

Research Article

Profile of astigmatism in school going children at state level hospital in Uttarakhand

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ABSTRACT

Background: Astigmatism is a clinically important condition and accounts for about 13% of the refractive errors of the eye. Its prevalence has been reported to vary with ethnicity, age, and sex. The aim of this study was to evaluate the profile of astigmatism in school going children and compared with similar studies in India and Asian countries.

Methods: This was prospective cross – sectional hospital based study. The children aged between 5-13 years of age attending the eye OPD during the period of one year, were screened for visual acuity. Those with visual acuity <20/40 were selected for detailed ocular examination. Statistical analysis was done by (IBM SPSS version 23) percentage and chi square test.

Results: Of the total 409 children, astigmatism was found to be present in 222 (54.27%) cases, of which 109 (49.09%) were males and 113 (50.90%) were females, With the Rule astigmatism was present in 188 (84.69%), Against The Rule astigmatism was present in 34 (15.32%) of cases.

Conclusions: Our present study showed that the single most common refractive error in primary school age children was astigmatism and emphasizes the need for more effective and regular school screening programmes.

Keywords: Astigmatism, Against the rule, With the rule, Refractive error

INTRODUCTION

In childhood, visual impairment due to uncorrected refractory error, is one of the most common problems in school aged children, and is the second leading cause of treatable blindness.¹ Approximately 12.8 million children in the age group of 5 -15yrs are visually impaired from uncorrected or inadequately corrected errors, estimating a global prevalence of 0.96%.² Astigmatism is clinically important condition and accounts for about 13% of the refractive errors of the eye.³ Its prevalence has been reported to vary with ethnicity, age, and sex.^{4,5} Astigmatism influences the normal visual development and may cause amblyopia in children.^{6,7} Presence of early astigmatism relates to the early development of myopia, possibly through the signal driven by astigmatic blur, which either aids or disrupts the emmetropization of the spherical power.⁸ Many Family studies have supported the role of genetics in astigmatism. Clementi and et al.

defined the genetic model for corneal astigmatism and provided an evidence for single major locus inheritance.⁹ Valluri et al. reported a stronger role of environment factors.¹⁰ In a study by Dobson et al., against the rule (ATR) astigmatism was 2.5 times more common than with the rule (WTR) in children younger than 3.5 yrs of age.⁴ In contrast, WTR Astigmatism was 3 times more common in children older than 5.5 yrs.¹¹ A high prevalence of astigmatism has been described in American Indian children.¹²

We conduct this study to evaluate the profile of astigmatism in school going children at state level referral hospital in Uttarakhand. The purpose of the study was to gather information on variation of astigmatism due to different factors prevalent in this region. The results were compared to similar regional studies in India and other Asian countries.

METHODS

The present study is a prospective cross sectional hospital based study conducted over a period of one year. All the children attending the eye OPD of the hospital aged between 5-13 years, underwent a preliminary examination in the form of visual acuity (VA), ocular motility, and cover uncover test. Those children with defective vision (VA < 20/40) were selected for detailed ocular examination including visual acuity, both for distance and near, subjective refraction with autorefractometer, (Righton speedy-1) objective refraction by wet retinoscopy (streak retinoscope Heinz, beta 200), keratometry, slit lamp examination and funduscopy. Autorefractometer findings (for both corneal curvature and objective refractions) were recorded as an average of minimum 5 measurements which ensured the minimum errors. The quality of examinations for each test was controlled by the leading investigators. The parents of all children were informed about the nature of the study and a written consent was obtained. The patients with history of prior ocular surgery or trauma, or any ocular disease contributing to the diminished visual acuity, manifest strabismus or retinopathy were excluded from the study. The children with all type of refractive errors on post mydriatic examination (N =409), were evaluated. Out of these 218 (53.3%) were boys and 191 (46.7%) were girls. Spherical equivalent ≤ -0.5 dioptre (D) was defined as myopia, +2D or more was defined as hypermetropia and a cylindrical refraction > than 0.75D was considered as astigmatism. Statistical analysis was done by (IBM SPSS version 23) percentage and chi square method.

RESULTS

The children were divided into three groups according to their age. 98 (23.96%) cases were between 5-7 years of age, 115 (28.12%) were between 8-10 years of age and 196 (47.92%) fell in the 11-13 years age group (Table 1).

Table 1: Percentage distribution of refractive errors in different age groups.

Age (years)	N=409 (100%)
5-7	98 (23.96%)
8-10	115 (38.14%)
11-13	196 (47.92%)

Table 2: Percentage distribution of different types of refractive errors.

Type of refractive error	n = 409 (100%)
Astigmatism	222 (54.27%)
Myopia	156 (38.14%)

Of the total 409 children, astigmatism was present in 222 (54.27%) cases, myopia in 156 (38.14%) cases and hypermetropia in 31 (7.58%) cases (Table 2).

