Original Article

Prevalence of Eye Diseases among Learners in Kafue District, Zambia

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ABSTRACT

Objective: To determine the pattern and magnitude of eye diseases among the primary and secondary schools' learners in Kafue District in Zambia.

Method: A cross-sectional survey of all 73 primary and secondary schools in Kafue.

Results: A total of 18,713 enrolled in the study. The prevalence of eye diseases was 20.9% accounting for 17.0% allergic conjunctivitis followed by refractive 3.3%, and least was retinal disorder at 0.01%. Urban dwellers were affected more than their rural counterparts.

Conclusion: The survey found a high prevalence of eye diseases among the learners in Kafue District with allergic conjunctivitis being the most prevalent cause followed by significant refractive errors.

INTRODUCTION

Screening is the process of examining people for the presence of disease or diseases.[1] This public health intervention measure fulfils specific criteria but which may not always be possible in practice.[2] The feasibility and cost-effectiveness of school health screening programmes for school-age children remain controversial in different countries.[3,4,5] In the developed countries, screening for eye diseases, including refractive errors in school going children are conducted routinely.[6] In the United Kingdom (U.K.) for instance, almost all children with significant visual problems, including refractive errors, are detected before entry into school. By the age of eight years, only 1.7% have not been screened for eye diseases.[6] This occurs because eye services are easily accessible in developed countries, and the majority of children with eye problems can access them without requiring referral by other health professionals from the primary level of health care.[6,7] Little is known about the prevalence and public health importance of eye diseases in school-age children in developing countries.[8]

Services for effective management of blindness due to refractive errors are readily available in developed countries, unlike in developing countries where it is scarce.[9] This management includes prompt refraction, accessibility to primary eye health care and affordable quality spectacles.[9] In Africa, the centres which offer refractive services are inadequate and limited compared with the magnitude of the problem. These centres are also not

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easily accessible, and the spectacles are not affordable to most people.[10] There is, therefore, the need to develop services and structures to match the magnitude of the problem.[10,11] Optimal vision is an essential requirement for learning, health, communication, and meeting educational needs. The magnitude of visual disorders among school-age children in Zambia is yet to be quantified. Various studies show that ocular morbidity is public a health problem.[12]

The accessibility of eye health to school-age children is significant for the following reasons:

1. It promotes eye health education to teachers, parents and children, thereby reducing the stigma of spectacle-wearing within the school as well as the community
2. It promotes early detection and treatment of childhood eye conditions.
3. Improving school children's vision contributes to their educational achievement, allowing them to reach their full potential and become productive members of society.
4. Good vision is essential for a child's ability to participate and learn in school as 80% of a child's learning is processed through their visual system.
5. The school-based eye health survey produces evidence that can inform the development of future health interventions led by the Ministry of Health.[13]

The aforementioned demonstrates the need for a comprehensive school-based eye health survey in Zambia for early identification and correction of eye health problems in children. A collaborative investigation that involves eye health workers, as well as teachers, could go a long way in identifying refractive errors. It could also serve as a platform for a more extensive eye health survey for early identification and treatment of other eye diseases in children, including those who are not in school. This strategy would also result in improved awareness of common eye conditions and spectacle acceptance in the communities.

It is for the above reasons that this survey was conducted in Kafue District by the Ministries of General Education and Health in collaboration with the Vision Aid Overseas (VAO).

MATERIALS AND METHODS

This survey was conducted in Kafue District of Lusaka Province in Zambia between June and October 2019 among primary and secondary school learners in all the 73 schools. The District Education Board Secretary (DEBS) and the headteachers of all the schools in Kafue District were contacted, and informed consent was obtained from them after a detail explanation of the purpose, content and benefit of the survey. The initial screening was conducted by the teachers who were trained to screen learners based on the visual acuity (VA) scoring and grading. The teachers screened 18,713 learners from which the mobile ophthalmic team rescreened and examined 5,958 learners. The vision screening chart used by the teachers was white, with four black 'E' optotypes of a size equivalent to 6/9 of the Snellen's visual acuity chart. The chart had to be read at a distance of six metres in proper daylight illumination. All the sampled learners registered in these schools participated in the survey in the order their names appeared in the school register from primary to secondary schools. A comprehensive ocular examination was performed by a team of three ophthalmologists and nine ophthalmic nurses. The ophthalmic nurses included in this survey were well and experienced in community screening and refractions for children. The ophthalmic nurses obtained detailed information from the children with regard to the age, sex, gender, class and history or presence of any eye problem; known or unknown. The ophthalmic team children were asked whether their parents were aware of their eye problems and if they had consulted any eye health care personnel.

