

Original Research Article

Profile of refractive errors and amblyopia in 5-15 yrs of school going children at a Union territory tertiary health centre

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Received: 20 March 2019

Revised: 12 April 2019

Accepted: 17 April 2019

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ABSTRACT

Background: Poor vision in childhood affects performance in school and has a significant impact on future life of child in terms of education and development. Current study aims at detecting the magnitude and patterns of refractive errors with amblyopia screening so that effective measures can be planned at the right time to minimize the burden.

Methods: Hospital based cross sectional study conducted on 200 children between 5-15 years attending the ophthalmology OPD of a tertiary health care centre, Puducherry. Interpretation and data analysis were done by SPSS software version 13.0.

Results: Mean age of presentation was 9 years. Female to male ratio in the present study was 1.3:1. Positive family history was noted among 48 children suggesting strong impact of genetic factor in refractive errors. Among 20 children who were already on spectacle correction, the most common refractive error was compound myopic astigmatism. Among 30 children who were diagnosed with amblyopia, 8 children below 8 years of age had improved vision on 1 month follow up of post treatment with spectacles and occlusion therapy and 22 children did not show improvement suggesting amblyopia can be corrected if intervention was instituted before the age of 8 years.

Conclusions: Refractive errors with or without amblyopia is a significant cause of childhood visual impairment. Though it is a hospital-based study, the results were in consistent with previously published hospital and population based study. This study also expected to serve as a tool for primary health care physicians to have an overview of magnitude and patterns of refractive errors in children presenting to hospital since refractive error is a significant public health problem worldwide.

Keywords: Amblyopia, Children, Childhood visual impairment, Refractive errors

INTRODUCTION

Eyes are the windows of learning and visual appreciation of objects that contribute to learning in any individual's life. The visual cortex of the brain needs a continuous, clear and focused visual stimulus for a normal development of the visual system in early childhood. Amblyopia is the reduction of visual acuity of 2 or more lines in the snellens chart in one or both eyes in which no structural abnormality can be made out in the eyes. Amblyopia is the most common cause of preventable

monocular/binocular blindness. The causes of amblyopia include strabismus, anisometropia, high refractive errors, high astigmatism, media opacities, ptosis etc. Visual disability in childhood can be minimized or even be prevented, if the causes are detected earlier and treated before they become irreversible.¹ Refractive errors are one of the major causes of low vision and second leading cause of preventable blindness and most common reason for patients to consult ophthalmologist and optometrist all over the world.² Detection of visual impairment in school children is important. Poor vision in childhood affects

performance in school and has a significant impact on future life of child in terms of education and development. Hence, the vision 2020 initiative to eliminate avoidable blindness has given high priority to correction of refractive error and has placed it within category of “Childhood Blindness”.³

It is estimated that there are 1.4 million blind children in the world, 2/3rd of whom live in India. About 13% of Indian population is in the age group of 7-15 years and about 20% of children develop refractive error by the age of 16 years and 6-7% in the age group of 10-15 years in India affecting their learning at school.⁴ Amblyopia becomes irreversible if it is not treated within 8 years of age which is the critical period.⁵

Present study aims at gathering the information on the refractive status of students with amblyopia so that an effective approach can be planned to tackle the burden of readily correctable refractive problems in school children.

METHODS

Facility based Cross sectional study among Children of age between 5-15 years attending ophthalmology outpatient department between May and June 2013 with the following inclusion and exclusion criteria after getting clearance from the ethics committee.

Inclusion criteria

- Age in the range of 5-15 years.
- Signature of the informed consent by parents or legal guardians and
- No history of systemic diseases.

Exclusion criteria

- Children below 5 years and above 15 years.
- Children who had a history of untreated closed-angle glaucoma or untreated anatomically narrow angles - information obtained from anterior segment examination and medical history.
- Children who have a history of juvenile diabetes.

Children from the age 5-15years with visual complaints attending the outpatient department of ophthalmology

were examined systematically and methodically in the OPD of ophthalmology.

Screening was undertaken with the help and co-operation of the technical staff of the OPD and with the guardian of the child. Each child’s guardian was explained about the importance of vision and overall development of the child. They were also informed about the importance of dilatation of the eye for the examination of both external and internal aspects of eye and the same was conducted after obtaining the consent.

