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Original Research Article

Teachers' vision screening of elementary school students: A pilot study

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Abstract

Introduction: Ocular problems are among the most prevalent disabilities in this age range, which is a sensitive time for the development of the visual system. Early-life visual impairment may have a negative impact on learning capacity and school adjustments, as well as later on in the person's career, socioeconomic situation, and personal life.
Purpose: The purpose of this study is to determine how reliable school instructors are when it comes to the vision screening of younger school students and to investigate the pattern of vision issues.
Methods: In this study, 5,938 school children ages 3 to 8 years old were screened for vision and ocular diseases by professional school teachers. The study was a cross sectional design. In order to evaluate the dependability of the instructors in terms of vision screening and the detection of ocular problems in these youngsters, cross screenings were performed on the children by trained specialists. Researchers looked into the relationship between visual acuity, ametropia, and ocular diseases.
Results: The vision screening that was performed by school instructors had a sensitivity of 69.2% (95% confidence interval [CI]) and a specificity of 95.3% respectively. Positive predictive value came in at 83.5%, while negative predictive value came in at 89.8%. The kappa statistic was calculated to be 0.68.
Conclusion: Teachers in elementary and secondary schools are in a position to efficiently screen younger students for vision evaluation and ocular problems.

Keywords: Younger schoolchildren, ametropia, vision Screening; visual acuity

Introduction

Ocular abnormalities are among the most prevalent forms of disability experienced by children of this age, despite the fact that early childhood is a crucial time for the development of the visual system [1]. Visual impairment in early childhood can have a negative impact on a child's capacity to learn, which may require them to make changes at school or later in life, which can have negative repercussions in the individual's professional, socioeconomic, and personal life [2, 3]. Pre-primary school screenings are designed to help uncover hidden vision abnormalities, namely amblyopia, strabismus, and refractive errors, particularly in children under the age of five [4-6]. The implementation of screening programmes for children of

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preschool age is frequently thwarted, however, by a number of obstacles, both real and perceived. In preschool-aged children, the question of whether or not vision screenings are financially beneficial is one that might be debated [7-9]. The purpose of this study was to determine whether or not instructors are capable of successfully delivering the initial component of eye screening services in schools. In addition, an analysis was done to determine the prevalence of ametropia and many other visual problems in this lower school age group [10-14].

Methods

The survey included younger students, 3 to 8 years old, from schools located within the boundaries of the municipal corporation of Hyderabad, India. The institutional review board gave its blessing to the study, which followed the Declaration of Helsinki's rules. The district education office provided a list of schools located within the city borders, and schools with pre-primary (for children ages 3 to 5) and primary (for children ages 5 to 8) students were chosen. Six zones were created inside the city of Udaipur, and each zone contained a map of its corresponding schools. To close the socioeconomic and gender differences, schools were categorised according to their operation and mode of instruction (co-education versus boys or girls alone). To gather information on the pre-primary school students who qualified, the sample size was established and schools were surveyed. Up until the necessary quantity of students was included, the schools were chosen at random from a sampling frame of schools in each zone. To screen children, a multistage process was intended (Figure 1). In order to determine whether utilising the Snellen chart for vision screening in these age groups was feasible, stage one entailed a pilot research in 10% of schools. A training package was created and verified at the same time to instruct instructors on ocular problem screening. In the second stage, two teachers from each class were chosen voluntarily and given vision screening training. The process of the gross ocular examination and vision screening was explained to teachers and demonstrated. Using teaching modules, teachers were taught how to spot lusterless eyes, white opacity, and signs and symptoms of ocular allergy during a gross ocular examination. Snellen charts were used for vision testing at a distance of six meters under outdoor lighting. Various Snellen chart types were used depending on the age range.

