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Screening for eye disease in Nigeria school children

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SUMMARY:

The study aimed to establish the validity of simple screening test conducted by readily available non-ophthalmic personnel (such as teachers rather than ophthalmologists who may be regarded as the gold standard) to detect cases of common eye problems in school children. Trained schoolteachers conducted screening using a simple pen torch eye examination to recognize common eye conditions like red eyes, squint, corneal scar and Bitot's spots. A total of 1585 students from a government owned public primary school (mixed boys and girls) and a private secondary (boys only) school located in Kaduna metropolis were screened by the teachers. The trained schoolteachers were able to attain a sensitivity of 59.1% and specificity of 85.1% for the simple eye examination. After just one day training, the trained schoolteachers were able to achieve reasonably high levels of specificity and modest levels of sensitivity in carrying out simple eye examination. Trained teachers can reduce the workload of ophthalmic personnel by as much as a factors of twenty. They can also play a vital role in promoting ocular health of school children especially in developing countries where there is little or no provision for school health services in schools attended by those from a poor background.

KEY WORDS: ***Screening, Eye diseases, School children***

INTRODUCTION

Screening is the presumptive identification of individuals in a population at risk likely to be affected by an asymptomatic or sub clinical condition who can benefit by being further investigated[1] it is a public health intervention measure[2] which has to fulfill ideally certain criteria but which may not always be possible in practice. Screening aims to reduce the magnitude of disease burden and by inference the associated negative social, economic, educational etc impact in a community.

Children constitute about 45%[3] of the population of Nigeria with about 15 – 20% being of 5 – 15 years. School going children are a "captive" population and are relatively accessible to intervention, as this will facilitate easy and early assistance to any child with visual problems[2]. This of course has to be balanced against the poor school attendance, which has been reported to be as low as 40%[4] in another study.

The public health significance of screening for eye disease in children can be better appreciated against the backdrop of the population of school-age children in Nigeria, which is approximately 24 million. Even assuming a worse case scenario of a school drop out rate of 50%, there will still be 12 million school age children in one form of school or another. Assuming a 1% prevalence of significant refractive error, this will translate to 240,000 children with this problem. This is indeed a huge "captive" population and is accessible to screening[2].

There are few ophthalmologists (one per 760,000 population)[5] and related ophthalmic personnel and services in Nigeria. And few ophthalmic nurses (1 per 390,000 population) and with even fewer optometrists (1 per 1.2 million population)[5]. There are no ophthalmic assistants or refractionists in Nigeria. Ophthalmic assistants are cadres of ophthalmic personnel trained particularly to assist ophthalmologists and perform those activities normally performed by ophthalmic nurses. They play

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active roles in developing countries where there is scarcity of ophthalmologists and ophthalmic nurses. In Nigeria, personnel resources are unevenly distributed, with the majority in some urban centers especially in private practice. This substantially increases the workload of the few available ophthalmic personnel.

It is envisioned that a school vision-screening program, which utilizes readily available non-ophthalmic personnel (such as teachers) will substantially decrease the workload of ophthalmic personnel allowing them to concentrate on dealing with other blinding conditions. In addition the program will lead to increased eye health awareness and education in the society in the spirit of community participation and intersectoral collaboration. This fact has been successfully proven in other developing countries notably India[4] whereby teachers have been trained to conduct school screening which led to a significant reduction in the workload of ophthalmic assistants. The Nigerian government frequently uses the services of teacher with success during other national programs such as national census or voting exercise.

The assertion about the better prognosis of pre-school screening is currently the subject of debate and controversy because it is hinged on trying to detect cases of amblyopia at an early stage when they are thought to be more amenable to treatment. This has so far not been proven conclusively. On the other hand, in terms of availability and accessibility of eye care services and manpower pre-school screening is not practically feasible in most developing countries[6]. Screening of school-age children for now better serves the needs of most developing countries although as development and resources permit, pre-school screening programs can also be introduced.

Vision screening of school children is suggested as one of the possible ways of detecting and managing children with eye problems within the current context of available resources and manpower in Nigeria. This study aims to find out how utilizable school teachers may be especially for vision screening of their pupils. This will go a long way to reduce the workload of already overburdened ophthalmologists. Teachers have often been made use in government activities for example national census with proven benefits.

MATERIALS AND METHODS

This paper is a continuation of our paper titled, Vision Screening in Nigerian school children, and as such the methodology used for this study, was as described in that paper. Only the materials and method specific to this study is reported here.

Formal training work-shop were organized for the teachers. The workshop participants were taught simple basic eye anatomy and physiology with emphasis on the anterior segment of the eye. Thereafter they were shown common eye problem of interest using charts and slides. They were taught how to grossly examine the eyes and how to use the pen-torch to do a simple eye examination. A series of practice sessions were held by all participants on how to identify the following: (a) Redness (b) Squint (c) Corneal Scar (d) Bitot's Spots. Each of the teachers was given a kit-bag containing a pen-torch with spare bulbs and batteries, some plain sheets of paper, a pen. and a training manual. All participants were encouraged to read and practice what was taught to then at home and to ask questions when they needed more clarifications. A quick revision/pilot was done for the teachers on the same day before commencing the exercise. The teachers were also provided with data sheet specially designed for the study, on which all data were entered.

RESULTS

A total of 1618 pupils were screened by the teachers, which comprised of 525 pupils from LEA primary school and 1093 from Rimi Secondary School.

The authors examined only the 24 pupils from the primary school and the 29 students from the secondary school, seen by the teachers but deemed to have failed the eye examination. However, only a sample of students seen by the teachers but deemed to have passed the eye examination, selected by systematic sampling comprising of 84 students from the primary school and 153 students from the secondary school were seen by the authors.

A coverage of 77.6% was achieved in the secondary school while that in the primary school was 49.4%.