After obtaining a detailed history, ocular examination was undertaken which included visual acuity assessment for distance with Snellen’s chart at room illumination and for near vision with near vision test types. Colour vision by Ishihara’s chart and squint evaluation was done wherever needed. Dry retinoscopy and automated refractometer examination were done in co-operative patients. Ocular movements and anterior segment evaluation with slit lamp, cycloplegic refraction and funduscopy were performed on each child. Post mydriatic refraction was performed after 3 days and the required spectacle correction was prescribed. In children with amblyopia, glass prescription with insistence on regular and constant wear was advised and was reviewed after 1 month with visual acuity testing and refraction. If a patient was found to have less vision in one eye compared to other, inspite of regular use of spectacles, occlusion therapy was initiated (duration of occlusion depended on age and visual deficit).

RESULTS

A total of 200 children between 5 to 15 years of age group were included; where majority (48%) were between 9-12 years with mean age as 9 years. Female children outnumbered by 12 % in the present study (Table 1).

Table 1: Demographic details of the children in the present study.

| Age | Male | Female | Total |
|-------------|------|--------|-----------|
| 5-8 years | 11 | 20 | 31(15.5%) |
| 9-12 years | 29 | 66 | 95(47.5%) |
| 13-15 years | 48 | 26 | 74(37%) |
| Total | 88 | 112 | 200(100%) |

Table 2: Distribution by types of refractive errors with respect to age and sex.

| Refractive errors | 5-8 years | | 9-12 years | | 13-15 years | |
|-------------------|-----------|--------|------------|--------|-------------|--------|
| | Male | Female | Male | Female | Male | Female |
| Astigmatism | 8 | 12 | 15 | 42 | 34 | 7 |
| Myopia | 2 | 8 | 10 | 17 | 10 | 17 |
| Hypermetropia | 1 | 0 | 4 | 7 | 4 | 2 |
| Total | 11 | 20 | 29 | 66 | 48 | 26 |

Astigmatism was the most common refractive error of about 59% followed by myopia 32% and hypermetropia 9%. Astigmatism was common in both males and females of about 64% and 55% followed by myopia which is 37% in females and 25% in males and hypermetropia which were almost 10% among both sexes.

Astigmatism was common in age group 9-12 years (57 children) followed by 13-15 years (41 children). Myopia

was found to have equal distribution between 9-12 and 13-15 years whereas hypermetropia was common in age group between 9-12 years showing that refractive errors are most common in age group 9-12 years (Table 2).

The common type of astigmatism was compound myopic astigmatism (47%) followed by simple myopic astigmatism (40%) (Table 3).

Table 3: Distribution by types of astigmatism.

| Types | No. of children found with error | Percentage |
|------------------------------------|----------------------------------|------------|
| Simple myopic astigmatism | 47 | 39.8 |
| compound myopic astigmatism | 55 | 46.7 |
| Simple hypermetropic astigmatism | 9 | 7.6 |
| compound hypermetropic astigmatism | 5 | 4.2 |
| Mixed astigmatism | 2 | 1.7 |
| Total | 118 | 100 |

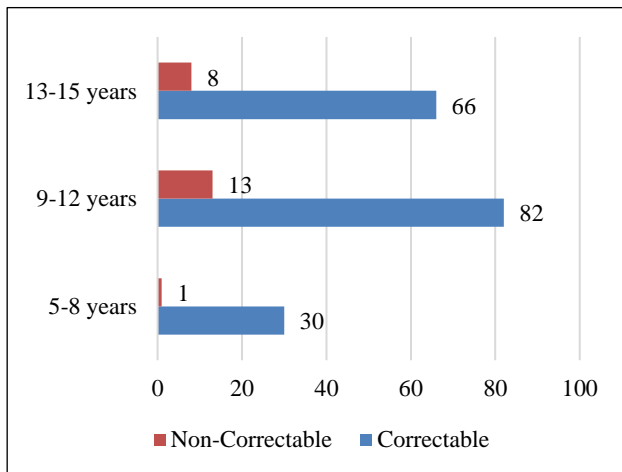


Figure 1: Depicting the distribution of correctable and non-correctable refractive errors in the study.

Of the 200 children with refractive errors in the study 22 were non correctable. Of the 22 non correctable refractive error 13 belonged to age group 9-12 years (Figure 1).

The most common complaints presented among the children was diminution of vision (110 children) especially between 13-15 years followed by headache (78 children) in children between 9-12 years with no much sex variation 18 children were found to have uncorrectable refractive error among 48 children who had positive family history suggesting strong influence of family history with uncorrectable refractive error.

Out of 200 children examined, 30 were found to be amblyopes and the common refractive error among amblyopes was found to be compound myopic

astigmatism followed by simple myopic astigmatism (Figure 2).

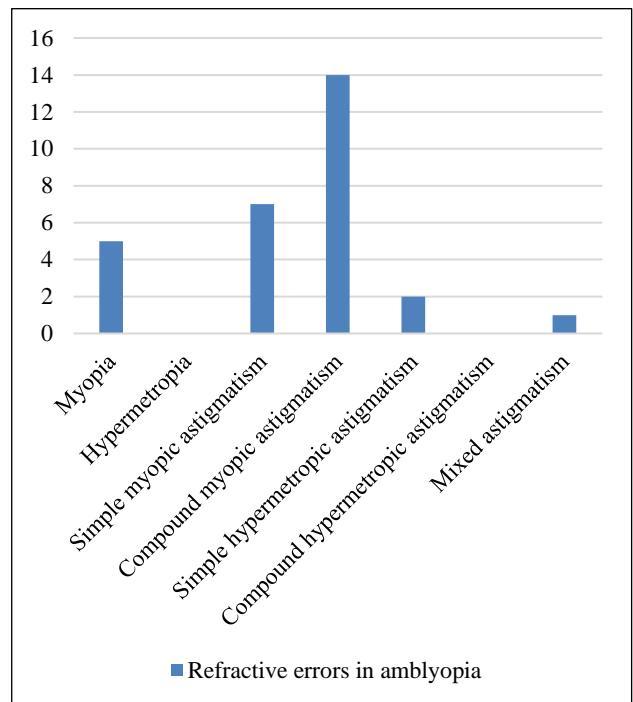


Figure 2: Distribution of types of refractive errors in amblyopia.

Out of 20 children who already had corrected refractive error with spectacles, astigmatism was seen in 4, myopia and hypermetropia was found in 1 child each.

Of the detected amblyopes, in 1 month of follow up only 8 children improved and those children were below 8

years of age implying that maximum amblyopic correction could be obtained below the age of 8 years.

Of the 200 children with refractive error, in 1 month follow up, 22 (11%) of children did not have improvement of vision and the reason for non-improvement of vision could be amblyopia in older children more than the 8 years of age.

Other ocular findings such as allergic conjunctivitis, bitot spots were also found in 18 children. Ocular defects such as congenital ptosis, corneal opacity, squint, spring catarrh were also found in about 6 children and contributed for uncorrectable refractive errors.

DISCUSSION

In our study out of 200 children 15.5% were in between 5-8 years, 47.5% between 9-12 years and 37%, between 13 to 15 years. In this study it was found that 88 patients were male while 112 patients were female. In our study 9% were hypermetropic 32 % were myopic and 59% were astigmatic. Out of total 59 % of astigmatic patients, simple myopic astigmatism was present in 39.8 % patients; compound myopic astigmatism 46.7% patients; simple hypermetropic astigmatism in 7.6% patients; compound hypermetropic astigmatism in 4.2% patients and mixed astigmatism in 1.7 % patients. These findings were consistent with other refractive error studies in children.⁷

These findings can be explained on the natural process of emmetropism of the development of immature human eye. In most new-borns, the growth of the eye increases initially and then declines over the first year of life. Babies with mild hypermetropia often become emmetropic or even myopic when they become older. In a study conducted in China it was found that myopia of -0.5 dioptre or less in either eye was essentially absent in 5 years old children, but increased to 36.7% in male and 55% in females by age 15.⁶ Over the same age range, hypermetropia of 2 dioptres or greater decreased from 8.8% in males and 19.6% in females to less than 2% in both. Similar results were found in refractive error study in children from La Florida, Chile.⁷ 53.66% of the patients had headache as the presenting complaint and 38.05% had diminution of vision as the presenting complaint and 15% had other complaints such as redness, watering, ocular pain, ocular injuries, frequent blinking etc. Therefore, children with complaints of headache, inattentiveness in class, frequent blinking or rubbing of eyes should be considered by the parent or school teacher as an indicator to have an ophthalmic examination to evaluate the visual status. In this study headache was the commonest symptom found in 54% of the children. This finding is in accordance with the study done by Hendricks et al, headache is the commonest habitual symptom in refractive errors, it is also seen more in females than males and common in age group 13-15.⁸ In this study, prevalence of myopia was higher in school

going children as compared to illiterate children. Similar findings were described by Seet et al who have raised concern that rapid rise in myopia prevalence among Singaporeans is related to higher educational attainment.⁹ In a study done by Afghani et al in school children found that myopia was three times more common (3.26%) than hypermetropia (0.99%).¹⁰ 24% of the patients had a positive family history suggesting strongly of the importance of genetic inheritance in refractive error incidence. About 3% of them had history of wearing glasses which suggests the importance of repeated visits to the ophthalmologist by a child who is already diagnosed to be suffering from refractive error. The reason for this is the constantly changing refractive correction particularly in hypermetropia and pathological myopia. 89% of the errors could be corrected which shows that though refractive error is the major cause for gradual dimness of vision, it can be treated. Though refractive errors cannot be prevented, its effects on visual deterioration could be controlled by timely examination and correction with spectacles and occlusion therapy in the needed cases. Among the children in the study about 15% (30 children) had amblyopia.

After 1 month of follow up of children with spectacle correction 178 children showed improvement in refraction while 22 children did not show improvement. Non correctable errors (11%) are typically seen in the older age groups which suggest that delay in treating refractive error in the younger age groups have a very damaging effect on the child's vision and future as amblyopia cannot be corrected after the critical and sensitive age of 8 years.

Other conditions such as strabismus, bitot spots, allergic conjunctivitis, and corneal opacity also contributed for refractive errors in children.

There is higher prevalence of refractive errors and associated strabismus and amblyopia in children. Many such children are treated late or not at all. Mass school screening by governmental and non-governmental organisations followed by prompt treatment appears the only viable solution to this problem. Teachers should also be educated about the symptoms of refractive errors and the method of checking the visual acuity which helps them to refer the children with the visual complaints to the ophthalmologist at the earliest.

Refractive errors in children are an important public health issue as they are the socio-economic future of the country. Screening should be initiated early in the schools and these children should be followed up regularly for compliance as amblyopia is an important preventable cause of needless blindness in children.

CONCLUSION

In summary, refractive errors with or without amblyopia is a common and significant cause of visual impairment

in the children. Though it is a hospital based study, the results were consistent with previously published hospital-based and population based study. Since no published community based study has been available from this union territory, this study hopes to serve as an initial step for conducting well established community based study in this region. Also, this study is expected to serve as a tool for primary health care physicians to have an overview of magnitude and patterns of refractive errors in children presenting to hospital since refractive error is a significant public health problem worldwide.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee of Indira Gandhi Medical College and Research Institute, Puducherry, India

REFERENCES

1. Das A, Dutta H, Bhaduri G, Sarkar AD, Sarkar K, Banerjee MA. Study of refractive errors among school children in Kolkata. J Indian Med Assoc. 2007;105:169-72.
2. Dandona R, Dandona L. Refractive error blindness. Bull World Health Organ. 2001;79:237-43.
3. World Health Organization. Global initiative for the elimination of avoidable blindness. Geneva: WHO program for the prevention of blindness. Geneva. WHO/PBL/9761, 1997. Availbale at: <https://apps.who.int/iris/handle/10665/63748>.
4. Government of India. Annual report 2003-2004, ministry of health and family welfare, New Delhi, 2004.
5. Rahi JS, Sripathi S, Gilbert CE, Foster A. Childhood Blindness in India: Causes in 1318 blind school children in 9 states. Eye. 1995;9:545-50 .
6. Smith JS. Eye diseases in hot climates. 4th ed. New Delhi, Elsevier; 2003:1-22.
7. Maul E, Barraso S, Munoz SR, Sperduto RD, Ellwein LB. Refractive error study in children; results from Laflorida, Chile. AM J Ophthalmol. 2000;129:445-54.
8. Hendricks TJ, De Brabander J, Van der Horst FG, Hendrikse F, Knottnerus JA. Relationship between habitual refractive errors and headache complaints in schoolchildren. Optometry Vision Science. 2007 Feb 1;84(2):137-43.
9. Seet B, Wong TY, Tan DTH, Balakrishnan V, Lee KH. Myopia in Singapore: Taking a public health approach. Br J Ophthalmol. 2001;85:52.
10. Afghani T, Vine HA, Bhatti A, Qadir MS, Akhtar J, Tehzib M, et al. Al-Shifa Al-Noor (ASAN) refractive error study of one million school children. Pak J Ophthalmol. 2003;19:101-7.

Cite this article as: Ezhilvathani N, Suruthi P, Jeiganesh M. Profile of refractive errors and amblyopia in 5-15 yrs of school going children at a Union territory tertiary health centre. Int J Res Med Sci 2019;7:1929-33.