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Effective Training of Schoolteacher for Vision Screening: Strategic Control of Visual Impairment in Schoolchildren

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Abstract

Introduction: Vision helps to perceive details of surroundings and regarded as the most important tool for learning for schoolchildren. World Health Organization (WHO) has prioritized vision screening in schools to decrease the burden of visual impairment (VI) in children. Any change in vision can be identified by schoolteachers when a child has difficulty in seeing the black board and reading books.

Aim: This study is aimed to see if visual screening training to schoolteachers can effectively be used to detect VI in children.

Material & Methods: Visual screening of 1134 eyes of 567 students was done by both the investigator and school teachers and results were formulated and compared. There was no difference in result in 66.31 % eyes. Investigator recorded better visual acuity (VA)+ with a 1-line difference in 14.55% eyes and two lines difference 3.35% eyes. Whereas, teachers recorded one-line better VA in 12.79% eyes and two lines better VA in 3% eyes.

Result: Out of 578 students from the three different schools of Allahabad district, from class 3 to 6, majority (267) belonged to school 3, whereas school 1 had the least (142) number of students.

Conclusion: The present study has identified the role of teachers as visual screeners in schools. The procedure is cost effective and require only visual screening training to the schoolteachers, so they can be used effectively for early detection of reduced vision in schoolchildren.

Keywords: *Visual screening, health screening, visual impairment, schoolteachers, schoolchildren.*

Introduction

Vision is the ability of eyes to have a clear perception for detail, hue of objects and to differentiate between different objects, which falls with age, but this can be improved with the help of spectacles and vision aids (Minto and Imran, 2004). Visual acuity (VA) is defined as "the assessment of the eye's ability to distinguish object details and shape of smallest identifiable object at a specified distance (usually 20 feet)" (Marsden, Stevens and Ebri 2014). It helps to identify the visual impairment (VI) for early treatment for improvement of vision as well as quality of life of a person in community (IAPB, 2011).

Schoolchildren perceive 90% of the information of surrounded world through eyes (Pastorino and Penerini, 1998), involving both far and near vision, which makes vision as the most important tool for learning in school (Gene-Sampedro et al., 2016). Their learning depends on their VA, which makes it important for both teacher as well as parents to be aware of the visual status of their children (Manjunath & Krishnaswamy, 2016).

Globally, 25-30% of primary school children suffer from VI which results in a decline in their academic performance. Treatment, at a very early stage, may prevent blindness (Gene-Sampedro et al., 2016). Therefore, visually impaired children needs to be identified for early diagnosis and treatment. This is important for their upbringing, development, education and in their social interaction with society (Mohammad, 2007).

World Health Organisation (WHO) has recognised VI as a major cause of morbidity in children, worldwide (Dandona and Dandona, 2001), refractive errors (RE) are considered as the most common cause of VI in children (He et al., 2007).

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Health screenings are quick and simple tests and examinations, which, if used effectively, may help to identify a disease early (Hatch et al., 2009). So, WHO has suggested to embrace vision screening and refractive facilities as a part of other screening programs. This will help to control blindness, as one of the priority area for Vision 2020 - The Right to Sight Program (Health dialogue, 2006). The most important initiative, according to Vision 2020: The Right to Sight is to decrease blindness and VI in children (Pizzarello et al., 2004).

Vision related problem can be detected in children at a lower grade level, so teachers may recognize them early when children find difficulty in seeing the black board and reading books (Taryam et al., 2017). Teacher screening in school is considered as an effective tool for detecting children with vision disorders (Latorre-Arteaga et al., 2014), as they can perform basic vision screening to identify a visually impaired student. They are the most suitable person for screening as they spend majority of their time having a major interaction with the students as they are readily available and experienced in interacting with children (Priya et al., 2015).

Vision screening of around 5.4 million schoolchildren in India by teachers suggested that the teachers can perform vision screening and refer children with poor vision for refraction and for corrective spectacles (Limburg et al., 1995). This recognized the role of schoolteachers as vision screener and promoter of eye health education in schools (Paudel et al., 2016), but limited data is available regarding refractive error in schoolchildren from India (Dandona et al., 1999). Therefore, it raised a need to develop a study, where we could see if visual screening training to schoolteachers can effectively be used to detect VI in children.