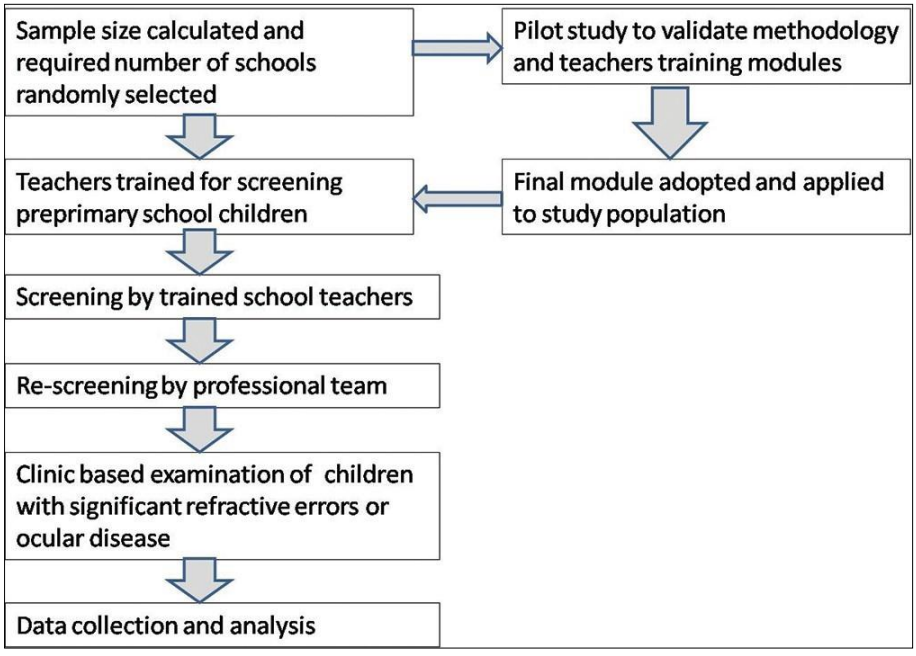

Fig 1: Structure illustrating the plan and research approach

During the vision screening, the need of maintaining the correct distance, lighting condition, and positioning of the hand over the opposite eye was highlighted. Teachers received written

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guidelines that provided a summary of the testing conditions, procedures, and common pitfalls. They were given three weeks to complete vision screening and to prepare a class-wise list of children who had a visual acuity of less than or equal to 6/9 in either eye, or who had the presence of any ocular disorder that was noticed during screening. At the stage three cross screening of youngsters, a team of specialists including ophthalmology residents and skilled medical students aided in the process. In order to identify real positives, the team conducted screenings on all of the youngsters that had been identified as "abnormal" by the teachers. The students who passed the screening conducted by the instructors were used to select a sample at random comprising 25 percent. These children underwent screening in an effort to identify false negatives. In the fourth stage, referral papers were given out to all of the children who had considerably diminished visual acuity or who showed signs of having any kind of ocular problem. Referral slips were delivered to the families by the administration of the school. The department of ophthalmology in the institute performed eye examinations, cycloplegic refractions, and subsequent therapy on the children who were brought to them. The fifth and final stage consisted of collecting data from children who had undergone refraction at other sites. These records were included in the collection. The children's permission slips were collected from them through their schools. This was done so that they might be incorporated into the analysis.

A pre-designed form was used to collect the necessary information, and it was then typed into excel sheets. In order to facilitate the analysis process, the enrolled youngsters were split into three distinct groups. Children aged 3 and 4 years were included in Group I, children aged 5 and 6 years were included in Group II, and children aged 7 and 8 years were included in Group III. Following that, we further subdivided each group based on the participants' gender. A descriptive statistical analysis was performed with the goals of determining the sensitivity and specificity of the screening performed by instructors, as well as determining the prevalence of refractive errors and ocular diseases. The x2 tests that were used in the statistical analysis to determine whether or not something was significant had a significance level of 0.05%.

Results

The research involved a total of 6,122 children, ranging in age from 3 to 8 years old, who were enrolled in 66 different schools. Of these 6,004 children, primary visual screening was performed on them by their school teachers; and 5,938 [Figure 3] children were available for professional screening (response rate, 97%; 95% Confidence interval (CI): 96.5 97.4%); these subjects included 3,393 (57%) males and 2545 (43%) girls.

