terms of lost education and employment opportunities, which result in impaired quality of life and lost economy for the individual, the family and community.[1]Uncorrected Refractive Errors (URE) is the single largest global cause of vision impairment.URE was estimated to impair the distance vision of 153 million people in 2004 (8 million of these people were blind).[2]The World Health Organization (WHO) figures were long awaited and they are the first step in seriously addressing this urgent and pressing need. As the WHO Press Release said on October 12th2005, that without an eye examination and the appropriate pair of spectacles "millions of children arelosing educational opportunities, and adults are excluded from productive working lives, withsevere economic and social

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consequences. Individuals and families are frequently pushedinto a cycle of deepening poverty because of their inability to see well."[3]Blindness at any stage of life is a concern to public health; however its health burden is significantly aggravated when it occurs at an early stage in life. Childhood blindness limits the child's development, affects quality of life, education and socioeconomic development of the child. Studies have shown that uncorrected refractive error is one of the main causes of visual impairment in children.[4]Failure to treatment of refractive errors in children may lead to amblyopia which turns into blindness of the children. Uncorrected refractive errors can hamper performance at school, reduce employability and productivity, and generally impair quality of life.[5] Yet the correction of refractive errors with appropriate spectacles is among the most cost-effective interventions in eye health care.The easiest and the most convenient place to deliver the service are at primary and secondary school.[6]In the developed countries, screening for eye diseases including refractive errors in school going children is done routinely.[7] This is so because eye services are easily accessible in the developed countries and majority of children with eye problems access them without requiring referral by other health professionals from the primary level of health care.[7, 8] Most developing countries have no national preschool or school eye screening programs and in most cases screening is done for the purposes of research.[9] In Africa, centers which offer these services are few, inadequate and limited compared with the magnitude of the problem. These centers are not easily accessible and the spectacles are not affordable to most people.[10]A total of 76 facilities offer eye health services in Zambia. Thirty nine percent of these belong to the Zambian Government, 24% are owned by Non-Governmental Organizations (NGOs), and 37% are private for-profit facilities. Eighteen of the 26 private for-profit facilities are optic shops offering refractive and diagnostic services, spectacles dispensing and referral services. Seven spectacles manufacturing workshops exist. The geographic positions of facilities and services are disproportionately favoring urban areas, especially in Lusaka and in the Copperbelt province.[11]

In recent years, new training courses for ophthalmic clinical officers and ophthalmic nurses have been established in Zambia. There are currently 35 ophthalmic clinical officers and 33 ophthalmic nurses working in public and private eye care facilities.[12]In the whole of Zambia there are currently only 18 ophthalmologists, eight cataract surgeons and 19 optometrists. This translates to one ophthalmologist for every 725,000 Zambians and one clinical officer for every 373,000 population. There is a wide disparity between provinces with regards to allocation of eye health personnel. While there are three human resources for eye health per 100,000 population in Lusaka, the figure is less than one (0.23) in Northern Province[13].

Specific Objectives

- To determine the proportion of refractive errors in schoolage children between the ages of 6 – 14 years.
- To determine the frequency of the different types of refractive errors in these children.
- To establish the sex and age group mostly prone to refractive errors.
- To make recommendations on how to improve the management of refractive errors in school age children.

Ethical Considerations: The study was approved by the Copperbelt University School of Medicine Public Health Unit and Tropical Diseases Research Center (TDRC) ethics committeeas well asthe hospital administration at Arthur Davison children's hospital.

Methods:A retrospective studyof the eye clinic department hospital records from January 2013 to December 2014 of children between the ages of 6 to 14 years oldat Arthur Davison Children's Hospital (ADCH)was done.

Study Site: The study was carried out at Arthur Davison Children's Hospital. Arthur Davison Children's Hospital is the only children's hospital in Zambia and is a referral children's District hospital from ages 0 – 14 years. The hospital offers curative, preventive and rehabilitative services.It is located on the Copperbelt in Ndola along Chiwanagala road.

Sample size: The sample size included all children aged 6 to 14 years old seen in the eye clinic at ADCH from January 2013 to December 2014.The exclusion criteria included all children aged below 6 years and above 14 years old.

Statistical Analysis: All the data obtained was entered into Epi-data version 3.1 and analyzed using the software SPSS version 16. Data was double entered and validated.

