Original Research Article

Prevalence of refractive errors among school children in the rural field practice area of a tertiary care hospital, Bengaluru

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ABSTRACT

Background: An estimated 19 million children are visually impaired, and 12 million are visually impaired due to refractive errors. Children fall in preventable age group for correction of refractive errors. Schools are best forum for implanting health education for children and for early detection of ocular morbidity. This study was undertaken to assess the prevalence of refractive errors among school children in rural field practice area of Rajarajeswari Medical College and Hospital, Bengaluru.

Methods: A cross sectional study was conducted among the schools in rural field practice area of Rajarajeswari Medical College and Hospital School children aged between 7-16 years were examined for defective vision using Snellens chart. General information of the children was collected using pre-designed and semi- structured questionnaire a. Children with abnormal vision were referred to hospital. Data was analyzed using SPSS software. Descriptive statistics was used and chi-square test of significance was applied.

Results: 1140 study subjects were examined out of which 577 (50.6%) were females and 563 (49.4%) males. The mean age was 11.28 years. The prevalence of refractive errors was 10.5%.The prevalence of refractive errors was significantly associated with age (p<0.05). The prevalence of myopia, hypermetropia and astigmatism in study subjects was 58.5%, 17.1%, 24.4% respectively.

Conclusions: The prevalence of refractive errors, especially myopia, was higher in older children. Causes of higher prevalence and barriers to refractive error correction services and compliance should be identified and addressed. Eye screening of school children is recommended.

Keywords: Refractive errors, School children, Myopia

INTRODUCTION

Visual impairment is a significant public health problem. Refractive errors are one of the most common causes of visual impairment around the world and second leading cause of treatable blindness.[1] A refractive error is a very common eye disorder. It occurs when the eye cannot clearly focus the images from the outside world. The result of refractive errors is blurred vision, which is sometimes so severe that it causes visual impairment.[2]

285 million people are visually impaired worldwide. Globally main causes of visual impairment are uncorrected refractive errors (myopia, hyperopia and astigmatism) 43%, cataract 33%, glaucoma 2%.[3] Children in school going age group (6-16 years) represent 25% of population in developing countries. They fall in preventable age group for correction of refractive errors.[4] An estimated 19 million children are visually impaired of these, 12 million are visually impaired due to refractive errors.[3] The presence of refractive errors in school going

children affects their physical, mental and behavioral development as well [5.]

Childhood blindness and visual impairment are as important and perhaps more devastating and disabling than adult onset blindness, because of the long span of life and their permanent effects on the developing eyes.[4] Children do not complain of defective vision, and may not even be aware of their problem. This warrants early detection and treatment to prevent permanent disability.[6] Schools are best forum for implanting health education for children and for early detection of ocular morbidity.[4] School eye screening programme was initiated by National programme for control of blindness in 1994.

Vision 2020-the right to sight is a global initiative launched by WHO in 1999 to eliminate avoidable blindness like cataract, xerophthalmia, refractive errors, trachoma and other causes of childhood blindness by 2020[7].

Considering the fact that 30% of India's blind lose their sight before the age of 20years, the early detection of ocular morbidity in young children is obvious.[8]

Need for the study

Refractive errors among school children remains unnoticed which have an impact on overall development of child.

Limited studies are available regarding refractive errors in rural area, hence an effort will be done to assess the prevalence of refractive errors among school going children in rural field practice area.

Objective of the study

The objective of the study was to assess the prevalence of refractive errors among school children in rural field practice area of Rajarajeswari Medical College and hospital, Bengaluru.

METHODS

A cross sectional study was conducted during November 2013- July 2015 among all the Government schools of rural field practice area of Rajarajeswari Medical College and Hospital Bangalore. All the school going Children in the age groups of 7-15 years from 18 schools present on the day of the study were included in the study.

Sample size

The sample size of 1077 was calculated by considering the prevalence of refractive errors of 27.08% (Prema) and with allowable error as 10%. However complete enumeration i.e. 1140 students were studied.[9]

Methodology

A pilot study was conducted before the actual study, following which necessary changes were incorporated in the questionnaire. This data has been excluded from the main study.