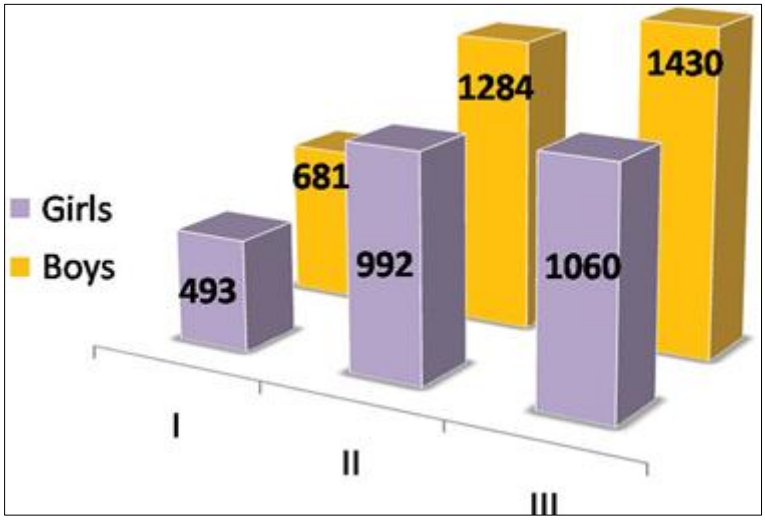

Fig 2: Statistics on the gender breakdown of children by age range. Group I: ages 3–4, Group II: 5–6, and Group III: 7–8

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During the primary screening, the school teachers found that 1,280 (21.5%; 95% CI: 20.4 22.5%) of the children had vision less than 6/9, and that 42 (0.7%) of the children had some kind of ocular problem [Table 1].

Table 1: Distribution of children at different age groups in relation to gender and the frequency

Sr. No.	Total	Boy	Girl	Total (%)	Boy	Girl	Total
I	1174	681	493	269 (22.9)	159	110	06
II	2274	1282	992	523 (22.9)	296	227	19
III	2490	1430	1060	488 (19.5)	270	218	17
All	5938	3393	2545	1280(21.5)	725	555	42

Our expert team assessed 2,447 children in total (41%) during the third stage, including the 1,280 kids who had failed initial screening and a random sample of 1,167 kids (25%) who were said to be normal (vision >6/9 and no ocular abnormality) on primary screening. 9 (0.7%) of the 1,280 kids whose eyesight was found to be subnormal after primary screening were not present for the professional team's screening. 1,271 youngsters were rescreened, and 1,070 (84%) had vision below 6/9 whereas 201 (16%) had vision above 6/9. 119 (10.1%) of 1,167 (25%) randomly chosen "normal" kids had eyesight that was less than 6/9 in one or both eyes (false negative). 475 (10.7%) false negatives were anticipated for the sample population (n = 4,658 with eyesight > 6/9). 4,393 (73.8%; 95% CI: 72.8 75.1) children in the study population had eyesight better than 6/9. Following the expert cross screening, the visual acuity of 364 kids had drastically decreased. The prevalence of substantially impaired visual acuity was 8.04% (95% CI: 7.35 8.73%), with children having the majority (4.05%) of significantly reduced visual acuity of 6/18 6/60. (Figure 3).

