

ORIGINAL PAPER

Prevalence of Refractive errors among Primary School Pupils in Kilungu Division of Makueni District, Kenya

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ABSTRACT

Objective: To determine the magnitude and pattern of significant refractive errors in primary school children in Kilungu division of Makueni District, Kenya.

Design: A cross – sectional primary school based study.

Setting: Eight (8) Primary school in Kilungu division of Makueni District, Kenya.

Target population: 1439 Primary school pupils aged between 12 and 15 years.

Results: The prevalence of significant refractive error was 5.2%, 75/1439, (95% CI) being responsible for 92.6 % of all causes of poor eyesight. Hypermetropia accounted for 3.2% (95% CI), myopia 1.7% (95% CI) and astigmatism 0.3% (95% CI) of refractive errors. Myopia was more likely to be present in the pupils aged 14 to 15 years than those aged 12 to 13 years with OR 2.9 (0.1 – 9.2) which was statistically significant (p=0.022).

Conclusion: The overall prevalence of significant refractive errors in pupils aged 12 to 15 years in Makueni's Kilungu division at 5.2% (95% CI) was high enough to justify a regular school eye screening in primary schools in Kenya.

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INTRODUCTION

Refractive errors are the fourth commonest cause of blindness in the developing world.¹ In the developed countries, screening for eye diseases including refractive errors in school going children is done routinely.² In the UK for instance, almost all children with important visual problems including refractive errors have been detected before entry into school, and by the age of 8 years only 1.7% have not been screened for eye diseases.² 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.^{2,3}

Most developing countries have no national preschool or school eye screening programmes and in most cases screening is done for the purposes of research.¹ Therefore, little is known about the prevalence and public health importance of eye diseases in school age children in these countries.⁴

Effective management of blindness due to refractive errors is readily available in developed countries unlike in developing countries where it is scarce.¹ This management includes prompt refraction, accessibility to primary eye care and affordable quality spectacles.¹ In Africa, centres which offer these services are few, inadequate and limited compared with the magnitude of the problem. These centres are not easily accessible and the spectacles are not affordable to most people.⁵ Therefore, there is, need to develop service structures to match the magnitude of the problem.^{5,6}

Key words: Refractive errors, Children, Prevalence, Kenya

METHODS

In this primary school based study 1439 pupils were recruited for the study. Computer generated random numbers were used to randomly select Kilungu division from 5 divisions and the 8 primary schools from 54 primary schools in Kilungu division of Makueni District. From the selected schools all pupils aged between 12 and 15 years present were picked from the school register and included in the study. The ages of the pupils were determined from admission school records. Pupils aged 12 – 15 years absent during the survey were excluded from the study.

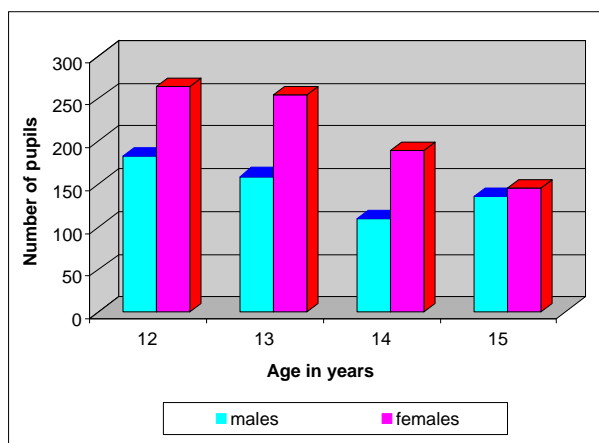
Study approval was sought from the Ministry of Education to conduct the study in Kilungu division of Makueni district. Ethical approval was obtained from Kenyatta National Hospital ethical committee. Written consent from the head teachers of each school was then obtained on behalf of all the students who participated in the study.

Questionnaire in English was then administered to collect demographic data and ocular history from each pupil followed by an eye examination. Visual acuity was assessed using a Snellen's E chart at 6m in a well lit room and each eye was tested separately which was entered in the questionnaire. Cycloplegic Objective refraction was carried out in all those with a visual acuity (VA) of less than 6/18 in either eye by way of retinoscopy in a darkened room after dilating the pupils with 1% cyclopentolate eye drops. Ocular examination was performed with a torch and a 20 dioptre loupe. Other ocular findings were documented and pupils who needed further management were referred to Kenyatta National Hospital via Machakos Provincial Hospital.