Methodology

The Allahabad is one of the metropolitan cities in Uttar Pradesh state of India, under the administration of Municipal Corporation of Allahabad Metropolitan Region. As per 2011 population census, literacy rate of Uttar Pradesh was 67.68 percent, where, the male literacy was 77.28 percent and female literacy was 51.36 percent. The child population accounted for 10.97 % of total urban population, whereas the child population in rural areas represented 16.27 % of the total rural population of Allahabad district. According to this census, there are 885355 children in Allahabad, below the age of 6 years. Gender wise literacy rate for schoolchildren was 80.97% and 55.46% for boys and girls respectively (Census of India 2011).

Study design and sampling

It is an interventional cross-sectional study designed to determine the hypothesis, if schoolteachers can be used as effective health screeners or health service providers for visual screening in schoolchildren. A total number of 578 students from 3 different schools of Allahabad district Uttar Pradesh, India, (from the Grades 3, 4, 5 and 6) were included. Non cooperative, were excluded from the study. The final sample size for the study was 567, selected by purposive sampling.

VA was measured by optometrist (investigator) and school teachers, divided into two groups:

- Optometrist group: included the optometrist /Investigator.
- Experimental group: included total number of 6 schoolteachers (2 teachers from each school), selected on random basis (by the school principals).

No ethical issues were observed during the collection of data, throughout the study, however authorization was taken by the principal of each school to conduct the vision screening. The Principal of each school was requested to nominate 2 teachers from his/her school, the selected teachers underwent a vision screening training program prearranged by the Investigator. A total of 6 teacher underwent training and the procedure of VA measurement was then practically demonstrated and explained in detail by the investigator. Afterward, each teacher repeated the whole procedure in front of the investigator in order to confirm that they understood the procedure completely and also to clear their doubts, if any.

They were provided with necessary supplies containing vision screening chart, 6m measuring tape, forms for detailed recording of vision screening of the school children and educational material (designed by the investigator). Each eye of the child was screened by both the teacher and investigator.

All the children identified as VA less than 6/12 were referred to the hospital for refraction and detailed ocular examination.

Data was collected, compared and analysed by using appropriate statistical tool such as MS Excel. Qualitative/categorical variables such as number of schoolchildren according to different grades in schools and comparison of qualitative difference in VA between Teachers and optometrist groups were represented in frequencies and percentages.

Result

The study involved younger school children, aged between 7 to 12 years, from schools situated within the municipal corporation limits of Allahabad India.

In present study, investigator identified 578 students from the three different schools of Allahabad district, from class 3 to 6 (including different sections from each class). Out of these students, investigator enrolled only 567 students to measure the habitual VA and excluded 11 students from the study. Where, five students did not cooperate for measurement of VA and six students were absent on the day. Both the investigator and the teachers measured the VA. Therefore, both teachers and optometrist (investigator) screened 1134 eyes of 567 children from three different schools (school 1, school 2 and school 3).

As explained in Table1, representing the total number of students from Grade 3 to 6, including all sections, from three different schools, School 3 had highest number of students (n= 267), whereas school 1 had the least number of students (n=142).

Table 1. Grade-wise distribution of students in schools

Grades	**Number of students in schools (n)**			**Total**
	School 1	**School 2**	**School 3**	
Grade 3	36	40	59	**135**
Grade 4	36	40	70	**146**
Grade 5	35	38	56	**129**
Grade 6	35	40	82	**157**

Following criteria is used for the interpretation of VA screening results for 1134 eyes of 567 schoolchildren from Allahabad, as shown in Table 2. Both, the teachers and the investigator (optometrist) screened 1134 eyes of 567 children. Where, No difference was considered, when both the teachers and investigator obtained a similar result for VA. Results were considered as false positive, if VA recorded by investigator showed a better result than the teachers. On the other hand, the screening was considered as false negative, if VA result from teachers were better than the investigator.