All the schools were enlisted and selected by simple random sampling. School authorities were approached before the examination and their permission was obtained and a date was fixed for examination.

Operational definitions

- Refractive error: There are three major types of refractive errors:
- Myopia or short sightedness was considered when the measured refraction was more than or equal to -0.5 spherical equivalent diopters in one or both eyes.
- Hypermetropia or long sightedness was considered when the measured objective refraction was greater than or equal to +1.00 spherical equivalent diopters in one or both eyes.
- Astigmatism was considered to be visually significant if ≥1.00 D.

Defective vision: Children who can read the 6/9 line are labeled as normal while those who cannot read this line with any eye are labeled as abnormal. According to school eye screening programme myopic correction is for school children.[10]

Jaeger's chart will be held at a distance of 14 inches and children who cannot read N9 line will be labeled abnormal.

General information of the children was collected using pre-designed and semi- structured questionnaire after taking informed consent. The study variables included Socio-demographic profile and questions related to Family history, Regular use of spectacles.

Snellens chart in English and Kannada was used on the basis of the students' preference.2nd and 3rd standard children who could not read the Snellens were assessed with the E charts or picture chart. The vision was tested for each eye separately. The cut off level of visual acuity to denote failure was fixed at less than 6/9 in either eye.

A well illuminated class room was chosen in each school and the students were made to stand at a distance of 6 meters from the chart hung on the wall. The vision was tested in each eye separately. If the student could not read even the top letters on the chart he was asked to read from a distance of 3 meters. Even if this was not possible finger counting and perception of light was tested. When one student was being tested the others were not allowed to watch this to prevent them from memorizing the letters beforehand.

Jaeger's chart (standard near vision chart) was used for testing near vision at a distance of 33 cm. Ishihara chart was used to test colour blindness.

The students with defective vision and other ocular problems were referred to Department of Ophthalmology in Rajarajeswari Medical College and Hospital. Out of 120 study subjects with refractive errors only 82 came for referral to ophthalmology department. Cycloplegic examination was done who came to Department of Ophthalmology. The cycloplegic used is 1% cyclopentolate. After instilling the cyclopentolate 3-4 drops into both eyes, refraction was done after 2 hours with streak retinoscope. Objective refraction was performed with retinoscope which was followed by subjective refraction till the best corrected visual acuity was achieved. Subsequent glasses were prescribed for appropriate study subjects.

Statistical analysis

The data was compiled in Microsoft (MS) Excel work sheet and analyzed using SPSS (Statistical Package for Social Sciences) software version 20.0. The descriptive statistics- All qualitative variables are presented as frequency and percentages. Chi-square test of significance was used to test the association between refractive errors and factors related to refractive errors and Fisher's exact test was used when the expected value of a cell was less than 5. P values of less than 0.05 were considered statistically significant.

RESULTS

A total of 1140 study subjects were examined. The age of the study subjects ranged from 7 to 15yrs and mean age in years was 11.28±2.273. The family history of refractive errors was present in 226 (19.8%) of the study subjects. 44 (3.9%) were using spectacles and majority of them i.e. 30 (68.2%) were using regularly. Only 131 (11.5%) of the study subjects had eye checkup in last one year. The prevalence of refractive errors in the present study was found to be 10.5%. Among the 120 (10.5%) study subjects who had refractive errors, most of them i.e. 52 (43.3%) were in age group of 13-15 yrs. The prevalence of refractive errors was found to be statistically increasing with the age (p<0.05) [chi square for trend]. 69 (57.5%) of the females had refractive errors. The association between the refractive errors and gender was not statistically significant (p>0.05).

