

ORIGINAL ARTICLE

Prevalence of Eye Diseases among Primary and Secondary School Learners in Kabwe District – Zambia

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ABSTRACT

Objective: To determine the pattern and magnitude of eye diseases among primary and secondary school learners in Kabwe District in Zambia.

Method: A cross-sectional study of 41 primary and secondary schools in Kabwe District. The examination included visual acuity (VA) testing, cycloplegic retinoscopy with subjective refinement if indicated, ocular motility testing, anterior segment

and fundus examinations in visually impaired children.

Results: There was an estimated total of 32,971 learners who were eligible to participate of which a total of 23,915 (72.5%) were enrolled into the study. The prevalence of eye diseases was 8.3%, with allergic conjunctivitis 5.7% followed by refractive error 1.5% and the least was pterygium disorder at 0.008%. None of those with refractive errors had an eye examination in the past. Glaucoma was diagnosed in three learners (0.01%).

Conclusion: The survey found a moderate prevalence of eye diseases among the learners in Kabwe District with allergic conjunctivitis being the most prevalent cause followed by exceptionally low prevalence of refractive errors.

Keywords: Eye diseases, significant refractive errors, prevalence, screening, learners

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INTRODUCTION

Screening is a public health service in which members of a defined population who do not necessarily perceive that they are at risk of or are already affected by a disease or its complications are asked a question or offered a test to identify those individuals who are more likely to be helped than harmed by further tests or treatment to reduce the risk of disease or its complications.¹ In screening there is a presumptive identification of unrecognized disease or defect by the application of tests, examinations, or other procedures which can be applied rapidly.² This public health intervention measure usually fulfils specific criteria which may not always be possible in practice.² School screening is one of the ways of identifying conditions in eye health of public health importance early enough to institute appropriate measures.

The feasibility and cost-effectiveness of school health screening programmes for school-age children remain controversial in different countries.³ ⁵In the developed countries, screening for eye diseases, including refractive errors in school going children are conducted routinely.⁶

In the United Kingdom 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% would have been screened for eye diseases.⁶ This occurs because eye health services are developed and 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} Services for effective management of visual impairment due to refractive errors are readily available in developed countries, unlike in developing countries where it is scarce.⁸ This management includes prompt refraction, accessibility to primary eye health care and affordable quality spectacles.⁸ Little is known about the prevalence and public health importance of eye diseases in school-age children in most of the developing countries.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 easily accessible and the spectacles are not affordable to most people.¹⁰ There is, therefore, need to develop services and structures to match the magnitude of the problem.¹¹ Optimal vision is an essential requirement for learning, health, communication, and meeting educational needs. In a study conducted in Kafue District of Zambia, prevalence of eye diseases was found to be 17.0% among 18,713 learners.¹² The magnitude of visual disorders among school-age children in Zambia is yet to be quantified. Various studies show that ocular morbidity is a public health problem.¹³

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.¹⁴

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 eye conditions including refractive errors.¹⁵

Vision screening in schools by teachers is an effective method of identifying learners with eye problems and poor vision early. This strategy could be valuable in reducing the workload of the eye health care staff.¹⁵ This collaboration was applied in Kafue District and generated valuable recommendations.¹⁵

School eye health screening could serve as a platform for a more extensive eye health approach 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 Kabwe District by the Ministries of Education and Health in collaboration with Vision Aid Overseas (VAO).

MATERIALS AND METHODS

This survey was conducted in Kabwe District of Central Province in Zambia between September and November 2021 among primary and secondary school learners in 41 schools. The District Education Board Secretary (DEBS) and the head teachers of all the participating schools in Kabwe District were contacted and informed about the activity. Consent was obtained from them after a detailed explanation of the purpose, content and benefit of the survey. The initial screening was conducted by teachers who were trained by an ophthalmologist to screen learners based on the visual acuity (VA) scoring and grading. The teachers screened 23,915 learners from which the mobile ophthalmic team rescreened and examined 2,424 learners. The vision screening chart used by the teachers was white, with four black 'E' opto types 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 daylight illumination.

All the sampled learners registered in the schools participated in the study 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

experienced in community screening and refractions for children. The ophthalmic nurses obtained detailed information from the children with regard to the age, sex, gender and class. The 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. Learners whose VA 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 VA improved with pinhole were refracted. Refraction was done with cycloplegia. Significant refractive error was the symptomatic refractive error of 0.5 or more for hypermetropia and worse for myopia and both for astigmatism.

In any vision-screening programme for children, decisions need to be made as to the level of acuity that denotes 'failure'. 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 and the majority (98.3%) of the learners had this level of VA.

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 Education and Health. The purpose of this study was explained to the learners in their own language and the information sheet was translated into the local language the participant were able to understand. This information was found in the participant's information sheet. Informed consent was obtained from the head teachers.

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

The data entry was done using Microsoft Excel 2013 and analysed using the software SPSS statistical package Version 24. Data processing involved editing, coding, classification, and tabulation. To

minimize errors, double entry of data and consistency checks were done.

RESULTS

A total number of 23,915 learners were screened from 41 schools in Kabwe district in all six zones. This coverage represented 72.5% of the targeted 32,971 learners. The majority of participating learners were females accounting for 54% (n=12,908) and 46% (n=11,007) were males. The learners' age ranged from five years to 24 years and the median age was 13 years. Most of the participants were aged 10-14 years (56.9%) followed by 5-9 years age group (31.0%), 15-19 years age group (12.0%) and then those aged 20-24 years (0.1%), Table 1.

Table 1: Distribution of learners screened by age groups and sex, N=23,915

Age Group	Female	Male	Total	%
5-9	4,043	3,366	7,409	31.0%
10-14	7,469	6,141	13,610	56.9%
15-19	1,389	1,479	2,868	12.0%
20-24	7	21	28	0.1%
TOTAL	12,908	11,007	23,915	100%

The survey had more learners from urban setting compared to rural, Figure 1.

LEARNERS SCREENED IN KABWE DISTRICT BY RESIDENCE

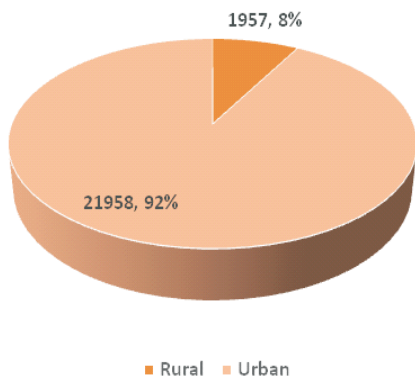


Figure 1: Distribution of Learners according to area of residence

Out of 23,915 learners who were screened by the teachers, 2,727 were referred for further screening by the mobile ophthalmic team. However, 2,424 learners came forward for screening by the mobile ophthalmic team, which resulted in a retention of 88.9% learners screened by eye health personnel. Of the 2,424 learners examined by the mobile ophthalmic team, 1,983 were found to have eye problems including allergic conjunctivitis and refractive errors, while 64 were referred for surgical intervention by an ophthalmologist at the University Teaching Hospitals–Eye Hospital, Table 2.

Table 2: Learners Screening by Teachers and the Mobile Ophthalmic Team, N=23,915

CHARACTERISTIC	NUMBER OF LEARNERS SCREENED BY TEACHERS	TOTAL NUMBER OF LEARNERS IDENTIFIED TO HAVE EYE PROBLEMS BY TEACHERS	TOTAL NUMBER OF LEARNERS EXAMINED BY THE MOBILE OPHTHALMIC TEAM	EYE PROBLEMS CONFIRMED BY THE MOBILE OPHTHALMIC TEAM	TOTAL NUMBER OF LEARNERS REFERRED TO THE OPHTHALMOLOGIST
Number of learners	23,915	2,727 (11.4%)	2,424 (10.1%)	1,983 (8.3%)	64 (0.3%)

Of the 2,424 who underwent ophthalmic examination by the mobile ophthalmic team, 1,983 were found to have various eye conditions representing 81.8% (1,983/2424). Of the 1,983 learners, 1,362 (68.7%) had allergic conjunctivitis and 359 (18.1%) refractive errors, Table 3. Concordance between the teachers and the mobile ophthalmic team was 81.8% and specificity was 83.5%.

Table 3: Eye Conditions identified during School Screening, n=1,983

EYE CONDITIONS IDENTIFIED	NUMBER OF LEARNERS SCREENED	PERCENTAGES
Refractive errors	359	18.1%
Allergic conjunctivitis	1,362	68.7%
Cataracts	5	0.2%
Dry Eye Syndrome	3	0.2%
Blindness	7	0.3%
Strabismus	23	1.2%
Glaucoma	3	0.2%
Pengicular	2	0.1%
Photophobia	18	0.9%
Others	201	10.1%
Total	1,983	100%

The prevalence of eye conditions amongst all the learners was 8.3% (1,983/23,915). The prevalence of refractive error was 1.5% (359/23,915), Table 4. The age group with the most substantial prevalence of refractive errors was found in learners aged 10-14 years old while the lowest prevalence was in the five to nine years old, Table 4. In terms of prevalence of other eye conditions, allergic conjunctivitis had the highest prevalence of 5.7%, Table 4.

