Evaluation of Refractive Errors in Children

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INTRODUCTION

Refractive error is said to occur when the eye is unable to bend and focus light appropriately onto the retina. There will be a defect in the vision (Saw, 2006). Nearsightedness (Myopia), farsightedness (Hypermetropia) and astigmatism are the most common types of refractive errors. When the refractive power is too strong, or the length of the eye is too large for the existing power of refraction, the image of the observed object will be formed in front of the retina. This type of refractive error is termed as myopia. On the contrary to myopia, if the refractive power is too weak or the length of the eye is too small, the image of the observed objects will be created behind the retina. This is termed as hypermetropia. Whereas when there is an occurrence of unequal refraction in the same eye, it is called astigmatism (Prajapati et al., 2008).

Eyeglasses, contact lenses or surgery can be done to correct these refractive errors (Giordano et al., 2009). Eyeglasses are the easiest and safest method for correcting refractive errors. Contact lenses can provide a broader and better field of vision and are cosmetically more acceptable, but they are associated with a risk of infection (Chen et al., 2010).

Refractive errors which are left untreated are the most common reason that leads to visual acuity.

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This is commonly seen in the case of children where these types of uncorrected refractive error and its consequences have an intense effect on their overall development. It most notably affects the educational, psychological and social development of the child (Kvarnström et al., 2001).

Generally, children do not complain of defective vision, and most of the time, they may not even be aware of their problem (Belaynew et al., 2012). They just try to adjust to the poor vision by changing the position in the classroom, moving things closer, and tend to avoid tasks that require more visual concentration (Simons et al., 1999). But these are not good for the children, and it causes unnecessary stress to the eye and also affects the children. It is highly necessary to screen the children regularly for early detection and intervention so that we can provide them with the best opportunities to correct the refractive errors and for them to learn and develop and improve the educational, psychological and social activities of the children (Shrestha et al., 2011).

METHODOLOGY

The study was conducted in the Department of Ophthalmology, Saveetha medical college and hospitals, Chennai. A total of 100 cases were taken. A cross-sectional type of study design was performed. It was conducted to evaluate the refractive errors in children. A comprehensive eye examination was performed.

All school-going children attending the eye OPD were included in the study. Initially, the students underwent a preliminary ocular examination. For this examination, an internally illuminated Snellen’s chart was used (Kleinstein, 2003). It was placed at a distance of 6 meters for assessment of uncorrected, presenting and best-corrected visual acuity (VA). Snellen’s chart is used to measure the visual acuity of the eye by determining the level of visual detail that a person can discriminate (Buchner et al., 2003). The chart consists of 11 lines, and there are letters in each line. There is one letter in the first line, two letters in the second, and three letters in the third line and so on. The chart is constructed in such a way that the size of the letters decreases as we go down on each lower line of the chart from above to below. Traditionally, the first line consists of a single letter “E” (Mayro et al., 2018). The children were made to stand at a distance of 20 feet (6 metres) from the chart. Children were then made to read each line of the chart, using only one eye. This process is continued until the child was unable to interpret or make out the letters correctly. There is an assigned ratio which indicates the visual acuity that is required for a person to read and comprehend the letters which are there for the letters in each row, and the ratio for the lowermost line that a person can read will represent the individual’s visual acuity for that eye.

All the children with defective vision were selected for detailed ocular examination. The same refraction and ophthalmologist examined throughout to avoid errors and to maintain infirmity (Larsson, 2003). A post mydriatic examination was done. After which children found with any type of refractive errors noted were further evaluated according to the type of refractive error (Ibironke et al., 2011). An equivalent of -0.5 diopter (D) or more was considered as myopia and +1D or more was considered as hypermetropia, and cylinder refraction greater than 0.75D was considered as astigmatism (Wadaani et al., 2012).

RESULTS

A total of 100 children were included in the study, between 5 and 17 years of age. A detailed ocular examination was done, and the type of refractive error was found out. The prevalence of refractive errors in different age groups and sex were determined.