Results

The age of the subjects ranged from 6 years to 14 years and a totalnumber of 507 files were reviewed out of

which241 (47.5%) were males and 266 (52.5%) were females. As shown in table-1, refractive errors were observed in a total of 211 (41.6%) children while 296 (58.4%) children had other eye conditions other than refractive errors. Table-2 shows the frequency of the different types of refractive errors. Out of the 211 children who had refractive errors, 90.5% (191/211) had myopia, 2.4% (5/211) had hyperopia and 7.1%(15/211)had astigmatism. Myopia was the most common type of refractive error suffered from with a prevalence of 90.5%.Table-3 shows a comparison of refractive errors in males and females. The table shows that refractive error was prevalent in 64.5% (136/211) femalesand 35.5% (75/211) males. Myopia was the commonest refractive error affecting 126 (47.4%) females and 65 (27.0%) males and according to these results it can be seen that there was an association between myopia and sex, with females being more prone to myopia than males (X^2=22.40, p<0.001).Distribution of hyperopia and astigmatism was insignificantly different between males and females, implying that there was no association between hyperopia and sex as well as astigmatism and sex. The comparison of refractive errors in different age groups is shown in table-4. Children with refractive errors in the age group 6 – 9 years were 20.4% (43/211) while those in the age group 10 – 14 years were 79.6% (168/211).Myopia was the most common type of refractive error in both age groups but there were 39 (17.4%) children in the age group 6 – 9 years and 152 (53.7%) in the age group 10 – 14 years suggesting that myopia was prevalent more in elder children (X^2=70.17, p<0.001).There was no association between hyperopia and age as well as astigmatism and age.

Table 1: Proportion of refractive errors

Eye Condition	Proportion No. (%)
Refractive Error	211 (41.6%)
Non Refractive Error	296 (58.4%)
Total	**507 (100%)**

Table 2: Frequency of refractive errors

Eye Condition	Frequency No. (%)
Myopia	191 (37.6%)
Hyperopia	5 (1.1%)
Astigmatism	15 (2.9%)
Non Refractive Error	296 (58.4%)

Table 3: Comparison of refractive errors in males and females

Sex	Eye Condition			
	Myopia	**Hyperopia**	**Astigmatism**	**Non Refractive Err**
Males	65 (27.0%)	2 (0.8%)	8 (3.3%)	166 (68.9%)
Females	126 (47.4%)	3 (1.1%)	7 (2.6%)	130 (48.9%)
	X^2 = 22.40	Fisher	X^2 = 0.21	
	p < 0.001	p = 1.000	p = 0.648	

Table 4: Comparison of refractive errors in different age groups

Age Group (Years)	Eye Condition			
	Myopia	**Hyperopia**	**Astigmatism**	**Non Refractive Err**
6 – 9	39 (17.4%)	0 (0%)	4 (1.8%)	181 (80.8%)
10 – 14	152 (53.7%)	5 (1.8%)	11 (3.9%)	115 (40.6%)
	X^2 = 70.17	Fisher	X^2 = 1.92	
	p < 0.001	p = 0.070	p = 0.166	

Discussion

Five hundred and seven children's eye clinic records were reviewed. The prevalence of refractive error among school-aged children in this study was 41.6% (37.6% myopia, 1.1% hyperopia and 2.9% astigmatism).From the study it was observed that myopia affected more females (47.4%) than males (27.0%) suggesting that females were more prone to having myopia than males (X^2=22.40, p<0.001). In a study done by Mavracanas et al(2000) the prevalence of myopia was found to be 36.8% and was more common in females (46.0%) than in males (29.7%).[14] In another study done by Khalaj et al(2009)myopia was found to be more prevalent in females (60%) than in males (40%) [p<0.005].[15] The results of the two studies above correlate with the results of our study.In our study myopia was observed to be high in the 10 – 14 years age group (53.7%) than in the 6 – 9 years age group (17.4%) indicating that the number of children with myopia increased as age advanced (X^2=70.17, p<0.001). Lian-Hong Pi et al(2010)conducted a study and foundas children's ages increased, the prevalence of myopia increased significantly (*P*<0.001).[16] In a study conducted by Fan et al(2004)myopia was the most common refractive error and was found in 36.71% of children and the prevalence of myopia correlated positively with older age.[17] The results found in the two studies above agree with the finding of our study.Looking at the prevalence of refractive errors in this study, it is possible that the prevalence may even be higher in school-aged children who have not had any eye examination before than observed in the study. Possible reasons to why only a few school-aged children's eye clinic records were observed in this study may include the lack of social awareness amongst parents about refractive errors or the children not having an opportunity to have their eyes checked. Furthermore, some affected individuals may be ridiculed by their peers if they wear glasses and shun away from them or find it shameful to wear eyeglasses, and thus, will not go to the hospital for eye examinations. Another reason may be the high costs of spectacles which only a few individuals can afford.But the most important contributing factor may be the absence of organized school health programs regarding the detection of vision problems in school children.

Conclusion

From our study, we can conclude that refractive error is common among school age children. Of the 507 hospital records reviewed 41.6% (37.6% myopia, 1.1% hyperopia and 2.9% astigmatism) of the children had refractive errors with myopia being the commonest refractive error suffered from. Myopia affected more females (47.4%) than males (27.0%) and was common in the 10 – 14 years old age group (53.7%) than the 6 – 9 years old age group (17.4%).

Recommendation

Refractive errors can have a long term impact on the learning abilities of school children, and therefore, we recommend that cost-effective routine visual screening of school children be incorporated into the school health program of the Ministry of Health and Education for early detection and correction of refractive errors in order to prevent the devastating impact of visual impairment on a child's education. The government should also come up with programs to train school teachers on how to identify children with visual problems and how to take visual acuity.

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