

The prevalence and pattern of visual impairment and blindness among Primary School pupils in Kitale Municipality, Kenya

Barasa E¹, Otieno SA², Karimurio J³

¹Division of Ophthalmic Services, Ministry of Health, Kenya, P.O. Box 43319-00100, Nairobi, Kenya

²Department of Zoological Sciences, Kenyatta University, P.O. Box 43844, Nairobi, Kenya

³Department of Ophthalmology, College of Health Sciences, University of Nairobi, P.O. Box 19676-00202, Nairobi, Kenya

Corresponding author: Mr Ernest B Wanyama. Email: barasaernest@yahoo.com

ABSTRACT

Objective: To investigate the prevalence and pattern of Visual Impairment(VI) and blindness among primary school pupils in Kitale Municipality from February to March 2009.

Design: Cross-sectional school based study.

Setting: Primary Schools in Kitale Municipality, Kenya.

Subjects: Seven hundred and seventy six pupils of the age range 5-22 and mean of 10.81 years from standard one to standard eight.

Results: The prevalence of visual impairment was 4.77% and 0% for severe visual impairment while that of blindness was 0.13%. Girls contributed 35.14% of cases of visual impairment while boys contributed 64.86%. The age group most affected was 11-15 years (59.46%). There were higher chances of developing VI with increasing age. Public schools contributed 81.08% of cases of visual impairment while for private schools, it was 18.92%. Two zones (Grassland and Bidii) with peri-urban characteristics contributed 75.68% of VI cases while two purely urban zones (Milimani and Bondeni) contributed 24.31%. The only case of blindness was due to retinal disease in a standard one female pupil aged 8 years, in a public school within Bondeni zone. The leading cause of visual impairment was refractive error (81.08%). Other causes included albinism, corneal disease, disease of whole globe and strabismus.

Conclusions: Visual impairment and blindness among primary school pupils in Kitale municipality is of public health importance.

Recommendations: There is need to carry out annual school eye screening by relevant ministries in order to enhance early detection and management of eye problems among primary school pupils.

INTRODUCTION

The control of blindness in children is one of the main priorities of the World Health Organization's VISION 2020 (The Right to Sight) global initiative. There are several reasons for this; first, the causes of blindness in children are very different from the causes in adults, and the strategies to combat blindness in adults will not result in the control of blindness in children. Secondly, unlike in adults, a delay in treatment can lead to amblyopia. There is therefore a level of urgency about managing eye diseases in children. Thirdly, children's eyes are not like small adult eyes. They respond differently to treatment, and specific expertise, equipment and training is required. Finally, blind children have many years of blindness ahead of them. The number of "blind years" resulting from blindness in children is more than half the number of "blind years" caused by cataract in adults¹.

The prevalence of blindness in children varies from approximately 0.3/1000 children in wealthy regions of the world to 1.2/1000 in the poorer countries or regions². Globally, there are approximately 1.5 million children who are blind and around three

quarters live in developing countries². An estimated 4/1000 children worldwide are visually impaired as a result of eye disease. Some of these children have nearly normal vision, some are totally blind, but the majority falls into a broad range in between these two points³.

A survey to determine the magnitude and etiology of visual and ocular handicaps amongst Standard one primary school children in Nairobi, Kenya, found that 330 out of 3,206 children had visual impairment which accounted for 10% of the study respondents⁴. No such study has been carried out in Kitale Municipality within Trans-Nzoia West District, Kenya.

The focus of this study was to investigate the prevalence and pattern of VI and blindness among primary school pupils in Kitale municipality. This will fill the gap of knowledge that exists with regard to VI and blindness among primary school pupils. Other studies done on VI and blindness either focused on a particular class, whole populations or narrower age categories with limited or no documentation of patterns among age groups, gender, class category, zone or type of school.

MATERIALS AND METHODS

Location: The study was carried out among subjects in primary schools within Kitale Municipality, Trans-Nzoia West District of Kenya from February to March 2009.