RESULTS

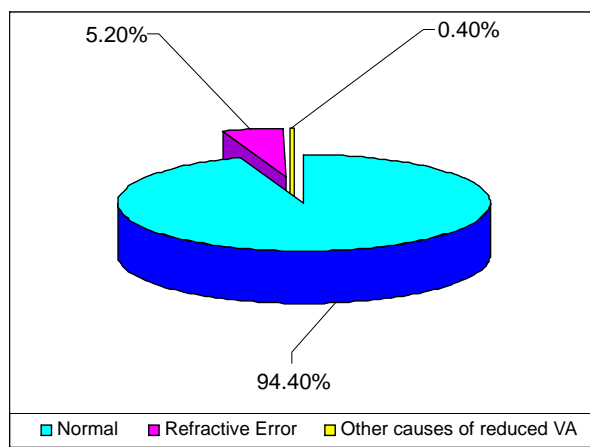
A total of 1439 pupils participated in the study representing a response rate of 94.5%.

Figure 1: Age distribution of pupils (n = 1439)



There was no statistical difference between the two sexes, $p = 0.453$. The pupils aged 12 to 13 years were slightly more than those aged 14 to 15 years.

Figure 2: Visual Acuity (VA) distribution (n = 1439)



5.2% (75) pupils had refractive errors and the rest 94.4% (1358) had normal vision ($\geq 6/18$). The prevalence of refractive errors was 5.2% (95% CI).

Table 1: Refractive error distribution (n = 75)

Characteristics	frequency	Percentage
• Myopia	24	1.7
• Hypermetropia	47	3.2
• Astigmatism	4	0.3

Hypermetropia was the most prevalent refractive error at 62.7% (47) followed by myopia 32.0% (24) and astigmatism at 5.30% (4).

Table 2: Relationship between Age and Refractive Status (n = 75)

Age distribution				
Characteristics	12 to 13, n (%)	14 to 15, n (%)	OR (95%CI)	P-value
• Myopia	7 (20.0)	17 (42.5)	2.9 (0.1-9.2)	0.022
• Hypermetropia	26 (74.3)	21 (52.5)	2.4 (0.9-6.3)	0.083
• Astigmatism	2 (5.7)	2 (5.0)	1.2 (0.2-8.6)	0.891

There was a significant association between myopia and age distribution, $p = 0.022$ and OR = 2.9, 95% CI (0.1-9.2).

Table 3: Relationship between Sex and Refractive Status (n = 75)

Characteristics	Sex		OR (95%CI)	P-value
	Females, n (%)	Males, n (%)		
• Myopia	14 (29.8)	10 (35.7)	0.8 (0.3-2.1)	0.595
• Hypermetropia	30 (63.8)	17 (60.7)	1.0(0.4-18.6)	0.032
• Astigmatism	3 (6.4)	1 (3.6)	1.8(0.2-18.6)	0.600

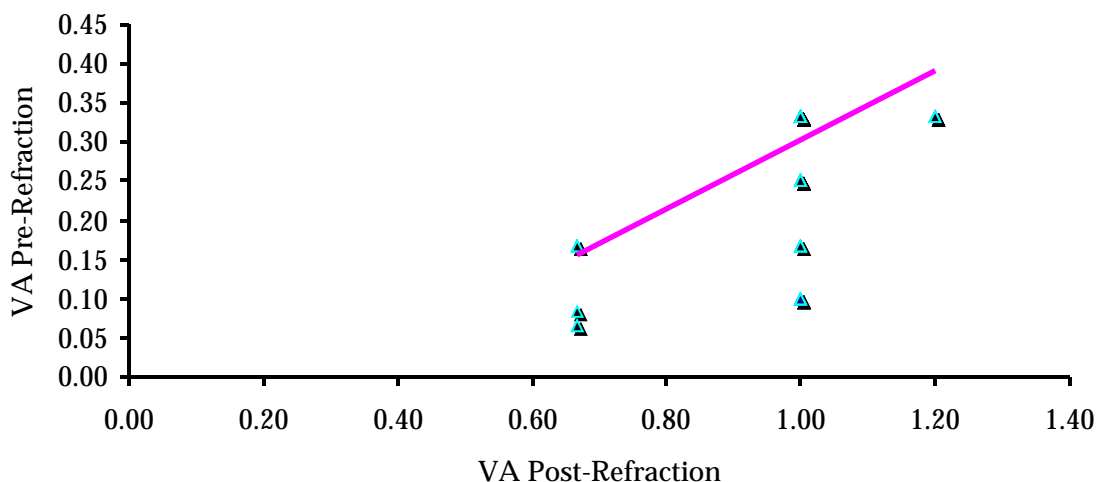
There was no significant association between refractive errors and sex of pupil.