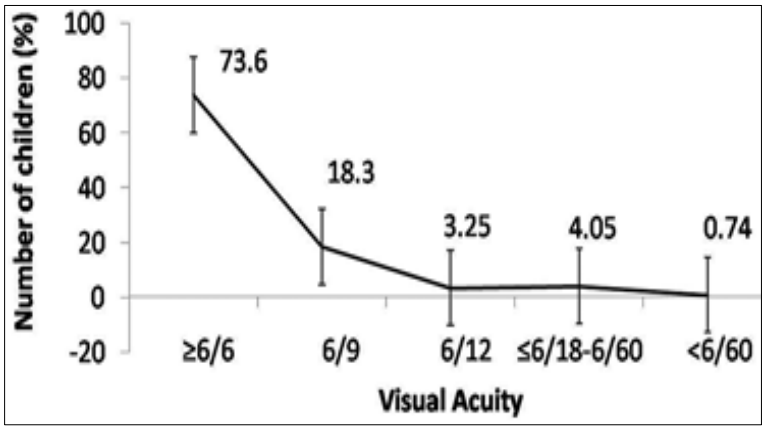

Fig 3: Frequency distribution of visual acuity

247 of the participants, or 68% (95% CI: 63.2 72.9%), were found to have ametropia in both eyes, and 41 of the youngsters, or 11% (95% CI: 8.2 14.7), were already using corrective lenses. All of the children who had considerably impaired visual acuity were handed referral sheets so that they may get a cycloplegic refraction and an eye test. An overall response rate of 93.6% was achieved by having 258 (or 71%) of the 364 children who were sent to our institute undergo refraction, while the remaining 83 (or 23%) were checked at other eye care centres. Every one of the 41 children who wore glasses was sent to an eye care centre to have their prescriptions checked, and out of those 41 children, 7 (17%; 95% CI: 5 28%) needed new spectacles. Children who did not have their refractive errors corrected by glasses had a level of visual impairment that was much lower than that of children who used glasses. In studies conducted on people of all ages, hyperopia was found to be the most prevalent kind of refractive error. There was no discernible variation in the frequency or pattern of ametropia based on the subjects' genders (p, 0.732). At our institution, a thorough eye exam was

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performed on each of the 42 youngsters who were found to be suffering from ocular problems.

Discussion

Vision screenings in schools are widely regarded as an efficient strategy for the early detection and treatment of conditions that can lead to childhood blindness. It is a component of India's national programme for the control of blindness, and it is carried out by school teachers for the purpose of reaching school-aged children between the ages of 8 and 15 [15, 16]. To the best of our knowledge, there has been no research conducted in India that examines the efficacy of school teachers in the screening of younger children who are of school age. In preschool-aged children, potential risk factors for amblyopia include substantial refractive defects as well as strabismus. The detection and treatment of amblyogenic disorders should be the major goals of early age vision screening and eye examination procedures. It is debatable whether or not screening children of this age group will be financially beneficial [17-19]. It has been established that vision screening in preschool children is useful, and it is advised that the programme be implemented. For the purpose of screening preschool-aged children, several different kinds of charts have been validated. Because of their widespread availability, ease of application, and the teacher's wealth of experience in screening, we decided to go with the Snellen charts. In a similar manner, the training module for detecting ocular disease was kept simple as the purpose was to detect children with any abnormal ocular sign and symptom, but not a correct diagnosis, by the screening teachers [20, 21]. In other words, the screening teachers were not responsible for providing a diagnosis. According to the findings of our research, all of the children with ocular abnormalities were appropriately diagnosed by their teachers. We decided to utilize a visual acuity threshold of 6/12 as the cutoff for referral because this threshold is believed to be more cost and compliance effective for the usage of spectacles. We observed that trained school instructors were helpful in detecting refractive errors and ocular abnormalities in younger school students. This was one of the findings from the study that we are currently discussing (Table 2).

Table 2: Prevalence of ocular disorder in children based on professional screening

Sr. No.	Ocular disorder	Prevalence, N (%)	95% CI (%)
1.	Amblyopia	11 (0.18)	0.08-0.29
2.	Bitot’s spot	5 (0.08)	0.01-0.16
3.	Cataract	2 (0.0003)	0-0.1
4.	Corneal opacity	7 (0.11)	0.03-0.2
5.	Ocularallergy	16 (0.26)	0.14-0.4
6.	Strabismus	12 (0.20)	0.09-0.32
7.	CI, Confidence interval		