Research design: Descriptive cross-sectional survey was used.

Target population: The target population for this study was 22,879 pupils from all primary schools within Kitale Municipality.

The source population: The source population was 11,543 pupils in the 24 sampled schools within Kitale Municipality from which the sample population was taken.

The study population: The study population consisted of 776 pupils.

Inclusion criteria: A primary school pupil in Kitale Municipality.

Sample size determination: Sample size was determined by the formula used by Fisher *et al*⁵ for a population > 10,000 where n = minimum sample, Z the confidence level (1.96 for 95% confidence interval), p assumed population prevalence (0.1%), q (1-p), D the likely design effect (5), and d the maximum acceptable error (0.05%).

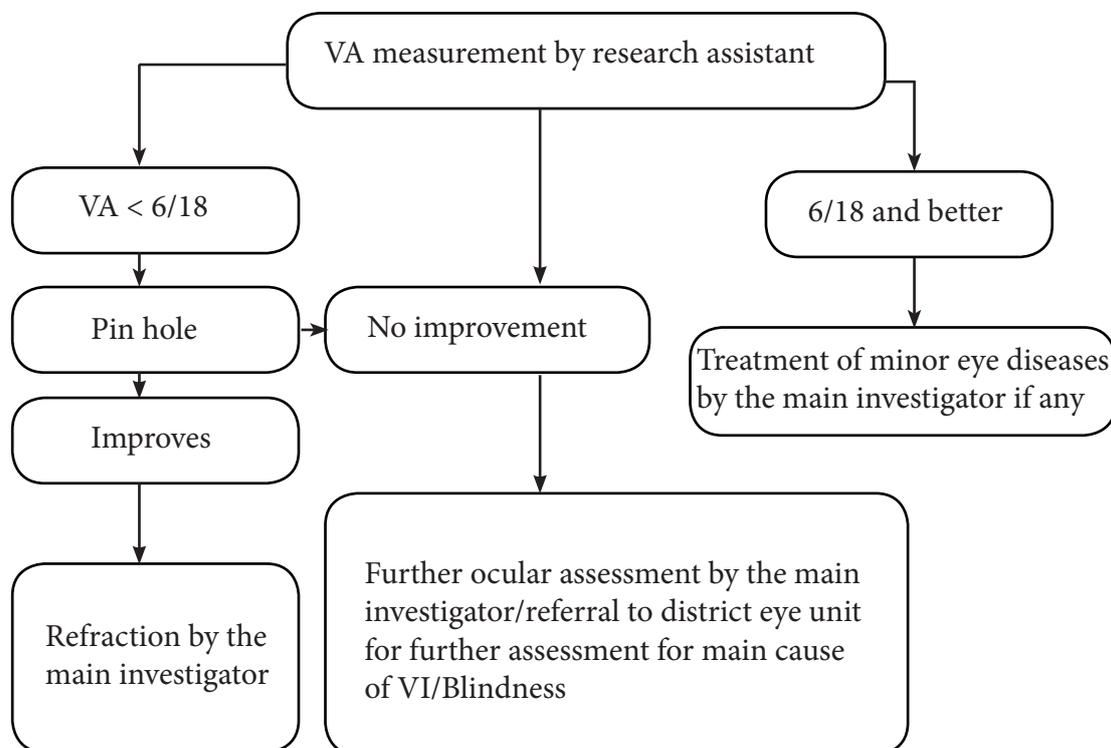
$$n = \frac{Z^2pqD}{d^2}$$

The minimum sample size for the study was therefore 692.

Sampling procedure: Multistage random sampling procedures were used. Schools were stratified by four existing educational administrative zones. At least 50% of the schools in each zone both public and private were sampled by simple random sampling. Fourteen public and ten private schools with populations of 8,226 and 3,317 respectively, (total 11,543) were sampled. Each school was assigned a sample proportional to its population. The sample proportional to population was calculated by dividing the total number of pupils by 11,543 and multiplying by 692 (Minimum sample size for the study). The school sample was divided equally among the eight classes and individual respondents selected from class registers by systematic random sampling. The first case however, was selected by simple random sampling.

