

## Unique systematic school eye screening – can this be emulated?

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### Abstract

**Aim:** To study the prevalence of refractive errors and amblyopia in school children of kindergarten to tenth class.

**Materials and Methods:** Prospective observational study conducted in a single school in south India.

970 students from LKG to class 10 underwent evaluation by 3 ophthalmologists and 2 optometrists on 12 consecutive days. All students of kindergarten underwent atropine refraction and those with suboptimal vision from Class I-X underwent best glass correction and refraction with homatropine. Fundus photograph was taken in all the students using a portable non mydriatic fundus camera to detect any fundus abnormality. Significant refractive errors requiring correction and amblyopia requiring management were defined as per American Academy of Ophthalmology guidelines.

**Results:** Out of 970 students screened, 160 were in kindergarten. Of the 970 students 19.1% had refractive error, of whom 56.7% were unaware of their ocular condition ( $p=0.0001$  statistically significant). Out of the 19.1%, 46(24.8%) were myopes, 4 (2.1%) hypermetropes and 135 (73.5%) had astigmatism. 91.8 % had binocular refractive error and one child (0.5%) had amblyopia. 18 (11.25%) of the 160 KG students had refractive error.

**Conclusion:** 56.7% of the students were unaware of their refractive error which would have gone undetected if the screening was not done. In addition methodical evaluation of KG students is of great importance in identifying refractive errors and prevention of amblyopia in preschool children.

**Keywords:** Amblyopia detection, Atropine refraction, Refractive errors, School eye screening.

### Introduction

Refractive error is a major cause of visual impairment in children worldwide.<sup>(1)</sup> An estimated 153 million people are visually impaired due to uncorrected refractive error of whom, 8 million are blind.<sup>(2)</sup> Defective vision has led to many school dropouts too.<sup>(2)</sup> Hence school eye screening has a major role in identifying the refractive errors. Most of the data available in the school screening programs concentrated on older children (first standard onwards) as it was easy and feasible. In the routine school screening, the initial screening of children is performed by the trained teachers, those found to have refractive errors are given glasses after evaluation by the screening team. A few are referred to the ophthalmologist when necessary. The current study is unique because it was designed in such a way that the children in a chosen school underwent complete ophthalmological evaluation as would be done in an ophthalmic clinic. Students had the advantage of complete ocular evaluation including cycloplegic refraction done by an ophthalmologist at the school itself instead of a visit to the hospital. There are not many studies in the literature which included cycloplegic (atropine) refraction in the preschool children. Hence this study presents a comprehensive, unique, free, in the campus school eye screening program which can be the screening protocol / guideline to obtain national level data if uniform protocol can be made mandatory.

### Materials and Methods

The study was conducted in a school in south India in the catchment area of a tertiary care hospital. It was a prospective observational study. The screening protocol included an address by an ophthalmologist during the parents' teacher meeting of the school where the information regarding the prevalence of refractive errors in children, need for screening, need for correction if found, amblyopia and permanent visual impairment if not treated are given. They were also informed about the detailed school eye screening procedure and the advantage of elimination of hospital visit. The screening was done on students whose parents gave an informed consent. An optometrist trained all the teachers to test the visual acuity by using Snellens chart and an illuminated Snellen chart was installed in the school for two weeks. Significant refractive errors requiring correction and amblyopia requiring management were defined as per American Academy of Ophthalmology guidelines.<sup>(3)</sup>

The teachers performed the initial visual acuity assessment in all students from first to tenth standard and isolated the students with decreased vision and / or not cooperative for assessment of visual acuity/ with ocular complaints/ headache even with visual acuity of 6/6. Following this a team of three ophthalmologists and two optometrists participated in the school screening for a period of two weeks on a daily basis and evaluated those students who were isolated by the initial screening. Visual acuity less than 6/6 was considered as sub optimal. These selected children underwent cycloplegic refraction and post mydriatic test for glass prescription

when required. Fundus examination and fundus photograph was taken in all the students.

All the kindergarten students were examined by an ophthalmologist. The protocol for evaluation included the following- assessment of visual axis, presence of any nystagmus, amblyopia, cataract, corneal opacity etc and the instructions to parents to instil Atropine 1% ointment twice daily into the eyes of their children for three days. On the fourth day the retinoscopy and fundus examination was performed. The children who were found to have refractive errors were given glass prescription based on retinoscopy. Parents of the children with amblyopia were asked to report to the school and were given an insight into the ocular condition of their children and amblyopia therapy was initiated. These children were then asked to follow up regularly in the base hospital for continued amblyopia therapy.

The statistical analysis was done using SPSS 15.0 software. Frequency distribution of refractive errors were noted.

## Results

The total strength of the school was 1120, of whom 970 students were willing to be screened. Out of these 970 students, 19.1% had refractive error. Almost 56.7% of these students with refractive error were unaware of the same ( $p=0.0001$  statistically significant).