Table 2. Explanation of the false positive and negative scoring

No Difference	Visual acuity recorded by optometrist and teacher is same.
False Positive 1	Visual acuity recorded by optometrist is one line better as compared to teacher.
False Negative 1	Visual acuity recorded by teacher is one line better as compared to optometrist.
False Positive 2	Visual acuity recorded by optometrist is two line better as compared to teacher.
False Negative 2	Visual acuity recorded by optometrist is two line better as compared to teacher.

Table 3 is showing result for 1134 eyes of all 567 schoolchildren from three different schools of Allahabad district where, both, the teachers and investigator (optometrist) screened the eyes for VA. Out of 1134 eyes of 567 children, there was no difference in the recording of VA in 752 (66.31 %) eyes of children.

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Table 3. Visual acuity result from 1134 eye of schoolchildren

Visual Acuity Criteria	Number of Eyes	Percentage
No Difference	752	66.31%
False Positive 1	165	14.55%
False Negative 1	145	12.79%
False Positive 2	38	3.35%
False Negative 2	34	3.0%
Total Number of Eyes	**1134**	**100%**

False positive results showed

Out of 1134 eyes, investigator (optometrist) recorded better VA screening results in 203 (17.9%) eyes as compared to teachers. Among these, one-line difference is seen in 165 (14.55%) eyes, whereas two lines difference was recorded in 38 (3.35%) eyes.

False negative results showed

Out of 1134 eyes, 179 (15.79%) eyes represented false negative result. Where, teachers recorded one line better VA in 145 (12.79%) eyes, in comparison to investigator. On the other hand, 34 (3%) eyes represented two lines better VA result, recorded by teacher.

Discussion

National Program for Control of Blindness, India has prioritized the school eye screening program as one of the major health screening programs (Vijayalakshmi and Miralidhar, 2010), which is usually done by ophthalmologists and ophthalmic assistants (Jose and Sachdeva, 2009). Present study aimed to substitute the primary health care providers by the school teachers were substituted by the school teachers to do vision screening of the children in the schools. The teachers were able to screen 567 children.

Out of 1134 eyes of 567 children, there was no difference in the recording of VA in 752 (66.31 %) eyes of children. This is supported by a similar study from in India, where Manjunath & Krishnaswamy (2016) measured the effectiveness of teacher for vision screening in children. In their study 1259 (69.40%) eyes, out of 1814 eyes (907 children), showed no difference in the recording of VA by teachers and investigator.

Investigator (optometrist) recorded better VA (false positive) in 203 (17.9%) eyes as compared to teachers. Among these, one line difference was seen in 165 (14.55%) eyes, whereas two lines difference was recorded in 38 (3.35%) eyes. This is somewhat different than their study where, they had shown a higher frequency of result for false positive. They represented false positive result in 499 eyes (27.51%), where teachers recorded worse vision than the optometrist. In majority of these cases, (408 eyes) 22.50% the difference was by one line only, while difference of 2 lines or more was observed in 91 eyes (5.01%).

Present study had shown a greater frequency (15.79%) for false negative than their study, where teachers recorded one line better VA in 145 (12.79%) eyes, in comparison to investigator and two lines better VA in 34 (3%) eyes. That was in disagreement to their study, where the teacher recorded better VA in 56 eyes (3.07%) of children than the optometrist. There was in one-line difference in 37 eyes, (2.03 %) and difference of 2 lines or more in 19 eyes, (1.04 %).

Overall result for vision screening in younger school children by teachers in our study was good and comparable to other studies. This may help to decrease the workload of an eye school nurse, school doctor, paediatrician or an eye specialist.

Conclusion

The present study has identified the role of teachers in visual screening as there was only minor difference between the screening results of teachers and investigator. As this procedure is cost effective and require only visual screening training to the schoolteachers, therefore, it is concluded that teachers

can be effectively used as primary visual health screeners in schools for early detection of any reduction of vision in schoolchildren.

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