Examination procedure: Visual acuity of all the sampled pupils in the twenty four schools was tested by four trained research assistants. Those pupils presenting with VA equal to or greater than 6/18 in the better eye were given free treatment for simple ailments where necessary but were excluded from the rest of the examination procedures (Figure 1).

Figure 1: Procedure for the examination of study subjects



Those pupils presenting with VA less than 6/18 in the better eye were tested with spectacles if worn and if VA improved to 6/18 or better were also excluded from the rest of the procedures. Those with presenting or best corrected VA < 6/18 in the better eye were subjected to further examination. Clinical examination and refraction was done by the principal researcher. The detailed examination included VA with Pinhole (PH), cycloplegic refraction for refractive errors, external ocular examination by use of natural light and torch, fundoscopy by use of an ophthalmoscope, and estimation of visual fields by use of the confrontation method. Causes of visual impairment and blindness were established purely by physical examination of the respondents using standard procedures and equipment and respondent's medical history. Difficult cases were referred to the ophthalmologist at Kitale District Hospital (KDH) with necessary follow up organized to record the findings.

RESULTS

Distribution of the respondents by age and gender: A total 776 pupils participated in the study. The age groups most represented were 11-15 and 6-10 years with 370 and 360 pupils respectively. The Male: Female ratio was 1.04:1 and 1.16:1 in public and private schools respectively.

Table 1: Distribution by age and sex

Age Category	Public schools			Private schools			Total
	Male	Female	Total	Male	Female	Total	
< 6	3	1	4	0	0	0	4
6-10	114	110	224	74	62	136	360
11-15	128	134	262	57	51	108	370
16-20	24	14	38	1	2	3	41
20+	0	0	0	1	0	1	1
Total	269	259	528	133	115	248	776

Prevalence of visual impairment and blindness:

A total of 95.10% of the respondents had normal visual acuity (Presenting and best corrected) while 4.77% had visual impairment (VI). There was no case of Severe Visual Impairment (SVI) but one pupil (0.13%) was blind (Table 2). The blind pupil was in a public integrated school where assistance is provided by special teachers, with necessary tools and equipment both for mobility and learning purposes.

Table 2: Prevalence of visual impairment and blindness among the respondents

VA Category	Frequency	(%)	95% CI
6/6- 6/18 (Normal)	738	95.10	94.89-95.31
< 6/18- 6/60 (V.I)	37	4.77	4.56-4.98
<6/60- 3/60 (S.V.I)	0	0.00	-
< 3/60 (Blind)	1	0.13	0.08-0.34
Total	776	100.00	

Prevalence of visual impairment by age: The prevalence of VI was highest in the age group 11-15 years. This contributed to 2.84% (22/776) of the overall prevalence (Table 3).

Table 3: Prevalence of visual impairment by age category

Age group	Frequency	(%)	95% CI
6-10	10	27.03	26.82-27.24
11-15	22	59.46	59.25-59.67
16-20	4	10.81	10.60-11.02
20+	1	2.70	2.49-2.91
Total	37	100	

Visual impairment and gender: Out the 392 males, 6.1% had VI while 3.4% of the 384 females also had VI (P= 0.052) (Table 4).

Table 4: Visual impairment by gender

Gender	Total number	Proportion of VI	P-value (Chi square)
Male	392	24 (6.1%)	
Female	384	13 (3.4%)	0.52

Causes of visual impairment: Ocular assessment showed that refractive error was the leading cause of VI (81.08%). Other causes were albinism (5.1%), corneal disease (5.1%), disease of whole globe (2.70%), strabismus (2.70%) and nystagmus (2.70%) (Table 5).