Table 4: Use of spectacles by pupils (n = 75)

Characteristic	Frequency, n (%)	Using spectacles n (%)
• Yes	9 (0.6)	1 (1.3)
• No	66 (4.6)	0 (0)

9 pupils had been prescribed spectacles previously but only one of them had the spectacles.

Figure 3: Visual acuity improvement following refraction (n = 75)



There was improvement in visual acuity following refraction.

DISCUSSION

A total of 1522 primary school pupils were eligible to participate in the study, but 1439 (94.5%) were screened for refractive errors. 83 (5.5%) of the pupils were absent (figure 1). All the eligible pupils who were present participated in the study.

59.2% (852) of the pupils examined were female and 40.8% (587) were male (figure 1). There was no statistical difference between the sexes, $p = 0.453$.

Reduced VA considered to be $< 6/18$ was present in 81 (5.6%) pupils (figure 2). The main cause of reduced VA was refractive error with a prevalence of 5.2% (75), 95% CI being responsible for 92.6% of all cases of reduced vision (figure 2). This was almost half of what Nzuki et al found in Nairobi's Langata division where the prevalence of refractive errors was found to be 10.2%.⁷

Myopia was found in 1.7% (24) pupils. Wedner et al and Nzuki et al found a higher prevalence of myopia in their studies at 5.6% and 4.2% respectively.^{7, 9} Similarly Naidoo et al in Uganda found an equally higher prevalence of myopia at 9.6%.¹³ This could be attributed to the fact that the studies were conducted on urban based pupils who tend to be more myopic due to the activities they are mostly

involved in which involves a lot of near work as explained by Wedner et al, Saw et al, Zhang et al and Garner et al.^{5, 10, 11, 14}

The prevalence of myopia in this study was similar between males and females at 1.8% and 1.7% respectively and the difference was not statistically significant, $p = 0.595$ (table 3). Kawuma et al and Nzuki et al found myopia to be more prevalent in females.^{7, 8} Prevalence of myopia in this study was found to be higher in the ages 14 to 15 years which is similar to what Naidoo et al found.¹³ There was statistical difference between those pupils aged 12 to 13 years and those aged 14 to 15 years ($p = 0.022$) and OR of 2.9 (0.1-9.2), table 2. This was contrary to what Wedner et al found where myopia was more prevalent in the pupils aged 11 to 13 years as compared to those aged 14 to 15 years and more in female.⁸

The prevalence of hypermetropia in our study was found to be 3.2% (95% CI), 2.1% (30) of which were females and 1.1% (17) males. The difference between the sexes was statistically significant ($p = 0.032$), table 3. Nzuki et al found the prevalence of hypermetropia to be 0.3% and there was no statistical difference between the sexes.¹³ In our study the prevalence of hypermetropia was found to be 10 times more than the Nzuki study.¹³ Wedner et

al and Garner et al also found lower prevalence of hypermetropia at 0.4% and 0.2% respectively.^{8,14}

The pupils aged 12 to 13 years were more than twice as likely to be hypermetropic than those aged 14 to 15 years OR 2.4, (0.9 – 6.3). However this was not statistically significant, $p = 0.083$, (table 2). Nzuki et al also found hypermetropia to be more prevalent in the younger age group as compared to the older age group.⁷

In this study, hypermetropia was found more prevalent than myopia unlike what has been reported in other studies. This may be due to the fact that probably in rural setting a hypermetropic trend is expected as put forward by McLaren, Wedner et al and Garner et al who all have pointed out that school going pupils who are urban dwellers tend to have a myopic shift because they tend to do more near work as compared to their rural counterparts.^{9,12,14}