The ocular examination included VA measurement using the standard Snellen's chart at six meters. Appropriate paediatric VA charts were used for the

few learners who were aged three to five years. Learners whose visual acuity was less than 6/9 in any eye were subjected to further ophthalmic review and refraction. Penlight examination of the anterior segment and fundoscopy (sometimes with pupillary dilatation using 2.5% phenylephrine mixed with 1% tropicamide) if necessary was conducted by the ophthalmologist. Those whose visual acuity improved with pinhole were refracted. Refraction was done without cycloplegia, but fogging was employed using high powered plus lenses. Significant refractive error was the symptomatic refractive error of 0.5 or more for hypermetropia and worse for myopia and both for astigmatism.

Ethical clearance was obtained from Excellence in Research Ethics and Science (ERES) Converge. Permission to carry out the survey was also obtained from the Ministries of General Education and Health. The purpose of this study was explained to the learners in their own language, and the information sheet was being translated into the local language the patient understands. This information is found in the participant's information sheet. Informed consent was obtained from the headteachers.

A coding system was used to ensure the confidentiality of all learners' details, and ensuring all data was captured for each learner independently.

All data were entered into a computer using the software SPSS statistical package version.

RESULTS

A total number of 18,713 learners were screened from all 73 schools in Kafue district in all six zones giving coverage of 43.1%. The learners' age ranged from three years to 24 years, and the median age was 12 years. Most of the participants were over 13 years (33.9%) followed by 11-13 age group (29.7%), 8-10 years age group (27.5%) and those below seven years 9.8%, Figure 1.

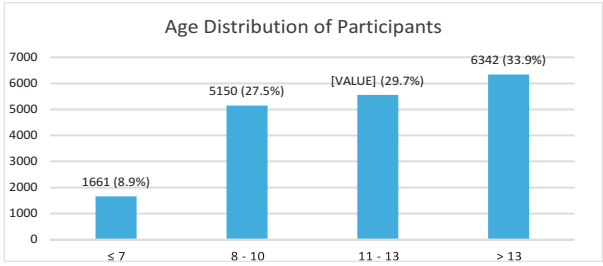

Figure 1: Age Distribution of Participants

The pilot had more learners from rural than Urban.

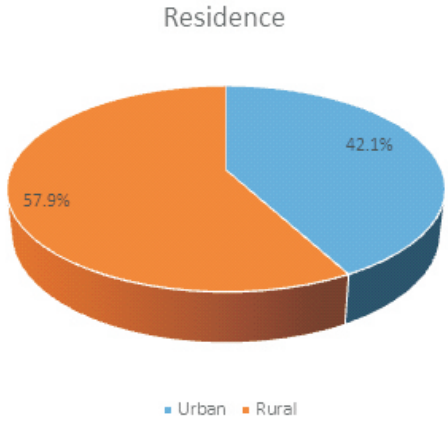

Figure 2: Distribution of Learners according to residence

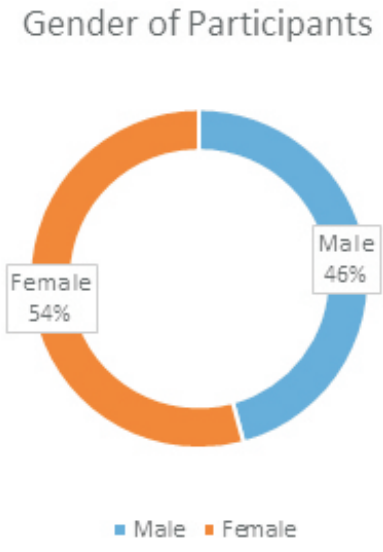

Figure 3: Gender of Participants

The male to female ratio was 1:1.17

Out of 18,713 learners who were screened by the teachers, 2,818 of them were referred for further screening by the eye health personnel. However, more children come forward for screening by the eye health personnel, which resulted in a high number of children (5958) being screened by eye personnel. Out of the 5958, 3817 were found to eye problems including refractive errors while 68 referred for surgical intervention by an ophthalmologist at University Teaching Hospitals – Eye Hospital, Table 1.

Table 1: Screening by Teachers and Eye Health Personnel, n=18,713

CHARACTERISTIC	NUMBER OF LEARNERS SCREENED BY TEACHERS	TOTAL LEARNERS IDENTIFIED TO HAVE EYE PROBLEM BY TEACHERS	TOTAL LEARNER EXAMINED BY HEALTH PERSONNEL	EYE PROBLEMS CONFIRMED BY HEALTH PERSONNEL	TOTAL NUMBER OF LEARNERS REFERRED TO THE OPHTHALMOLOGIST
Number of learners	18,713	2,818	5958	3,817	68

Of the 5,958 who underwent ophthalmic examination by the mobile ophthalmic team, 3,073 (85.5%) had allergic conjunctivitis (80.5%) followed by refractive error (16.3%), Table 2. Both significant morbidities were treatable within the community. Other conditions like cataract and strabismus were referred for further management to an ophthalmologist at a tertiary institution.