Table 5: Percentage distribution of respondents with various causes of VI

Causes	Frequency	(%)	95% CI
Refractive Error	30	81.08	80.87-81.29
Albinism	2	5.41	5.20-5.62
Corneal disease	2	5.41	5.20-5.62
Disease of whole globe	1	2.70	2.49-2.91
Strabismus	1	2.70	2.49-2.91
Nystagmus	1	2.70	2.49-2.91
Total	37	100	

Causes of blindness: The cause of blindness in the single case was retinal disease in both eyes (Retinoblastoma) in early childhood. This was established from the medical history given by the coordinating itinerant teacher at the integrated school.

DISCUSSION

Prevalence of visual impairment: The prevalence of visual impairment in this study was 4.77%. This is far above the global estimate of 0.40%³, and therefore of public health importance. A similar study conducted among standard one pupils in Kibera slums of Nairobi, Kenya found a prevalence of VI to be 10%⁴. The lower prevalence in the current study compared to the Kibera study is explained by the difference in the socio-economic status of the two groups.

Prevalence of blindness: The prevalence of blindness in this school based study was 0.13%. This is much lower than the National figure for Kenya of 0.70%⁶. However, the national prevalence was based on whole population that includes all age groups. Generally, the prevalence of VI and blindness increases with age due to conditions such as cataract, trachoma, glaucoma and age related macular degeneration. In a hospital-based cross-sectional study of all patients less than 16 years of age at the eye clinic of Obafemi Awolowo University Teaching Hospital Complex, the prevalence of blindness was 1.4%⁷. In another community-based survey on the magnitude and pattern of eye diseases in Korogocho slum, Nairobi, the prevalence of blindness was 0.7%⁸. In another study, the prevalence of blindness in a Nairobi urban population at Kibera was found to be 0.6%⁹.

Visual impairment, blindness and age category: In Kenya, children aged 5-19 years constitute 48% of the total population. This age group suffers varying but significant degrees of ill health, nutritional deficiencies and morbidity that unequivocally impede effective learning and realization of their full productive potential¹⁰. The leading cause of VI in this study was refractive error. The age category most affected by visual impairment (11-15 years) is the period when refractive errors usually manifest. Majority of significant refractive errors manifest themselves during teenage life¹¹. The only blind pupil was in the age category 6-10 years, the blindness being caused by retinal disease. Retinoblastoma is the most common primary ocular malignancy of childhood.

Visual impairment, blindness and gender: In this study, males were more affected by VI than females. Though more males than females were affected, the difference was not statistically significant ($p = 0.071$). There is not enough population-based data to evaluate the issue of gender and VI among children. Use of eye care services could be un-equal between genders at this age and can be a subject for further research. In a study carried out among children aged 12-15 years within a hospital setting in Nigeria, males were also more affected by VI at 31.60% than females at 22.20%⁷.

Visual impairment, blindness and educational grade: The educational grade most affected in the current study by visual impairment was class 5-6. Pupils of the age category 11-15 years that was most affected are usually in this class category. The only blind pupil was in standard one and at the age of 8 years was ordinarily expected to be in standard three. The lag in class can be explained by the time used to seek medical and surgical interventions to address the illness that resulted in blindness. The start age for primary education in Kenya is six years and primary education takes eight years¹².

Visual impairment, blindness and zone: Grassland and Bidii zones with peri-urban characteristics had higher proportions of visually impaired cases compared to Milimani and Bondeni with urban characteristics. This difference could be explained by differences in economic characteristics among parents of the VI cases. In ordinary circumstances, it would be expected that good economic status facilitates access and affordability of eye care services and hence reduce the burden of VI and blindness. Since majority of the pupils had refractive error as the cause of VI, those who could afford spectacles had corrected VA $>6/18$ and therefore were not subjected to further examination.

Visual impairment and blindness by type of school: Public schools contributed upto 81.08% of the cases of VI while for private schools, this was 18.92%. The economic status of the parents of the visually impaired and blind, could explain this difference. Parents from public schools had lower economic status and hence majority were not able to meet the costs of acquiring spectacles for their children. Parents from private schools on the other hand had better economic status and hence were more likely to purchase spectacles. The only blind pupil was in a public school with integrated education service. Since she had no other disability, it was not necessary for her to be in a special school for the blind.