The prevalence of astigmatism in this study was found to be 0.3% (95% CI) (4). This was slightly higher than what was found by Wedner et al where the prevalence was found to be 0.1%.⁹ Nzuki et al found prevalence of astigmatism to be 0.5%. The prevalence of astigmatism in females and males was 0.2% (3) and 0.1% (1) respectively.⁷

Of the 9 pupils who had previous refraction only 1 had full spectacle correction, the other 8 (10.7%) did not have the correction which had been prescribed to them (table 4). The reason given for this was that the pupils could not afford to buy spectacles. The other 66 (88.0%) were newly diagnosed cases of refractive error. Some of them were not aware that they had refractive errors necessitating correction with spectacles. There was no pupil found using contact lenses.

Pupils who had refractive errors were corrected fully with the majority (96%) of them coming to 6/6 (1.0). Figure 6 shows the trend in the improvement of VA as the pupils were refracted. Most of the pupils fall below the line which indicates improvement of vision with refraction.

CONCLUSION

The overall prevalence of significant refractive errors (VA worse than 6/18) in pupils aged 12 to 15 years in Makueni's Kilungu division was 5.2%. A regular school screening programme would be beneficial to the primary school pupils. Hypermetropia was the most prevalent refractive error at 3.2% followed by myopia at 1.7% and astigmatism at 0.3%.

It is important that more school screening for refractive errors and eye diseases be conducted in order to identify and treat these disorders in as many school children as possible and as early as possible. Such a screening programme would be an opportunity for intervention in those pupils having refractive errors but unable to attend a health facility due to lack of finances. There is need to conduct school screening programmes in Zambia for us to know the prevalence of refractive errors.

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REFERENCES

1. Hugh RT, Refractive Errors: Magnitude of the need. *Community Eye Health*. 2000; 13; 33: 1-2.
2. Cummings GE. Vision screening in junior schools. *Public Health* 1996; 110: 369–72. [Medline]
3. Stewart-Brown SL, Brewer R. The significance of minor defects of visual acuity in school children: implications for screening and treatment. *Trans Ophthalmol Soc UK* 1986; 105: 287–95. [Medline]

4. Jewell G, Reeves B, Saffin K, et al. The effectiveness of vision screening by school nurses in secondary schools. *Arch Dis Child* 1994; 70: 14–18.[Abstract]
5. Wedner SH, Ross DA, Balira R, et al. A prevalence survey of eye diseases in primary school children in a rural area of Tanzania. *Br J Ophthalmol* 2000; 84:1291–7.
6. Lewallen S, Lowdon R, Courtright P, et al. A population-based survey of the prevalence of refractive error in Malawi. *Ophthalmic Epidemiol* 1995;2: 145–9.[Medline]
7. Nzuki NH, Karimurio J, Masinde SM. *Med Ophthalmology* dissertation, Significant refractive errors as seen in standard eight pupils attending public schools in Langata division, Nairobi, Kenya, 2004, 37–47.
8. Kawuma M, Mayeku R. A survey of the prevalence of refractive errors among children in lower primary schools in Kampala district, *Afri Health Sci*; 2, 69-72, Aug 2002.
9. Wedner SH, Ross DA, Todd J, Myopia in secondary school students in Mwanza City, Tanzania: the need for a national screening programme, *British Journal of Ophthalmology* 2002;86:1200-1206.
10. Saw SM, Katz J, Schein OD, et al. Epidemiology of myopia. *Epidemiol Rev* 1996; 18:175–87.[Medline]
11. Zhang MS, Saw SM, Hong RZ, et al. Refractive errors in Singapore and Xiamen, China - A comparative study in school children aged 6 to 7 years. *Optom & Visual Sci*; 77-302-308, 2000.
12. McLaren D. The refraction of Indian school children. A comparison data of East Africa and India. *Br J Ophthalmol* 1961; 45: 604-13.
13. Naidoo KS, Raghunandan A, Mashige KP, et al. Refractive error and visual impairment in African children in South Africa. *Invest Ophthalmol Vis Sci*. 2003 Sep; 44(9):3764-70.
14. Garner LF, Owens H, Kinnear RF, et al. Prevalence of myopia in Sherpa and Tibetan children in Nepal. *Optom Visual Sci* 1999; 76:282–5.[Medline]