Table 4: Prevalence of Eye Conditions in Learners Surveyed in School Screening in Kabwe District, N = 23,915

CHARACTERISTIC	TOTAL NUMBER OF LEARNERS SCREENED	NUMBER OF LEARNERS WITH REFRACTIVE ERRORS	PREVALENCE
TOTAL NUMBER OF LEARNERS SCREENED	23,915	359	1.5
SEX			
Male	11,007	135	0.6
Female	12,908	224	0.9
AGE GROUPS IN YEARS			
5 – 9	7,409	36	0.2
10 – 14	13,610	212	0.9
15 – 19	2,868	106	0.4
20 – 24	28	5	0.02
TYPES OF REFRACTIVE ERRORS			
Myopia		119	0.5
Hyperopia		207	0.9
Astigmatism		33	0.1
OTHER EYE CONDITIONS			
Allergic conjunctivitis	1,362	-	5.7
Strabismus	23	-	0.1
Others	262	-	1.0

DISCUSSION

School screening for eye diseases including uncorrected significant refractive errors causing visual impairment has been the subject of many studies with the advocates suggesting that school vision screening provides an effective way of identifying learners who require vision therapy, especially spectacles.^{16,17,18} To benefit from the

screening, learners with abnormal screening results must receive follow-up eye health care at appropriate eye health facilities.

The current study was conducted in order to detect eye diseases such as allergic conjunctivitis, refractive errors and squint that may predispose the learners to poor educational performance.

The slightly high prevalence of allergic conjunctivitis in Kabwe District among the learners could probably be attributed to the pollution from lead mining in the district. More investigations need to be carried out in order to determine if at all the lead poisoning in Kabwe has a role in the prevalence of allergic conjunctivitis in Kabwe District. The limbal stem cell deficiency could also be looked into during the same investigation. The prevalence of allergic conjunctivitis was, however, more in Kafue District¹² as compared to Kabwe. In a study conducted in Kafue District allergic conjunctivitis was found to be three times higher¹² than in Kabwe District. This difference could be attributed to the high levels of pollution in Kafue District due to industries there.

The prevalence of eye diseases in this study was lower than what was reported by Muma et al., and Adegbehingbe et al., in Nigeria.^{12,19} It was similar to what was reported by Castanes in the United State of America (USA).²⁰ The most common ocular disorders among school children in the USA were strabismus, amblyopia and optical problems impairing visual acuity and depth of perception.²⁰ In this study the common ocular disorders were allergic conjunctivitis, refractive errors and strabismus among others.

In the Baltimore vision-screening project, the estimated prevalence of ocular morbidity was found to be equally similar to this study.²¹

The prevalence of significant refractive errors and other eye diseases among secondary school students aged 11-27 years in Tanzania was high (6.1%) compared to what was found in both Kafue and Kabwe Districts.^{12,22} In a study conducted on children aged 5-15 years in Durban area of South

Africa, refractive error was the cause of reduced vision in 63.6%.²³ Amblyopia was in 7.3%, retinal disorders in 9.9% and corneal opacity in 3.7%.²³ In this study, the prevalence of refractive error was 1.5%. – Any possible explanation for the high prevalence of refractive errors in Durban?

This was a very interesting finding which needs to be explored further in order to determine the reasons for this finding of very low prevalence of refractive errors in the learners from Kabwe District. The study was conducted in order to have a general overview of eye diseases among all the learners in the district. Other causes of impaired vision among these students were squint (strabismus), glaucoma and cataract. It was surprising that we did not encounter amblyopia and 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 Muma et al., and Adegbehingbe et al., reported although both reported higher prevalence.^{12,19} Only 10 learners had 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.

With the high number of learners enrolled in Kabwe District compared to the Kafue study, the prevalence would have been expected to be just as high. However, the prevalence was interestingly three times lower. This is a clear demonstration that the eye disease pattern and distribution would differ in the country from one district to another and from one province to another.

This was also shown by the rapid assessment of avoidable blindness (RAAB) surveys that were conducted in Southern Zambia and Muchinga Province in 2011 and 2016 respectively were the prevalence of blindness was 2.3 and 4.1 respectively, a clear demonstration of regional prevalence

variations.^{24,25} The eye disease and visual impairment patterns and distribution were equally different in the two RAAB surveys. In the study conducted in Kafue District amblyopia, retinal disorders and cornea scars were important findings reported whereas in the study conducted in Kabwe District these eye diseases were not found at all and instead there were other eye diseases reported such as glaucoma, penguin and dry eye syndrome.¹² Indeed the ocular disease pattern and distribution cannot be same in all the districts and Provinces.

CONCLUSION

The low prevalence of ocular diseases in Kabwe District was found to be low. The main causes of eye conditions were allergic conjunctivitis, uncorrected significant refractive errors and squint (strabismus). These findings may justify a periodic school eye screening/health education programme in primary and secondary schools in Kabwe District of 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 eye health planning and promotion at national level.

RECOMMENDATIONS

The authors recommend conducting a study on allergic conjunctivitis in Zambia. 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 especially that there are regional differences in eye diseases.

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