The 525 pupils from LEA comprised of 263 boys and 262 girls with a male to female ratio of 1:1. The 1093 students screened in Rimi secondary school were all boys. Comparing the findings of the teachers to those of ophthalmologists using the findings of the ophthalmologists in a total of 290 students examined by the authors of all the selected children already examined by the teachers. The ophthalmologists' findings were used as the gold standard.
13 students who failed (by ophthalmologists) were

Table 1a: ***Screening for eye diseases in LEA school children: Teachers versus Ophthalmologists***

	Ophthalmologists Say	
	Fails Test	**Pass Test**
Fails Test (Teachers)	8	16
Pass Test (Teachers)	4	80

Confidence Intervals
Sensitivity = 66.7% (35.4, 88.7)
Specificity = 83.3% (74.0, 89.9)
Predictive Value Positive = 33.3% (16.4, 55.3)
Predictive Value Negative = 95.2% (87.6, 98.5)

Table 1b: ***Screening for eye diseases in Rimi Secondary school children: Teachers versus Ophthalmologists.***

	Ophthalmologists Say	
	Fails Test	**Pass Test**
Fails Test (Teachers)	5	24
Pass Test (Teachers)	5	148

Confidence Intervals
Sensitivity = 50.0% (20.1, 79.9)
Specificity = 86.0% (79.8, 90.7)
Predictive Values Positive = 17.2% (6.5, 36.5)
Predictive Value Negative = 96.7% (92.1, 98.8)

identified by teachers as failed
228 students who passed (by ophthalmologists) were identified by teachers as passed
9 students who failed (by ophthalmologists) were wrongly identified as passed
40 students who passed (by ophthalmologists) were wrongly identified as failed.
Agreement between teachers and ophthalmologists = 81.5% for normal and 59.1% for disease.

Table 1a shows the 2 x 2 contingency table of Teachers findings versus Ophthalmologists findings in LEA primary school. Table 1b shows the findings in Rimi college.

Sensitivity and specificity in LEA primary school were 66.7% and 83.3% respectively. Sensitivity and specificity in Rimi Secondary School were 50% and 86%, combined sensitivity and specificity in both schools were 59.1% and 85.1%, the positive and negative predictive values in LEA were 33.3% and 95.2%, the positive and negative predictive values in Rimi were 17.2% and 96.7%, the combined positive and negative predictive values were 47.4% and 97.9%. Table shows the sensitivity, specificity, positive, negative and combined predictive values in both schools of Teachers screening.

Table 2: ***Sensitivity, specificity, positive and negative predictive values of Teachers Screening for eye diseases in school children.***

Statistical values (C.I%)	LEA school	RIMI College	Both LEA + RIMI
Sensitivity	67% (35.4, 88.7%)	50% (20.1, 79.9)	59.1% (36.7, 78.5)
Specificity	83.3% (74, 89.9)	86% (79.8, 90.7)	85.1% (80.1, 89.0)
+ predictive value	33.3% (16.4, 55.3)	17.2% (6.5, 36.5)	47.4% (31.3, 64)
- predictive value	95.2% (87.6, 98.5)	96.7% (92.1, 98.8)	97.9% (94.9, 99.2)

DISCUSSION

Coverage which is the proportion of students actually screened to the total number in the selected sample in the secondary school was considered quite good while that in the primary school was fair. The reasons for this disparity in coverage was due to the advice of the principal (head teacher) of the secondary school, who suggested that the vision-testing program be scheduled to coincide with examinations which from his experience are well attended even by truant students, as they need to show their end of term exam results to their parents as evidence that they has been attending school. This idea proved very useful in attaining this level of coverage especially in the public secondary school. This was not the case in the primary school because there were no examinations for the pupils scheduled within the period. Consequently the coverage here was less though more likely to be consistent with the "normal" school attendance. In addition, school attendance was probably worsened by communal riots, which resulted in parents withdrawing their children temporarily from school. Using the research as the gold standard for the eye examination, the overall performance by the teachers is considered good (Table 1a and 1b). This is further buttressed by the results for the sensitivity and specificity were 59.1% and 85.1% respectively and considered quite encouraging, while a combined

positive predictive value of 25.3% and a negative predictive value of 95.9% (Table 2 was quite good. These results of sensitivity and specificity for the teacher's findings compares quite favourably with that obtained in a similar study in India by Limburg[7] et al. In our study, the sensitivity and positive predictive of the screening procedure for simple eye examination were relatively lower for the teachers but it is well known that these values are influenced by a host of factors e.g. prevalence of the conditions being screened, how subjective or objective the screening tests are themselves, the quality and duration of the training for the teachers among others.

On the other hand, the accuracy with which the teachers confirm the absence of eye problems was quite good; as evidenced by the high specificity and negative predictive values. It is comparable to that achieved by trained staff such as paramedical ophthalmic assistants[7]. The concept and findings of this study should be put in the proper context and perspective i.e. non-ophthalmic personnel (e.g. schoolteacher) who are readily available, willing and accessible to students (subject of interest) is given a one day training after which she screens a large number of students for eye conditions and is able to say with a high degree of certainty that the majority of the students "passed" the test and with a modest degree of certainty that a majority "failed" the test (have eye problems). This is a notable achievement on the part of the teachers. In addition, there is a concurrent increase in eye health awareness, uptake of eye health services and health education. The fact that all this is happening where there was nothing being done previously is a worthwhile achievement. The service rendered by the teachers has the potential to greatly reduce the workload of scarce ophthalmic personnel freeing their time to deal with other sight threatening conditions.

CONCLUSION

The study has shown that it is possible to successfully utilize the services of non-ophthalmic personnel (e.g. schoolteachers) to conduct eye-screening programmes in order to promote eye health in school children

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