Table 2: Eye Conditions Identified during School Screening

EYE CONDITIONS IDENTIFIED	NUMBER OF LEARNERS	PERCENTAGES
Refractive errors	621	16.3%
Allergic conjunctivitis	3,073	80.5%
Cataracts	23	0.6%
Cornea scars	14	0.37%
Amblyopia	8	0.21%
Strabismus	15	0.39%
Retina disorders	2	0.05%
Others	61	1.6%
Total	3817	100%

The prevalence of refractive error amongst learners surveyed during the Kafue pilot programme was 3.3%, Table 3. The prevalence of refractive error is not significantly different from rural (1.6%) and urban (1.7%). The age group with the most substantial prevalence of refractive errors was found in learner more than 13 years old while the lowest prevalence less than seven years old, Table 3.

Myopia had the most considerable prevalence of 2.2% of all refractive error while hyperopia had the lowest prevalence. With regards to eye conditions, allergic conjunctivitis had the highest prevalence of 17.01%, followed by refractive error 3.32 %and the lowest prevalence being retinal disorders. Myopia and hypermetropia were most prevalent among the urban dwellers, while astigmatism was more among the rural dwellers, Table 3.

Table 3: Prevalence of Eye Conditions in Learners Surveyed in School Screening

CHARACTERISTIC	TOTAL NUMBER OF LEARNERS	NUMBER OF REFRACTIVE ERRORS	PREVALENCE
TOTAL	18,713	621	3.3
SEX			
Male	9,200	282	1.5
Female	9513	339	1.8
AGE			
≤ 7	1,661	3	0.02
8 – 10	5,150	26	0.14
11 – 13	5,560	122	0.65
>13	6,342	470	2.51
RESIDENCE			
Urban	7,873	303	1.6
Rural	10,840	318	1.7
TYPES OF REFRACTIVE ERRORS			
Myopia		416	2.2
Hyperopia		80	0.4
Astigmatism		125	0.7
EYE CONDITIONS			
Allergic conjunctivitis	3,184	-	17.0
Cataracts	23	-	0.11
Cornea scars	14	-	0.07

DISCUSSION

School screening for eye diseases and uncorrected significant refractive errors causing visual impairment has been the subject of many studies with the advocates suggest that school vision screening provides an effective way to identify children who require vision therapy, especially glasses.[14,15,16] To benefit from the screening, children with abnormal screening results must receive follow-up eye health care at appropriate eye health facilities. This study was conducted in order to detect eye diseases such as allergic conjunctivitis, amblyopia, refractive errors and squint that may predispose the learners to poor educational performance. The high prevalence of allergic conjunctivitis in Kafue District among the learners could probably be attributed to the pollution by the industries in the district. More investigations need to be carried out in order to determine if at all the pollution in Kafue has a role in the high prevalence of allergic conjunctivitis in Kafue District. The limbal stem cell deficiency could also be looked into during the same investigation.

The prevalence of eye diseases in this study was similar to what was reported by Adegbehingbe et al., 2005, in Nigeria.[17] It was certainly more significant than what was reported by Costanes in the USA.[17] There was a high prevalence of undetected ocular problems in our study. The most common ocular disorders among school children in the USA were strabismus, amblyopia and optical problems impairing visual acuity and depth perception.[18] In the Baltimore vision-screening project, the estimated prevalence of ocular morbidity was found to be also lower than that of this study.[19] The prevalence of significant refractive errors and other eye diseases among secondary school students aged 11-27 years in Tanzania has also been studied.[20] In a study conducted on a sample of children aged 5-15 years in Durban area of South Africa, refractive error was the cause in 63.6% of 191 eyes with a reduced vision, amblyopia in 7.3%, retinal disorders in 9.9%, corneal opacity in 3.7%.[21] In our study, refractive errors were 3.3%. The reason for this finding could be because most of the learners were from secondary schools. Many studies conducted such surveys in primary schools for the purpose of early intervention strategies. Perhaps that is why the number of refractive errors could be too low in this case. The study was conducted in this manner to have a general overview of eye diseases among all the learners in the district.

Other causes of impaired vision among these students were amblyopia, squint (strabismus), corneal opacities, retinal disorders and cataract. The two retinal disorder patients had a retinal detachment in the affected eye. It was surprising that we did not encounter keratoconus. But with the low refractive errors prevalence probably that could have been an expected outcome. For strabismus, all forms of it were documented as such and were all referred for specialist treatment at the University Teaching Hospitals – Eye Hospital. Allergic conjunctivitis was the most common ocular morbidity in our study. This finding is similar to what Adegbehingbe et al., 2005, reported. In any vision-screening programme for children, decisions need to be made as to the level of acuity that denotes 'failure'. Only five learners conjunctivitis due to viral or bacterial infection and they were treated during the activity. These conditions were documented in the other eye diseases category in the survey.