### The distribution of refractive errors was as follows:

Out of 970 students screened, 160 were in kindergarten. Of the 970 students 19.1% had refractive error, of whom 56.7% were unaware of their ocular condition ( $p=0.0001$  statistically significant). Out of the 19.1%, 46(24.8%) were myopes, 4 (2.1%) hypermetropes and 135 (73.5%) had astigmatism. 91.8 % had binocular refractive error and one child (0.5%) had amblyopia.

### Among the Kindergarten students:

18 (11.25%) of the 160 KG students had refractive errors, of whom 4 students (22.2%) were myopic and 14 (77.8%) students had astigmatism.

Among the children from class one to ten, 167 (20.6%) out of 810 students had refractive error.

In the class I to IV- 270 students were examined of whom 51 students had refractive error.

Among these 51 students, 41 (80.39%) students had astigmatism, rest of them had myopia.

In the class V to VII, 52 out of 310 students had refractive error. Among these 52, 35(67.3%) had astigmatism, 4 (7.7%) had hypermetropia, and 13 (25%) had myopia.

In the class VIII to X – 64 out of 230 students had refractive errors. Among these 64, 45(70.3%) had astigmatism, rest (19 students) had myopia.

Fundus examination of all the students was within normal limits.

## Discussion

In spite of several reports suggesting that the refractive errors are a cause of visual impairment and the ophthalmologists stressing on the need for constant wear of spectacles for refractive errors, many a times the advice is ignored. Uncorrected refractive errors can have a long term impact on the lives of children. Visual impairment if not corrected on time can hamper performance at school, affect employability and productivity, and in turn impair the quality of life.<sup>(2)</sup>

Prevalence of refractive errors (visual acuity of  $<6/12$  in the better eye) in children in various countries range from 1 to 5%.<sup>(4,5,6)</sup>

Yared et al in their study in northwest Ethiopia found that refractive errors in either eye were present in 9.4% children, of which myopia was diagnosed in 31.6% and hyperopia in 23%.<sup>(7)</sup>

Similarly Hashemi et al found 8.49% of children having refractive error in the school screening.<sup>(8)</sup> A study by Chebil et al reported that in the age group of 6-14 years, 3.4% had myopia.<sup>(9)</sup>

The current study showed a significantly high incidence of 19.1% refractive error in the study sample. Out of the 19.1%, 46(25%) were myopes, 2(1%) hypermetropes and 137(74.0%) had astigmatism. 91.8 % had binocular refractive error and one child (0.5%) had amblyopia. Significant number of students with the refractive error were not aware of the condition. This emphasizes the importance of school screening in children, especially in the preschool children since the visual impairment and amblyopia can be prevented by early detection and appropriate correction. Though the prevalence of amblyopia was not very high in the present study, many other studies have founds significantly high prevalence of amblyopia due to refractive errors in children.

In a study similar to the current one by Handler et al and Gupta et al had a high incidence of astigmatism. Handler et al screened children in the age group of 3-5 years of age and found 8.9% of children having refractive errors, of whom 58% had hyperopia, 21% had myopia, 69% had astigmatism and 9% had amblyopia.<sup>(10)</sup>

Gupta et al performed a retrospective study to know the incidence of amblyopia in children in 5-15 years age group. They found that 8.6% of the tested children had amblyopia. Of whom 41.93% had astigmatism, 32.25% had hypermetropia and 25.8% had myopia. More over nearly 50 % of them were more than ten years of age.<sup>(11)</sup>

It is observed that in this study 14.2% children had astigmatism which if uncorrected, would probably make some of these children prone to develop amblyopia. Timely intervention has a major role in amblyopia prevention and management specially when diagnosed in children in less than 5 years of age.

When compared to other studies, the current study had a higher incidence of refractive error. This may be attributed to the higher cut off level of visual acuity (that is 6/6) being chosen. Some studies have taken 6/9, 6/12

or even 6/18 as cut off level to label the children to have refractive error.<sup>(6)</sup>

The important strength of the present study as compared to other studies is that all kindergarten children were included and underwent atropine refraction which helped in detection of refractive errors efficiently. 11.25 % of students in this age group had refractive error.

The present study is a new model of “in the campus, free of cost, two weeks of detailed screening program” in order to offer a full-fledged ophthalmological evaluation of the students. This would avoid the painstaking efforts on the part of the parents to take a day off, take their children to an ophthalmologist and also the need of repeat visits to the hospital for a post mydriatic test for accurate glass prescription.

The school personnel, many parents and of course the ophthalmologists were very much satisfied with this model as it provided a better care to the children which was way beyond the preview of other screening camps. However, handful of parents were anxious about the detailed screening and were hesitant.

To conclude, though this new model of school screening is time consuming and more dependent on the trained man power, the benefits achieved is worth the time and energy utilized. If made applicable to all schools with a uniform protocol the study may lay a foundation to ideal screening protocol for school eye screening and for obtaining authentic data which missing at the national level at this juncture.

**Conflicts of interest:** Nil

**Funding:** Nil

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