According to the findings of our research, there was a good level of agreement regarding the validity of vision screening in younger school children; however, the performance was better in children who were older than five years. This was presumably the result of a lack of collaboration, hesitancy, shyness, or trouble understanding the instructions given by the professors [22, 23]. The findings, on the other hand, are comparable to those of studies on screening middle and high school students by teachers. Previous research has found a lack of consistency in the validity of school vision screenings performed by instructors. The other study was carried out in Iran, and its findings showed that screening done by instructors had a low sensitivity and positive predictive value. In a survey conducted in Nigeria, the level of agreement for vision screening among school teachers and the profession was modest. It has been demonstrated that training school teachers to screen school students leads to improved outcomes [24, 25]. The current study found that the prevalence of refractive errors among younger school children was 8%, which places it in the middle range of what has been

reported in prior studies. The prevalence of refractive errors varies from one study to the next due to factors such as the age of the target population, the definition of refractive defects, and the sampling methods used. The age distribution of the population is another factor that affects the pattern of refractive errors. Myopia is the refractive error that most usually occurs throughout elementary school and typically presents itself between the ages of 8 and 12 years old, whereas hyperopia is the refractive error that tends to predominate in the early years. In our research, we discovered that hyperopia is the most common form of refractive error across all age groups. On the other hand, myopia and astigmatism have a tendency to become more prevalent as one gets older. It has been demonstrated that amblyopia is linked to the existence of hyperopia as well as the degree of hyperopia. The study found that a large number of children had uncorrected or undiscovered refractive problems; yet, only 11% of children were wearing glasses [26]. This issue supports the argument that school-aged children should be subjected to routine screening measures. A certain percentage of the children who wore glasses needed new eyewear since their refractive errors had not been monitored on a consistent basis and they had not had their prescriptions updated. We included amblyopia in our analysis of the prevalence of visual abnormalities among children despite the fact that initial screening for the condition is not performed by teachers in schools. Our study found a significantly lower prevalence of amblyopia compared to past research on the topic. One of the explanations for this problem could be that youngsters who needed more corrections for their vision were already wearing glasses. It has also been observed that there are racial variances, with Asians having a tendency to have a lower prevalence. Various research' findings regarding the prevalence of other illnesses were consistent.

Conclusions

The current study does have a few caveats attached to it. We investigated only one facet of screening, namely the dependability of school instructors in screening youngsters, but we did not look into the challenges that are involved with screening people of this age. Second, we did not do any research into the factors that led some children to miss their scheduled refraction appointments. The investigation of this component might prove useful in the process of developing study designs that are more accurate and feasible. However, the findings of this study suggest that the scope of school vision screening might be expanded to cover children of younger ages, and that instructors who have received enough training are able to properly detect and refer children in this age group. This study has the potential to give data that can be used for the efficient planning of a school health programme that is geared toward pre-primary school children in India, where such a programme does not yet exist.

Conflict of Interest: None

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References

1. AB NF, Chen AH, Rahim A, Goh PP. Pilot study: A review of personnel involved in school vision screening and the training module in Betong, Malaysia. IIUM Medical Journal Malaysia, 2012, 11(2).
2. Flook L, Goldberg SB, Pinger L, Bonus K, Davidson RJ. Mindfulness for teachers: A pilot study to assess effects on stress, burnout, and teaching efficacy. Mind, Brain, and Education. 2013;7(3):182-195.
3. Chandrashekar BR, Suma S, Kiran K, Manjunath BC. The use of school teachers to promote oral hygiene in some secondary school students at Hyderabad, Andhra Pradesh, India: A short term prospective pilot study. Journal of family and community

