Magnitude and pattern of significant refractive errors in primary school children of Ntcheu, a rural district in Malawi

AUTHORS

Msiska V[1], Njuguna M[2], Kariuki M[2]

[1]Mzuzu Central Hospital, Malawi. mzomatumbo@yahoo.co.uk

[2]Department of Ophthalmology, College of Health Sciences, University of Nairobi, P.O. Box 19676, KNH, Nairobi 00202, Email: ophthalmoluon@yahoo.com

ABSTRACT

Objectives: **To determine the prevalence and pattern of significant refractive errors in rural primary school children.**

Design: **Cross sectional community based study.**

Setting: **Nine primary schools from Muluma, Kasinje and Bunyenga education zones in Ntcheu district, Malawi.**

Subjects: **One thousand two hundred and seventy eight primary school pupils aged 12 – 15 years from rural non boarding primary schools.**

Results: **The prevalence of significant refractive errors was 2.4% (31/1278) with hypermetropia accounting for 1.4%, myopia 0.8% and astigmatism 0.1%. Female pupils were more hyperopic (58%) while myopia risk was significantly associated with a male gender (70% in boys and 30% in girls).**

Conclusion: **The prevalence of significant refractive errors is very low in a rural Malawi setting to justify a regular eye screening programme in primary schools.**

INTRODUCTION

In monitoring refractive errors as a priority in vision 2020, Catherine *et al* noted that the magnitude of refractive errors is not reliably known and that there is a large global variation in the prevalence of refractive errors[1]. In school children aged 5–15 years the World Health Organisation estimates that 40 million have visual acuity of 6/12 or less with uncorrected refractive errors or improperly corrected[2]. The recent population based refractive error study in children surveys, collected data from 6 countries[3 - 7]. Reports indicated wide geographic and ethnic variations with high myopia prevalence in East Asian countries and urban areas.

Effective management of visual impairment due to refractive errors requires the establishment of proper service structures to match the magnitude of the problem. In many developing countries including Malawi, there are no national preschool or school eye screening programmes and in most cases screening is done for the purpose of research. Therefore little is known about the prevalence and public health importance of refractive errors in school age children. In developed countries, screening for refractive errors in preschool and school children is done routinely even though there is active debate about its value and cost effectiveness (2).

METHODS

Ntcheu district was chosen to represent the most rural set up in Malawi. At 84.0%, it has the highest poverty levels head count of all districts in Malawi. Three zones were randomly selected in the district and three schools were then randomly selected from each zone. All pupils aged between 12 and 15 years were included in the study as long as they consented to take part in the study and were present during the study period.

Study approval was granted by the Malawi Ministry of Education. Written consents from the head teachers of the selected schools were obtained.

A total of 1,278 children aged 12 – 15 years in the selected schools were examined. Objective cycloplegic refraction (OR) was carried out on those pupils with visual acuity of 6/12 or worse in the better eye, followed by subjective refraction the next day. Prescriptions were given to those pupils who needed spectacles.

A case was defined based on the specific recommendations of the WHO refractive error working group as a pupil with a significant refractive error if the visual acuity during the study period was 6/12 or worse in the better eye with the use of a Snellen's chart and was

improving with refraction[8]. All data was analysed using the SPSS version 12.0 statistical software and Epi info version 3.4.1.

RESULTS

A total of 1,278 pupils participated in the study representing a response rate of 87%. The mean age of the study subjects was 12.98 (± 0.018) years, with a standard deviation of 0.967. The oldest pupil was 15 years of age and the minimum age being 12 years (range = 3). Majority of the study participants were females and they comprised 54.6% of the study population. The prevalence of significant refractive errors in Ntcheu (rural district) was 31/1,278 (2.4%).

Table 1: Distribution of refractive status (n = 1,278)

Refractive status	Prevalence	
	No.	(%)
Hypermetropia	19	1.4
Myopia	10	0.8
Astigmatism	2	0.1
Emmetropia	1247	97.7
Total	1,278	100

Hypermetropia was the predominant type of refractive error

Table 2: Distribution of significant refractive errors by age in Ntcheu district (n = 31)

Refractive status	Age in years								
	12		13		14		15		P-value
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	
Hypermetropia	6	66.7	2	40	8	72.7	3	50.0	0.574
Myopia	2	22.2	3	60	3	27.3	2	33.3	0.512
Astigmatism	1	11.1	_		-		1	16.7	0.482
Total	9	100	5	100	11	100	6	100	

No clear pattern of refractive status is observed with increasing age.

