Original article

Refractive errors as a cause of childhood blindness in school going children of a rural set-up

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Abstract:

Objectives: The study was done to determine the prevalence and causes of low vision in school going children and to assess the pattern of refractive errors and prevalence of common ones.

Materials & Methods: A prospective observational study was carried out in school children of rural area, to find out the prevalence of refractive errors by vision screening programme. Primary screening was carried out by trained teachers of the school. During two months of study period, 1220 students of age group 10-12 years were screened to find out the refractive errors.

Results: A total of 1220 school going children of standard 5th, 6th and 7th were screened for visual acuity using Snellen’s charts. Out of the total 1220 children screened, 721 were boys and 499 were girls. Total of 266 children had defective vision, out of which 128 (25.65%) were girls and 138 (19.14%) were boys. The total incidence of refractive error in the screened population of school going children was 21.80%. Amongst this, the incidence of myopia (17.13%) is high as compared to that of hypermetropia (4.67%).

Conclusion: There is need for awareness among the community about the ocular health. Vision testing must be added in the schedule of child health programme implemented by government. Annual school health check-ups must focus their attention towards vision impairment due to refractive errors and affected children should get visual aids.

Key words: Refractive error, Childhood blindness, Myopia, Hypermetropia, Astigmatism

Introduction:

Majority of the population in India, still lives in rural areas. Health consciousness is much less in the rural population as compared to its urban counterpart. World Health Organization (WHO) in 1999 proposed a programme VISION 2020: RIGHT TO SIGHT. It plans to decrease the ocular morbidity among the people, by eliminating the treatable causes of blindness. Blindness can be defined as a vision of less than 3/60 in the better eye or an inability to count fingers at a distance of 3 meters in daylight in the better eye.\(^1\) It can also be defined as visual field of less than 10 degree irrespective of visual acuity.\(^1\) According to WHO, childhood blindness refers to a group of diseases and conditions occurring in childhood or early adolescence, which if left untreated, result in blindness or severe visual impairment that are likely to be untreatable later in life. It is estimated that 1.4 million children are blind worldwide out of the total 45 million blind people.\(^1\) The prevalence of childhood blindness ranges to about 1.5/1000 in developing countries, whereas it is
0.3/1000 in well affluent countries. The causes of childhood blindness vary and include corneal scarring, cataract, glaucoma, refractive error. In India main causes of blindness in childhood can be refractive errors, vitamin A deficiency, congenital abnormalities and retinoblastoma. Refractive error contributes about 19% of the total blindness worldwide. Refractive error is an optical defect intrinsic to the eye which prevents the light from being brought to a single point focus on the retina, thus reducing normal vision. Refractive errors are common in children and are easily correctable, usually with the use of the spectacles. This is the commonest cause of visual impairment around the world.

The majority of the population in rural areas is unaware about the early symptoms of visual impairment and thus results in the high incidence of uncorrected refractive errors. Visual impairment due to refractive error can be detected among the population by vision screening programs. Such surveys can best be initiated in schools, since the refractive errors identified at a young age can be corrected by providing quality spectacles and thus save the child from becoming visually handicapped.

**Materials and Methods:**
A prospective observational study was carried out in school children of rural area, to find out the prevalence of refractive errors by vision screening programme. Primary screening was carried out by trained teachers of the school. During two months of study period, 1220 students of age group 10 to 12 years were screened to find out the refractive errors. The inclusion criteria include children in the age group of 10 to 12 years as they are cooperative for vision testing and there would be better compliance to treatment and follow-up. The children having other ocular problems such as stye, blepharitis and conjunctivitis were excluded. The study was done to determine the prevalence and causes of low vision in school going children and to assess the pattern of refractive errors and prevalence of common ones. In this study health education about prevention and correction of these refractive errors was also done.

A pretested questionnaire was used to collect the information from the students. Primary screening was carried out in the school setting with the use of Snellen’s charts after obtaining verbal informed consent from the parents or school authorities. The children, who were found to have defective vision or other associated ocular problems with asthenopic symptoms, were referred to Medical College Hospital for detail opthalmic evaluation and treatment by specialists. The refractive status of children was assessed by retinoscopy under cycloplegic refraction (cyclopentolate eye drops 1%). Children were prescribed spectacles three days after initial evaluation. Statistical analysis of the relevant data was done by using appropriate statistical test. Institutional Ethical Committee clearance was obtained. A health education activity (IEC) on common ocular problems was arranged for the children in the school and subsequently in the hospital with the help of charts and posters. Arrangements were made for free spectacles.