medicine. 2012;19(3):184-189.
4. Barnes G, Crowe E, Schaefer B. The cost of teacher turnover in five school districts: A pilot study. National Commission on Teaching and America's Future, 2007.
5. Tobi P, Ibrahim N, Bedell A, Khan I, Jolley E, Schmidt E. Assessing the prevalence of refractive errors and accuracy of vision screening by schoolteachers in Liberia. International Health. 2022;14(1):i41-i48.
6. Kolcu M, Çelik S, Güney R, Şendir M. A school nursing health screening program in turkey: A pilot study. Samsun Sağlık Bilimleri Dergisi. 2022;7(1):125-140.
7. Chiofalo ML, Foti C, Michelini M, Santi L, Stefanel A. Games for teaching/learning quantum mechanics: A pilot study with high-school students. Education Sciences. 2022;12(7):446.
8. Yousof A, Parrott D. A Pilot Study: Can Elementary School Students Learn A Second Language and Cultural Awareness in An Immersive Video Game? In Society for Information Technology & Teacher Education International Conference. Association for the Advancement of Computing in Education (AACE), 2022 April, 388-404pp.
9. Chen CY. Immersive virtual reality to train preservice teachers in managing students' challenging behaviours: A pilot study. British Journal of Educational Technology. 2022.
10. Kolcu M, Çelik S, Güney R, Şendir M. A school nursing health screening program in turkey: A pilot study. Samsun Sağlık Bilimleri Dergisi. 2022;7(1):125-140.
11. Chiofalo ML, Foti C, Michelini M, Santi L, Stefanel A. Games for teaching/learning quantum mechanics: A pilot study with high-school students. Education Sciences. 2022;12(7):446.
12. Tobi P, Ibrahim N, Bedell A, Khan I, Jolley E, Schmidt E. Assessing the prevalence of refractive errors and accuracy of vision screening by schoolteachers in Liberia. International Health. 2022;14(1):i41-i48.
13. Aparna KS, Bhaskar R, Nair U. Role of teachers in screening of ocular disorders in school children: A multistage school screening program. Kerala Journal of Ophthalmology. 2022;34(2):110.
14. An B, Yang SJ. Evaluation of a road safety educational programme for senior elementary school students in Cambodia: A pilot study. Health Education Journal. 2022;81(4):451-462.
15. Qazi SH, Mumtaz R, Masoud S, Tassaduq R. Effectiveness of an Oral Health Care Workshop in Primary School Teachers of Barakahu; A Pilot Study. PAFMJ. 2022;72(1):115-18.
16. Chen CY. Immersive virtual reality to train preservice teachers in managing students' challenging behaviours: A pilot study. British Journal of Educational Technology. 2022.
17. Muralidhar R, Vijayalakshmi P. Sensitivity and specificity of teachers for vision screening among primary school children in South India. Oman Journal of Ophthalmology. 2019;12(2):88.
18. Sudhan A, Pandey A, Pandey S, Srivastava P, Pandey KP, Jain BK. Effectiveness of using teachers to screen eyes of school-going children in Satna district of Madhya Pradesh, India. Indian journal of ophthalmology. 2009;57(6):455.
19. Tabansi PN, Anochie IC, Nkanginieme KEO, Pedro-Egbe CN. Evaluation of teachers' performance of vision screening in primary school children in Port Harcourt. Nigerian Journal of Ophthalmology, 2009, 17(1).
20. Sabherwal S, Sood I, Siddiqui Z, Das Gupta S, Ganesh S, Basset K. Out-of-school vision screening in north India: estimating the magnitude of need. Ophthalmic Epidemiology. 2020;27(6):449-452.
21. Qamar AR. Eye screening in school children: A rapid way. Pakistan Journal of Ophthalmology, 2006, 22(02).
22. Abubakar S, Ajaiyeoba AI. Vision screening in Nigeria school children. Nigerian Journal of Ophthalmology. 2001;9(1):1-5.
23. Rustagi N, Uppal Y, Taneja DK. Screening for visual impairment: outcome among schoolchildren in a rural area of Delhi. Indian journal of ophthalmology. 2012;60(3):203.

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24. Shukla P, Vashist P, Singh SS, Gupta V, Gupta N, Wadhwani M, *et al*. Assessing the inclusion of primary school children in vision screening for refractive error program of India. Indian journal of ophthalmology. 2018;66(7):935.
25. Priya A, Veena K, Thulasiraj R, Fredrick M, Venkatesh R, Sengupta S, *et al*. Vision screening by teachers in southern Indian schools: testing a new "all class teacher" model. Ophthalmic Epidemiol. 2015;22(1):60-5.
26. Saxena R, Vashist P, Tandon R, Pandey RM, Bhardawaj A, Menon V. Accuracy of visual assessment by school teachers in school eye screening program in Delhi. Indian Journal of Community Medicine: Official Publication of Indian Association of Preventive & Social Medicine. 2015;40(1):38.