Of the total cases studied (409), 218 (52.81%) were males and 191 (47.18%) were females. In the astigmatism group, 109 (49.09%) were males and 113 (50.90%) were females. In the myopia group, 89 (57.05%) were males and 67 (42.95%) were females. In the hypermetropia group 18 (58.07%) were males and 13 (41.94%) were females as in (Table 3)

Table 3: Gender distribution of different refractive errors.

Sex	N=409 (100%)	Astigmatism n=222 (100%)	Myopia n=156 (100%)	Hypermetropia n=31(100%)
Males	216 (52.81%)	109 (49.09%)	89 (57.05%)	18 (58.07%)
Females	193 (47.18%)	113 (50.90%)	67(42.95%)	13 (41.94%)

Table 4: Distribution of refractive errors in different age groups.

Age (years)	Refractive error n= 409 (100%)	Astigmatism	Myopia	Hypermetropia
5-7	98 (23.96%)	66 (67.35%)	14 (14.29%)	18 (18.37%)
8-10	115 (38.12%)	57 (49.56%)	49 (42.61%)	9 (7.83%)
11-13	196 (47.92%)	99 (50.51%)	93 (47.45%)	4 (2.04%)

In the 5-7 years age group, astigmatism was present in 66 (67.35%) cases, myopia in 14 (14.29%) cases and hypermetropia in 18 (18.37%) cases.

In the 8-10 years age group, astigmatism was present in 57 (49.56%) cases, myopia in 49 (42.61%) case and hypermetropia in 9 (7.83%) cases. In the 11-13 years age group, astigmatism was present in 99 (50.51%)

cases, myopia in 93 (47.45%) cases and hypermetropia in 4 (2.04%) cases (Table 4).

Table 5: Percentage distribution of different types of astigmatism.

Astigmatism	N=222 (100%)
With the rule	188 (84.69%)
Against the rule	34 (15.32%)

The astigmatism in the lower age group 5-7 is n = 66 (67.35%) while in the 11 -13 age group showed 99 cases (50.51%). The difference in between the two age groups was found to be significant for astigmatism (p value<0.05).

In the astigmatism group, with the rule astigmatism was present in 188 (84.69%) cases and against the rule astigmatism was present in 34 (15.32%) cases (Table 5).

Table 6: Age wise distribution of types of astigmatism.

Age- Group (years)	WTR Astigmatism	ATR Astigmatism
5-7 (n=66)	54 (81.81%)	12 (18.18%)
8-10 (n=57)	47 (82.45%)	10 (17.54%)
11-13 (n=99)	87 (87.87%)	12 (12.12%)

With advancing age WTR astigmatism shows an increasing trend while ATR astigmatism shows a decreasing trend as in (Table 6).

DISCUSSION

In our present study the single most common refractive error in primary school age children was astigmatism (50% to 67%) in different age group followed by myopia. Hypermetropia was least common. Astigmatism is significantly more in younger age group and less in higher age group (p value<0.05). This high percentage can be attributed to different environmental factors in our state. In different Asian and Indian studies percentage of prevalence varies from 13 per cent to 30% or higher depending on the age or ethnic groups.¹³⁻¹⁷ Human infants exhibit both high prevalence and high degrees of astigmatism, largely corneal in origin than in schoolchildren and is also known to vary with ethnicity.^{8,12,16,18-21} The reported prevalence of astigmatism in children aged 3 to 6 years varies in different studies and in different ethnicities.^{7,11,18} In Asian countries the prevalence rates of astigmatism varies from 21.1% in Hong Kong preschool children, 11.4% in Taiwan, to 6% in Chinese children.²¹⁻²³ In Indian studies, the astigmatism varies from approximately 3% in Andhra Pradesh, to 7% in New Delhi.^{23,24} Valluri et al. reported a stronger role of environment factors in development of astigmatism.¹⁰

There have been conflicting data about the association of increased percentage of astigmatism in infants with prematurity or low birth weight, and with retinopathy of prematurity, but the association of height, weight, and astigmatism have not been described in preschool children. Some but not all studies find higher rates of astigmatism among subjects with ametropia in either the myopic or hyperopic direction, particularly for higher magnitude spherical refractive errors.²⁵ The presence of high astigmatism is associated with the development of amblyopia and progressive myopia. There is conflicting studies about association between the presence of astigmatism and higher degree of myopia.⁸

In our study there is no significant difference of astigmatism between boys and girls (p value>0.05). The WTR astigmatism is more than the ATR astigmatism.

With advancing age WTR astigmatism showed the increasing trend and it was consistent with other studies.^{8,1,14,18,25}

In our study the trend and pattern of astigmatism in different age groups present results which are comparative with the other Indian and Asian studies.^{22,23,26}

CONCLUSION

The present hospital based study shows a high percentage of astigmatism in school going children in our region. It emphasizes the need for conducting large population based studies in future, to further evaluate the cause and the magnitude of astigmatism. With the help of nongovernment and government organizations, more efforts are needed to increase the number of school screening programmes and accurate prescription of spectacles to prevent the development of amblyopia due to astigmatism. Such noble efforts will help us to achieve the goal of vision 2020 by WHO.

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