Myopia was more in the age group 13-15 years (54.2%) where as it was only 8.3% in 7-9 years. The hypermetropia was found to be higher (p<0.001) in younger age group of 7-9 years (57.1%). Astigmatism was higher among age group 13-15 yrs (60.0%). The observed difference was statistically significant p<0.001. Myopia (56.3%) and Astigmatism (50.0%) was higher among study subjects in 8th-10th class, whereas hypermetropia was more in 2nd-4th class. The results

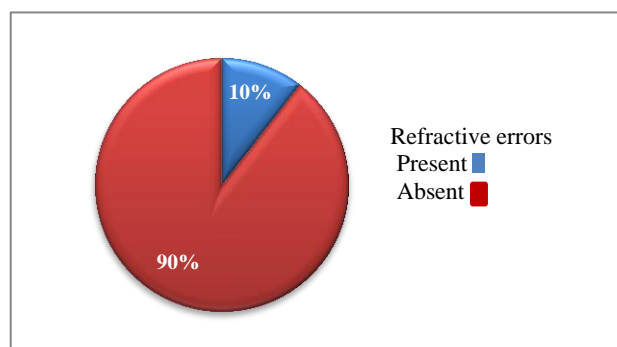showed a significant association between refractive errors and class (p<0.05).

Figure 1: Pie chart showing the prevalence of refractive errors among the study subjects.
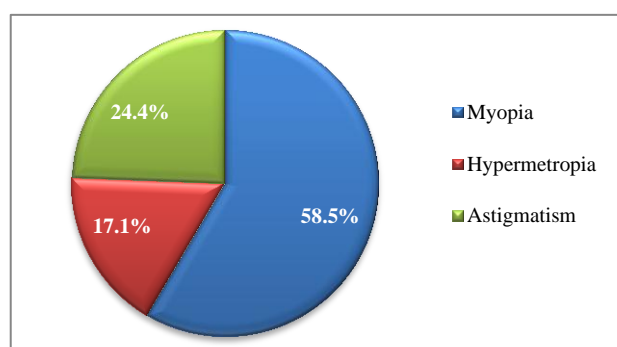

Figure 2: Pie chart showing distribution of study subjects according to their types of refractive errors (n=82).

Table 1: Socio-demographic profile of study subjects.

	Frequency	Percentage (%)
Age in years		
7-9	278	24.4
10-12	487	42.7
13-15	375	32.9
Total	1140	100.0
Gender		
Female	577	50.6
Male	563	49.4
Total	1140	100.0
Religion		
Hindu	1016	89.1
Muslim	112	9.8
Christian	11	1.0
Sikh	1	0.1
Total	1140	100.0
Class		
2nd-4th (Primary)	317	27.8
5th-7th (Middle)	449	39.4
8th-10th (High)	374	32.8
Total	1140	100.0

Table 2: Distribution of study subjects with refractive errors according to their age.

Age in years	Refractive error		Total (%)
	Present (%)	Absent (%)	
7-9	20 (16.7)	258 (25.3)	278 (24.4)
10-12	48 (40.0)	439 (43.0)	487 (42.7)
13-15	52 (43.3)	323 (31.7)	375 (32.9)
Total	120 (100.0)	1020 (100.0)	1140 (100.0)

χ^2=7.952, df-2, p=0.019.

Table 3: Distribution of study subjects with refractive errors according to their class.

Class	Refractive error		Total (%)
	Present (%)	Absent (%)	
2nd-4th (primary)	25 (20.8)	292 (28.6)	317 (27.8)
5th-7th (middle)	43 (35.8)	406 (39.8)	449 (39.4)
8th-10th (secondary)	52 (43.4)	322 (31.6)	374 (32.8)
Total	120 (100.0)	1020 (100.0)	1140 (100.0)

χ^2=7.305, df-2, p=0.02.

Table 4: Distribution of study subjects with refractive errors according to their age.

Age (years)	Myopia (%)	Hypermetropia (%)	Astigmatism (%)	Total (%)
7-9	4 (8.3)	8 (57.1)	4 (20.0)	16 (19.5)
10-12	18 (37.5)	4 (28.6)	4 (20.0)	26 (31.7)
13-15	26 (54.2)	2 (14.3)	12 (60.0)	40 (48.8)
Total	48 (100)	14 (100)	18 (100.0)	82 (100.0)

χ^2=18.869, df-4, p<0.0001.