In our study, a cut off of <6/9 in either eye was used to decide abnormal vision. We employed the <6/9 cut off level in either eye for abnormal vision in our study because the majority (67.8%) of the children with this level of VA had one visual complaint or the other despite their low degree of refractive errors. Myopia was the most common refractive error (66.9%) followed by hypermetropia and myopic astigmatism at 12.7% and 20.4% respectively.

There are few data available on the prevalence and types of refractive errors in children in developing countries.[20] We found 14 (2.3%) and 23 (3.7%) children with previously undetected squints and cataracts respectively, eight (57.1%) of which had squint due to uncorrected refraction error. This finding highlights the need for a vision-screening

programme. The low prevalence of amblyopia in our study is similar to the results of other researchers in Nigeria.[12,17] Most of the amblyopia cases in this study were due to uncorrected anisometropia. The importance of early therapeutic intervention to achieve complete visual rehabilitation in those with amblyopia cannot be overemphasised.

CONCLUSION

The high prevalence of ocular diseases due to allergic conjunctivitis, uncorrected significant refractive errors, chalazion and squint (strabismus) among the study population may justify a regular school eye screening/health education programme in primary and secondary schools in Zambia. Besides, there is the need for a national survey to evaluate such disorders amongst the primary and secondary school learners as this will provide data for health planning and promotion.

RECOMMENDATIONS

It will be great to conduct a study on allergic conjunctivitis in Kafue District. Future school survey must be focussed on children age 14 years and below. The school screening programme must be scaled up to the whole country in order to determine the national prevalence of eye conditions in school-going children in Zambia.

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REFERENCES

1. https://www.collinsdictionary.com/dictionary/english/screening
2. Wilson JM, Junger YG. Screening for disease, the World Health Organization. Geneva. 1986
3. Grant WW, Feamow RG, Herbertsons LM et al. Health screening in school-age children. *Am J Dis Child* 1973; 125: 510-522.
4. Yankauer A, Lawrence RJ. A study of peri-odic school medical examinations: 11. The annual increment of new 'defects'. *Am J Pub Hlth* 1995; 45: 71-78.
5. Yankauer A, Lawrence RJ. A study of peri-odic school medical examination: 1. Methodology and initial findings. *Am J Pub Hlth* 1995; 45: 45:71-78
6. Alakija W. Poor distant vision in post-primary schools in Benin City, Nigeria. Public Health, London. 1995; 95: 165-170.
7. Hugh RT, Refractive Errors: Magnitude of the need. *Community Eye Health.* 2000; 13; 33: 1-2.
8. Cummings GE. Vision screening in junior schools. *Public Health* 1996; 110: 369–72. [Medline]
9. Stewart-Brown SL, Brewer R. The significance of minor defects of visual acuity in school children: implications for screening and treatment. *Trans Ophthalmol Soc U*.K. 1986; 105: 287–95. [Medline]
10. 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]
11. 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.
12. 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]
13. Gilbert, C. et al., 2014. Standard Guidelines for Comprehensive School Eye Health Programs. P.iv, 2.

14. WHO International classification of disease. World Health Organization, Geneva. 1975; 1: 241-242.
15. Abiose A, Bhar IS, Allanson MA. Ocular health status of post-primary school children in Kaduna, Nigeria. Report of a survey. *J Paed Ophthal and Strabismus* 1980; 17: 337-340.
16. Donaldson LA, Karas MP, Charles AE, Adams CG. Pediatric community vision screening with combined optometric and orthoptic care: a 64-month review. *Ophthalmic Physiol Opt* 2002; 22(1): 26-31.
17. Adegbehingbe B.O, Oladehinde M.K, Majemgbasan T.O., Onakpoya H.O. and Osagiede E.O. Screening of Adolescents for Eye Diseases in Nigerian High Schools, 2005 Volume 39, Number 4 Ghana Medical Journal
18. Castanes MS. The underutilization of vision screening for amblyopia, optical anomalies and strabismus among preschool-age children. *Bonocul Vis Strabismus Q* 2003; 18(4): 217-232.
19. Presian MW, Norak A. Baltimore vision screening project. *Ophthalmol* 1996; 103(1): 105-109.
20. Wedner SH, Ross DA, Todd J, Anemona, Balira R, Foster A. Myopia in secondary school student in Mwanza city, Tanzania: the need for a national screening programme. *Br J Ophthalmol.* 2002 Nov;86(11):1200-6.
21. Naidoo KS, Raghunanadan A, Mashige Kp, Govender P, Holden BA, Pokharel GP, Ellwin LB. Refractive error and visual impairment in African children in South Africa. *Invest Ophthalmol Vis Sci* 2003; 44(a): 374-380.