Table 3: Distribution of refractive error status by sex (n = 64)

Sex	Refractive status prevalence					
	Hypemetropia		Myopia		Astigmatism	
	No.	(%)	No.	(%)	No.	(%)
Male	8	42	7	70	2	100
Female	11	58	3	30	0	0
Total	19	100	10	100	2	100

Boys were more myopic (70%) than girls though not statistically significant (p =0.148)

DISCUSSION

The prevalence of refractive errors of 2.4% in the rural setting in Malawi compares well with other reports in sub-Saharan Africa. Naidoo *et al* in Durban, South Africa reported 2.9% in the 11 – 15 year age group[4]. Wedner *et al* in rural Mwanza primary school children in Tanzania (age 9–15 years) noted a prevalence of 1% [9]. Muma *et al* in rural schools of Kenya noted a prevalence of 5.4% in a similar age group. The lower prevalence of refractive errors in sub-Saharan Africa as compared to East Asia is

partly due to the low industrialisation prevalent in African countries. The rigorous schooling system in the East Asia region particularly China does contribute to the development of refractive errors especially school myopia in school aged children as well.

The higher prevalence of hypermetropia as compared to myopia in this rural population (Table 1) compares well with that noted by Muma *et al* in the rural district of Makueni in Kenya and Foutuhi *et al* in Iran[10,11]. Hypermetropia was noted to be very high in the rural as compared to the urban areas of Dezful (21.4% and 13.8% respectively)[11]. In Ntcheu, electricity coverage is only limited to a few trading centres hence very little or no TV viewing by school children. This, coupled with the increased poverty levels hence a weaker purchasing power does limit the amount of near work. Children in the rural areas are also involved in activities such as farming and looking after cattle which do not require near strenuous visual activities.

The definition used in this study may actually have underestimated the prevalence of hypermetropia in the district. Hypermetropes tend to accommodate, hence could have been able to read the 6/12 line with effort even with a huge refractive error and consequently missed as normal subjects in the study.

There was no clear pattern in the prevalence and pattern of significant refractive errors with increasing age (Table 2). Myopia was however noted more in boys than in girls while hypermetropia was more in girls (Table 3). In Malawi girls are involved more in household activities while boys are more adventurous hence often travel long distances to watch television and play the video games only available in trading centers in the rural areas. Parents in Malawi also exert more education demands on the boy child who then spend more time reading in order to succeed academically than his female counterpart in a rural set up. The cultural concept is that a girl child will be supported by the husband while a boy child prepares himself as the eventual bread winner in a family.

Of the 31 subjects with refractive errors none of them had any form of correction. Such a service is not available in the district but is offered in the capital Lilongwe which is about 250km from the district. The majority indicated that they were not aware that their disability could be corrected.

CONCLUSION

The overall prevalence of significant refractive errors in a rural district of Ntcheu in Malawi is 2.4%. This is very low to justify a regular screening programme in primary schools. There is great need however to create awareness on the use corrective services and to bring such services close to the community, in this case the district.

REFERENCES

1. Catherine,A., Mc Carty, Hugh, R., *et al*. Myopia and vision 2020: Editorial*. Am. J. Ophthalmology*. **29 (4):** 526.
2. Donatella P. Visual impairment in children from refractive errors: Estimate of the global prevalence in 2005. Bulletin of the World Health Organisation, Nov 1st, 2005.
3. Negrel, A. D., Maul, E., Pokharel, G. P., *et al*. Refractive error study in children: Sampling and measurement methods for a multi country survey. *Am. J. Ophthalmology*. 2000; **129**: 421 – 426.
4. Naidoo, K.S., Raghunandan, A., Mashige, K.P., *et al*. Refractive error and visual impairment in African children in South Africa. *Invest Ophthalmol. Vis. Sci*. 2003; **44(9):**3764-3770.
5. Dandona, R., Dandona, L., Naduvilath, T.J., *et al*. Refractive errors in an urban population in Southern India: the Andhra Pradesh Eye Disease Study. *Invest Ophthalmol Vis. Sci.* 1999; **40:**2810–2818.
6. Pokharel, G. P., Negrel, A. D., Mono, S.R., *et al*. Refractive error study in children: results from Mechi one, Nepal. *Am. J. Ophthalmology*. 2000; **129:** 427 – 435.
7. Maul, E., Barroso, S., Munoz, S.R., *et al*. Refractive error study in children: Results from La Florida, Chile. *Am. J. Ophthalmology*. 2000; **129:** 445 – 454.
8. World Health Organization prevention of blindness and deafness *elimination of avoidable visual disability due to refractive errors*. Report of an informal planning meeting. WHO, Geneva, 3-5 July 2000.
9. Wedner, S.H., Ross, D.A., Balira, R., *et al*. A prevalence survey of eye diseases in primary school children in a rural area of Tanzania. *Br. J. Ophthalmol.* 2000; **84:** 1291–1297.
10. Muma, M., Kariuki, M. M. and Kimani, K. Prevalence of significant refractive errors in primary school children in Makueni district, Kenya. *East Afr. J. Ophthalmol*. 2007; **13(3):** 48 – 51.
11. Fotouhi, A., Hashemi, H. and Khabakhoob, M. The prevalence of refractive errors among school school children in Dezful, Iran. *Br. J. Ophthalmology*. 2002; **91:** 287 – 292.