Table 5: Distribution of study subjects with refractive errors according to their class.

Class	Myopia (%)	Hypermetropia (%)	Astigmatism (%)	Total (%)
2nd-4th (Primary)	6 (12.5)	8 (57.1)	4 (20.0)	18 (22.0)
5th-7th (Middle)	15 (31.2)	4 (28.6)	6 (30.0)	25 (30.5)
8th-10th(secondary)	27 (56.3)	2 (14.3)	10 (50.0)	39 (47.6)
Total	48 (100)	14 (100)	20 (100.0)	82 (100.0)

χ^2=13.07, df-4, p=0.007.

DISCUSSION

Out of 1140 study subjects of age 7 to 15 yrs mean age was 11.28±2.273 and 42.7% belonged to age group of 10-12 yrs. In a similar study done by Gohel et al in school children the mean age was 10 and 39.4% belonged to the age group of 10-12 yrs.[11] Males (49.4%) and Females (50.6%) had almost equal distribution in the present study (Table 1) this observation was similar to the study conducted by Chandramohan et al where 49% were males and 51% females.[12] The present study showed 449 (39.4%) from 5th-7th classes, 374 (32.8%) were in 8th-10th class and 317 (27.8%) were in 2nd-4th class. In a similar study done in Sulia by Meundi et al 38.3% of the study subjects were in class 2nd-4th, 34.9% in class 5-7th, 26.8% in 8th-10th classes.[13]

In the present study prevalence of refractive errors was 10.5% (Figure 1) similar results were found in Jayanth et al study (10.12%).[14] This results were similar to the studies by Singh et al (13.09%), Chandramohan et al (9%), Shresta et al (8.6%), Pavithra et al (7.03%).[12,15-17] Dhulani et al in their study among school children in Jaipur found that prevalence of refractive errors was 30.39%.[18]

Figure 2 shows the distribution of study subjects according to their types of refractive errors where there were 58.5% myopes, 24.4% with astigmatism, and 17.1% with hypermetropia. This was similar to the results of study by Pavithra et al in Bangalore who found that myopia was seen 62.9%, hypermetropia in 14.4%, and astigmatism in 24.4% of the study subjects.[17] Shresta et al in their study reported that 35% of myopia, 19% hypermetropia, 32% astigmatism.[16]

The study shows the prevalence of refractive error was found more (43.3%) in 13-15 year age group compared to

7-9 years age group and this is statistically significant (Table 2). Similar results were observed in study by Pavithra et al in Bangalore where refractive error increased significantly with increased in age.[17] In a study done by Saad et al the prevalence of refractive error was significantly higher among subjects aged >12 years.[19]

Among the study subjects with refractive errors 69 (57.5%) of them were females and 51 (42.5%) were males. The association between the refractive errors and gender was not statistically significant but this high prevalence in female might be due to the higher rate of growth in girls and also because girls attain puberty earlier than boys. Similar results were observed in Singh et al, Prema et al, Sethi et al, where prevalence of refractive errors was more common in females than males and association was not statistically significant whereas refractive error was significantly associated with female gender in study done by Seema et al, Pavithra et al, Saad et al, Sun et al.[9,15,17,19-22]

Myopia and astigmatism was more in age groups 13-15 years (54.2%, 60%) whereas hypermetropia was more in the younger age group of 7-9 years (57.1%) (Table 4). The observed difference was found to be statistically significant. These observations were similar to the one made by Pavithra et al in Bangalore, Ore et al in Israel.[6,17]

Refractive error among children is a common problem and needs to be assessed regularly for early intervention. The present study indicates that the school age represents high risk group for refractive errors. The data support the assumption that vision screening of school children in developing countries could be useful in detecting correctable causes of decreased vision, especially refractive errors by which long term visual disability could be minimized. Screening of the children for vision at the time of school admission and periodical eye examination of the children is recommended for early rectification of impaired vision.

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