**Results:**
A total of 1220 school going children of standard 5th, 6th and 7th were screened for visual acuity using Snellen’s charts. Out of the total 1220 children screened, 721 were boys and 499 were girls. Total of 266 children had defective vision, out of which 128 (25.65%) were girls and 138 (19.14%) were boys.
Table 1: Age and gender distribution of study population screened

<table>
<thead>
<tr>
<th>Age</th>
<th>Girls</th>
<th>Boys</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 yrs</td>
<td>151</td>
<td>212</td>
<td>363(29.75%)</td>
</tr>
<tr>
<td>11 yrs</td>
<td>180</td>
<td>251</td>
<td>431(35.33%)</td>
</tr>
<tr>
<td>12 yrs</td>
<td>168</td>
<td>259</td>
<td>427(35%)</td>
</tr>
<tr>
<td>Total</td>
<td>499(40.90%)</td>
<td>721(59.10%)</td>
<td>1220</td>
</tr>
</tbody>
</table>

Figure 1: Distribution of children as per visual performance

![Figure 1: Distribution of children as per visual performance](image)

Figure 2: Gender distribution of children with normal and defective vision

![Figure 2: Gender distribution of children with normal and defective vision](image)
Figure 3: Distribution of students according to their visual acuity

Figure 4: Comparison between myopia and hypermetropia amongst the screened population

The above bar diagram shows a predominance of myopia over hypermetropia in the screened visually defective children.
Discussion:
Blindness is defined either in terms of best-corrected distance visual acuity or presenting distance visual acuity. Level of visual acuity of less than 3/60 in the better eye has been commonly used to define blindness. A normal eye condition whereby with no accommodation, parallel light is focussed on the retina is called emmetropia. Thus any optical departure from this condition is called refractive error (RE) or ametropia. There are three kinds of refractive errors namely myopia, hypermetropia and astigmatism.2,5 According to WHO estimates, globally there are 40 million blind people and an additional 245 million visually impaired.1 A further 517 million people have significant near vision impairment caused by uncorrected presbyopia.6

A comparative survey of prevalence of refractive error in urban and rural school children in and around Hyderabad was carried out. Prevalence of uncorrected visual impairment (≤ 6/12 in the better eye) in the urban and rural group was found to be 9.8% and 6.6% respectively, which dropped to 7.1% and 3.3% respectively with presenting vision, and reduced to 1.1% and 2.5% respectively with best corrected visual acuity. The primary cause of the visual impairment was myopia and increased incidence was observed in urban population than rural. This was attributed to increased literacy rate and more visual associated activities like use of computers, watching television for longer hours.7 In a similar type of study, by Kasa T & Allene S D, prevalence rate of visual impairment due to refractive error in a preschool and school children aged 5 to 15 years of Debark & Kola Diba towns, was found to be 7.6%. Myopia was a major cause of visual impairment.8 Further 5.6% of the children were observed to have a visual acuity of <6/12 in the better eye while 2.6% showed visual acuity <6/18.
In the present study as evident from figure 1, the sample size of girls and boys studying in 5th, 6th and 7th standard were apparently not largely different. The total number of children screened in 5th, 6th and 7th standards was 29.75%, 35.33% and 35% respectively. Out of the 1220 children screened, 266 children with <6/6 visual acuity as determined by Snellen’s chart were identified with defective vision (21.80%). Children with visual acuity of less than 6/9, 6/12, 6/18, 6/24, 6/36 and 6/60 were identified and segregated from the total number of students with defective vision. The number of students (figure 3) with the above visual acuity is 100,110,21,19,13 and 3 respectively. 

The prevalence of myopia in the present study (figure 6) is 17.13%. There was a similar study which was conducted in western china in which the incidence of myopia was found out to be 13.75%. Many studies which detected refractive error in school children have reported myopia to range from 4% to about 8%. In one primary school study of Qazvin city prevalence of refractive error was 61.9% of those 65.03% were myopic. This difference may be attributed to various factors such as geographical location, economic development, contributing environmental factors and the overall awareness amongst the masses. Amongst the visually defective children 78.57% comprises of myopia while the rest is of hypermetropia. Also the incidence of hypermetropia amongst the total screened masses is 4.67% in present study. Hence from the above findings it is clear that the incidence of myopia amongst school going children is higher than that of hypermetropia. The incidence of myopia is 17.13%. Hence the primary cause of visual impairment amongst these children is myopia. Out of the total children having defective vision, only 6 children had a previous history and current use of spectacles as a visual aid. This can be attributed to illiteracy amongst the parents of the children. Majority of the parents of the children earn daily wages and belonged to low socio-economic group. Due to low socio-economic status of the parents they could not afford frequent visits to the eye care centre and the cost of the visual aids (e.g.- spectacles). This depicts ignorance amongst the community as a cause of increased risk of ocular morbidity in the future. Hence a provision was made for free spectacles for the children with the help of a non-governmental organisation. The incidence of myopia was more than hypermetropia in the screened population. Refractive errors were commonly seen in males than females. Correction was given to these children with appropriate lenses. Arrangements for free spectacles were made with help of a non-governmental organisation. Health education was imparted to the children and counselling regarding need and importance of regular follow-up and use of spectacles was emphasised to the parents.

Conclusion:
There is need for awareness among the community about the ocular health. It can be done through mass media (electronic and paper media), through awareness campaigns, rallies, posters, exhibitions, etc. Vision testing must be added in the schedule of child health programme implemented by government. Annual school health check-ups must focus their attention towards vision impairment due to refractive errors and affected children should get visual aids. Up gradation of ophthalmic facilities/services at primary health centers should be done so that it becomes easily accessible for rural population.
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References: