

Refractive errors among school children of Aurangabad city of Maharashtra: A cross-sectional study

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Abstract

Background: Refractive errors during school years can have an adverse effect on not only the educational performance but also the overall personality of the child. Identification and proper management of errors of refraction would go a long way in enhancing the quality of life among the school going children. This cross-sectional study was done to assess the refractive errors among school going children of Aurangabad city of Maharashtra. **Methods:** This cross-sectional study was done at Aurangabad during 2017 -2018. School children between 6 to 15 years of age studying in government schools of the city were included. Sample size was 2000 children. In a well illuminated class room, Snellen's chart in English and Marathi was used to test distant vision based on student preference. Children who could not read were assessed by E charts and cross verified. The cut-off level of visual acuity to denote failure was fixed at less than or equal to 6/9 in either eye. Children having vision less than or equal to 6/9 were listed separately for refraction evaluation on next visit. Data was entered in Microsoft excel spreadsheet and analysis was done. Chi square test was done to assess statistical significance of study parameters. **Results:** The study comprised of 2000 students with 1060 males and 940 females. There were 125 children (6.25%) who were found to have refractive errors on ophthalmological examination. Of these 125 children, only 28 (22.4%) were previously known cases whereas 97 (77.6%) were new found cases. The age group of 13 to 15 years had the highest proportion of children with refractive errors among the studied population and the difference was statistically significant. Out of 125 cases with refractive error, 65 (52%) students had myopia, which was the most common refractive error, followed by 56 (44.8%) of astigmatism and only 4 (3.2%) students had hypermetropia. Amblyopia due to uncorrected refractive error (hypermetropia) was seen in 2 children. **Conclusions:** From study results it can be concluded that there was high number of students with undetected refractive errors among school children. There is a need for screening school students for refractive errors as it can impact their quality of life especially academic performance. Moreover it is an easily correctable disorder. Its early diagnosis and management can help in prevention of more serious visual problems in these promising children.

Key Word: Myopia, Hypermetropia, Astigmatism.

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INTRODUCTION

Vision disorders related to refractive errors can be easily avoided by correction of the error of refraction at the earliest. Provision of the appropriate lenses for the refractive error correction is a very effective intervention with minimal costs. The vision 2020 initiative has included refractive errors among the category of 'childhood blindness' and also listed refraction error correction as an area of importance for achieving the objective of elimination of blindness due to avoidable

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causes.¹⁻⁴ Vision impairment during childhood and school years is considered more dangerous and disabling than adult onset vision disorders as it affects the formative years of life, moreover children often do not complain regarding the problem and adjust by sitting close to blackboard, holding the books near to eyes, squeezing the eyes and also develop a tendency to avoid work that requires visual concentration which may affect their performance potential.^{5,6} School going children represent a set of population in whom screening can help in early identification and management of refractive errors and hence WHO has also recommended the screening of school children for refractive errors.^{1,7} In this context, this cross-sectional study was done to assess the refractive errors among school going children of Aurangabad city of Maharashtra.

METHODS

The present cross-sectional study was done at Aurangabad during 2017 -2018. School children between 6 to 15 years of age studying in government schools of the city were included. Sample size was 2000 children. In a well illuminated class room, Snellen's chart in English and Marathi was used to test distant vision based on student preference. Children who could not read were assessed by E charts and cross verified. The cut-off level of visual acuity to denote failure was fixed at less than or equal to 6/9 in either eye. Children having vision less than or equal to 6/9 were listed separately for refraction evaluation on next visit. All these children were assessed under the cycloplegic effect of 1% cyclopentolate, by streak retinoscopy, and the appropriate glasses were prescribed after one week by post mydriatic test. Children already wearing spectacles were also examined and change in power was noted. The visual acuity was tested with appropriate lenses inserted in a trial frame. Each eye was tested separately while an opaque disc was placed in other compartment of the frame, and then two were finally tested together. Alterations in spheres were tried first, and then the strength and axis of the cylindrical lens were verified. Examination of the fundus with direct ophthalmoscope was done and indirect ophthalmoscopy was done when needed. Data was entered in Microsoft excel spreadsheet and analysis was done. Chi square test was done to assess statistical significance of study parameters.

OBSERVATIONS

The study comprised of 2000 students with 1060 males and 940 females. There were 152 students with vision less than or equal to 6/9 on visual acuity testing by Snellen's chart of which 125 children (6.25%) were found to have refractive errors on ophthalmological

examination. Of these 125 children, only 28 (22.4%) were previously known cases whereas 97 (77.6%) were new found cases. The age group of 13 to 15 years had the highest proportion of children with refractive errors among the studied population and the difference was statistically significant. Out of 125 cases with refractive error, 65 (52%) students had myopia, which was the most common refractive error, followed by 56 (44.8%) of astigmatism and only 4 (3.2%) students had hypermetropia. Males had comparatively more number of students with astigmatism whereas females had more number of students with Myopia. Amblyopia due to uncorrected refractive error (hypermetropia) was seen in 2 children. Table 1 to 9 describe the observations of the study.

Table 1: Age Distribution of Students

| Age in Years | Frequency | Percentage |
|--------------|-------------|------------|
| 6 – 9 | 540 | 27 |
| 10 – 12 | 1080 | 54 |
| 13 – 15 | 380 | 19 |
| Total | 2000 | 100 |

Table 2: Gender Distribution of the Students

| Gender | Frequency | Percentage |
|--------------|-------------|------------|
| Boys | 1060 | 53 |
| Girls | 940 | 47 |
| Total | 2000 | 100 |

Table 3: Unaided Visual Acuity in Study Population

| Visual Acuity | Frequency | Percentage |
|---------------|-------------|------------|
| 6/6 | 1848 | 92.4 |
| 6/9 | 43 | 02.15 |
| 6/12 | 36 | 1.8 |
| 6/18 | 24 | 1.2 |
| 6/24 | 34 | 1.7 |
| 6/36 | 14 | 0.7 |
| 6/60 | 1 | 0.05 |
| Total | 2000 | 100 |

Table 4: Children with Defective Vision in Study Population

| Classification | Frequency | Percentage |
|----------------|-------------|------------|
| 6/6 | 1848 | 92.4 |
| ≤ 6/9 | 152 | 7.6 |
| Total | 2000 | 100 |

Table 5: Distribution of Students with Refractive Error

| On Examination | Frequency | Percentage |
|---------------------|------------|------------|
| Refractive Error | 125 | 82.25 |
| No Refractive Error | 25 | 16.44 |
| Amblyopia | 2 | 1.31 |
| Total | 152 | 100 |

Table 6: Previously Known Cases and Newly Diagnosed Cases of Refractive Error

| Classification | Frequency | Percentage |
|------------------------|------------|------------|
| Previously Known Cases | 28 | 22.4 |
| Newly Diagnosed Cases | 97 | 77.6 |
| Total | 125 | 100 |

Table 7: Age Wise Distribution of Refractive Error Cases

| Age in years | Refractive Error | | Total | Age wise prevalence |
|--------------|------------------|-------------|-------------|---------------------|
| | Present | Absent | | |
| 6 – 9 | 24 | 504 | 528 | 4.54% |
| 10 – 12 | 64 | 1028 | 1092 | 5.8% |
| 13 – 15 | 37 | 343 | 380 | 9.73% |
| Total | 125 | 1875 | 2000 | 6.25% |

Chi square=10.79, df=2, p=0.004, statistically significant

Table 8: Age Wise Distribution of Type of Refractive Error Cases

| Age in years | Myopia | Hyperopia | Astigmatism with type | Total |
|--------------|------------|-----------|--|------------|
| 6 – 9 | 10 (15.3%) | 2 (50%) | 12 (21.4%) [SMA -8, CMA-2, SHA-2] | 24 |
| 10 - 12 | 30 (46.1%) | 2 (50%) | 32 (57.1%) [SMA -20, CMA-10, SHA-2] | 64 |
| 13 - 15 | 25 (38.4%) | -- | 12 (21.4%) [SMA -6, CMA-4, SHA-2] | 37 |
| Total | 65 | 4 | 56 [SMA -34, CMA-16, SHA-6] | 125 |

Table 9: Sex Wise Distribution of Type of Refractive Error Cases

| Sex | Myopia | Hyperopia | Astigmatism | Total |
|--------------|------------|-----------|---|------------|
| Boys | 25 (38.5%) | 4 (100%) | 32 (57.2%) [SMA -16, CMA-10, SHA-6] | 61 |
| Girls | 40 (61.5%) | --- | 24 (42.8%) [SMA -18, CMA-06, SHA-00] | 64 |
| Total | 65 | 4 | 56 [SMA -34, CMA-16, SHA-6] | 125 |

SMA: Simple Myopic Astigmatism, CMA: Compound Myopic Astigmatism SHA: Simple Hyperopic Astigmatism

DISCUSSION

In the present study, there were 125 children (6.25%) with refractive errors. Of these 125 children, only 28 (22.4%) were previously known cases whereas 97 (77.6%) were new found cases. Out of 125 cases with refractive error, 65 (52%) students had myopia, which was the most common refractive error, followed by 56 (44.8%) of astigmatism and only 4 (3.2%) students had hypermetropia. Amblyopia due to uncorrected refractive error (hypermetropia) was seen in 2 children. The age group of 13 to 15 years had the highest proportion of children with refractive errors among the studied population and the difference was statistically significant. Similar study on school children aged 10 to 15 years by Mehzabeen Rahman at Dibrugarh, Assam in 2013-14 found that 13 year old children had maximal prevalence (15.09%) of refractive errors followed by 11 year old children with prevalence of 13.64%. Also, maximal cases were newly found cases (42 out of 53) similar to our

study. However, they reported a significantly high prevalence of refractive errors among males as compared to females which is in contrast to our results where there is not much difference noted in prevalence of refractive errors among males and females. In their study, the prevalence of refractive errors was 8.8% and Myopia was the commonest error. Amblyopia was reported in 3 children (0.5%). They suggested early screening of school children for refractive errors to prevent amblyopia and blindness.⁸ In the Padhye AS *et al* study from Pune, Maharashtra which is near to our geographic region, the prevalence of refractive errors among urban school children was similar at 5.46%. An earlier study from Pune by Gupta R has also reported similar prevalence of 5.65%. Also, the commonest refractive error among urban children was Myopia as found in our study. They included the same age group of 6 to 15 years and observed higher prevalence of refractive errors among 13 to 15 years age group which is in line with our observations. Amblyopia was reported in 0.8% children from urban areas. The authors also recommended screening of school children with involvement of optometrists, teachers, general practitioners and school nurses. However, they suggested different approaches for urban and rural children based on differences observed among these two groups in relation to refractive errors distribution.^{1, 9} Pradhan N *et al* study on school children aged 6 – 12 years from Haryana reported a higher prevalence of 7% with Myopia again as the commonest error of refraction. They concluded that increasing use of technology in education like laptops, computers as well as for entertainment along with television viewing and mobiles maybe contributing to increasing prevalence of refractive errors among school children. Similar to other authors, they also recommended screening of school children for refractive errors.² Some studies have given very high prevalence of refractive errors in school children. Gupta M *et al* study from Shimla has found a prevalence of 22% refractive errors among 6 to 16 years age group.¹⁰ A recent systematic review done in 2018 by Sheeladevi S *et al* has reviewed studies from 1990 to January of 2017 and mentioned the prevalence of refractive errors as 10.8% among school children at a higher side as compared to our study results. Myopia was found to be commonest refractive error reported. They highlighted that refractive errors in school children has become a major health issue in India and needs urgent attention from policy makers and all stakeholders so as to address this avoidable cause of visual impairment at an optimal stage.¹¹ The study limitation is cross sectional collection of data which can only reflect the magnitude of problem among students from government schools at the point of collection of data with no prospective or

retrospective insight and there is no collection of data regarding associated risk factors or association with academic performance and quality of life to convincingly comment on the impact of this visual disorder and the associated risk factors.

CONCLUSIONS

From study results it can be concluded that there was high number of students with undetected refractive errors among school children. There is a need for screening school students for refractive errors as it can impact their quality of life especially academic performance. Moreover it is an easily correctable disorder. Its early diagnosis and management can help in prevention of more serious visual problems in these promising children.

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