Causes of visual impairment and blindness among the respondents: In the current study, refractive error was responsible for 81.08% of visual impairment. Other causes of visual impairment were albinism, corneal disease, disease of whole globe, strabismus and nystagmus. This is in agreement with similar studies conducted in urban India where 83% of cases were due to refractive error¹³. In southern India, it was reported that refractive error was responsible for 94.80% of cases of visual impairment among school children¹⁴. In Shun Yi district of China, Zhao found that refractive error was the cause of visual impairment in 89.50% of all cases of VI¹⁵. The only blind pupil had retinal disease (Retinoblastoma) as the cause of blindness.

CONCLUSIONS

In Kitale Municipality, the prevalence of visual impairment among primary school pupils was 4.77% and blindness 0.13%. The age group most affected by visual impairment was 11-15 years while the only blind pupil was 8 years. The leading cause of visual impairment in the study population was refractive error with hypermetropia accounting for most of the cases. Other causes of visual impairment were albinism, corneal disease, lesions of the whole globe, strabismus and nystagmus. The only case of blindness was due to retinal disease (Retinoblastoma) in early childhood.

RECOMMENDATIONS

There is need to enforce the school health policy (2009)¹² on visual assessment before school admission as well as carry out annual school eye screening in order to enhance early detection and management of eye problems. There is also need to provide low cost spectacles since a large number of pupils with visual impairment had refractive error as the cause of impairment.

REFERENCES

1. Clare G, Jugnoo SR, Graham EQ. The epidemiology of eye disease (2nd ed) London: Hodder Arnold: 266. 2003.
2. Clare G. New issues in childhood blindness. *Comm Eye Health J.* 2001; **14**(40):53-56.
3. Lynne A. Optical services for visually impaired children. *Comm Eye Health J.* 1998; **11** (27): 38-40.
4. Musa, W. Visual and ocular problems in Standard one children. Department of Ophthalmology. MMed. Thesis. University of Nairobi. 1998.
5. Fisher AA, Laing EJ., Stoekel EJ, Townsend WJ. Handbook for family planning operations, Research Design, 2nd Edition, Population Council Nairobi: 45. 1998.
6. Ministry of Health. *National strategic plan for eye care in Kenya 2005-2010* Nairobi: 5-9. 2005.
7. Adegbehingbe BO. Prevalence and pattern of childhood blindness in a resource limited teaching hospital in Nigeria. *East Afr J Ophthalmol.* 2007; **13**(3):43-47.
8. Nyaga G, Kollmann M, Kimani K, Ilako D. Magnitude and pattern of eye diseases in Korogocho slum, Nairobi. *East Afr J Ophthalmol.* 2007; **13**(2):29-34.
9. Ndegwa LK, Karimurio J, Okelo RO, Adala HS. Prevalence of visual impairment and blindness in a Nairobi urban population. *East Afr Med J.* 2006; **83**(4):69-72.
10. Ministry of Public Health and Sanitation and Ministry of Education. Guidelines for school health policy. Ministry of Public Health and Sanitation and Ministry of Education: 42-43. 2009.
11. Garcia EG, Pavan-Langston D. *Manual of ocular diagnosis and therapy* 3rd Edition: Little Brown and company Toronto (USA):398-428. 1991.
12. Ministry of Public Health and Sanitation and Ministry of Education School health policy. Ministry of Public Health and Sanitation and Ministry of Education: 34. 2009.
13. Brien A. The role of optometry in vision 2020. *Comm Eye Health J.* 2002; **15**(43): 33-36.
14. Kalikivayi V, Naduvilath TJ, Bansal AK, Dandona L. Visual impairment in school children in Southern India. *Indian J Ophthalmol.* 1997; **45**:129-134.
15. Zhao J, Pan X, Munoz SR. Refractive errors study in children in Shun Yi District China. *Amer J Ophthalmol.* 2000; **129**:427-435.