Between 11-15yrs, the prevalence of refractive errors was found to be high (Table 1). Out of these, 48 were males, and 52 were females (Table 2). The eye examination of 100 children revealed that 54 children had myopia, 40 had hypermetropia, and 6 children had astigmatism (Table 3)(Figure 1).

DISCUSSION

Refractive errors are, therefore found to be one of the significant problems in school-going children. Therefore, visual assessment of these children is a significant issue (Nirmalan et al., 2003).
Table 1: Prevalence of refractive errors and age

| Age (in years) | %   |
|---------------|-----|
| 5-10          | 35  |
| 11-15         | 47  |
| 15-17         | 18  |

Table 2: Prevalence of refractive errors and sex

| Sex      | %   |
|----------|-----|
| Males    | 48  |
| Females  | 52  |

Table 3: Prevalence of refractive error

| Refractive Error | %   |
|------------------|-----|
| Myopia           | 54  |
| Hypermetropia    | 40  |
| Astigmatism      | 6   |

In this study, the age group between 11-15 years were more commonly affected. The results of this study were concordant with the research conducted by MB et al. (2013) in Bangalore which showed that the prevalence of refractive error was more in the age group of 13 -15 years old children when compared to 7-9 years age group.

There was no notable difference observed in the prevalence of myopia, hypermetropia, astigmatism among the males and females in this study, as shown in Table-2. This result was similar to the results observed by Ande et al. (2015) in Andhra Pradesh and Krishnan et al. (2015) in Villupuram and Puducherry, where there was no difference or predisposition of refractive error based on the sex was said to be noted. However some studies showed that there was evidence of the increased prevalence of these refractive errors in female students (Flitcroft, 2005). This was attributed to the prior attainment of puberty by a girl when compared to boys. But these results were in contrast to the findings observed in the study of Chandramohan and R (2014) in Tamil Nadu which showed that refractive errors were more prevalent in male children (21.5%) than the female children(17%).

The most frequent refractive error was found to be myopia, followed by hypermetropia and then astigmatism in this study (Nielsen et al., 2007). This was similar to the study conducted by Williams and Holmes (2004) were the most common type of refractive error was myopia. But the results of this study was disconcordant with the findings of Donahue (2018), which showed astigmatism to be more prevalent than the other errors among children. Still, this study was concordant to the findings of Jönelid et al. (2002), which showed that about 56% of children had myopia.

Studies suggest that early screening, use of spectacles, creating awareness and educating the parents to motivate students to use spectacles (Ehrt et al., 2007) are vital to reduce the incidence of these refractive errors. The already existing eye care services and a good partnership and co-operation between the public and private can be strengthened by proper and improved utilization of the health service when required.

CONCLUSION

Refractive errors were found to be the most common reason that leads to visual impairment among children. If these errors are left untreated, they can have immediate as well as long-term consequences in children. This suggests that lack of awareness and the inability of recognition of these problems is the leading cause for these types of refractive errors to remain untreated and uncorrected. It is very important to undergo regular eye examination and correct the defect as soon as possible. Awareness should be created about these problems. In most cases, the children will not be able to express the condition correctly, so awareness must be created among the parents for identification of these problems in their children and to do a proper and regular eye examination. A lot of children are being affected due to these types of refractive errors. Early detection is a crucial measure which is to be taken to prevent...
there is an increasing need for implementation of programmes such as vision screening on a much-expanded scale to detect individuals who are affected or suffering from refractive errors, to correct them appropriately and to prevent blindness.

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**Conflict of Interest**

The authors declare that they have no conflict of interest.

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**Ethical Consideration**

Before starting the study, the Institution Review Board of Saveetha University has approved our protocol, later grant sanction form was obtained from HOD of all department. Further, informed oral consent was obtained from all the parents and children before they were included in the study.

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