

ORIGINAL RESEARCH

A Clinical Study on Prevalence, Visual and Functional impact of Astigmatism among patients attending Out Patient Department in a tertiary care hospital in UP

¹Dr. Sarjana Singh, ²Dr. Charu Jain, ³Dr. Sanjiv Kumar

¹Postgraduate Resident, ^{2,3}Professor, Department of Ophthalmology N.S.C.B Subharti Medical College and Associated Chhatrapati Shivaji Subharti Hospital, Meerut, Uttar Pradesh, India

Corresponding Author

Dr. Sarjana Singh

Postgraduate Resident, Department of Ophthalmology N.S.C.B Subharti Medical College and Associated Chhatrapati Shivaji Subharti Hospital, Meerut, Uttar Pradesh, India

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ABSTRACT

Introduction: One of the most significant and intriguing feature of the human body is the human eye. The physiological function of human eye is visual perception. There are three basic types of refractive errors namely: astigmatism, hyperopia and myopia. Astigmatism is a refractive condition in which parallel rays of light entering the eye are brought to a focus at two different focal lines which are perpendicular to each other, instead of focusing to a single focal point. It happens due to meridional variations in the curvature and/or refractive index and/or alignment of the eye's optical components along their principal meridians. **Methods:** A prospective study was conducted to know about prevalence of astigmatism and its visual and functional impact in patients at the Department of Ophthalmology, Netaji Subhash Chandra Bose, Subharti Medical College, and Meerut among 2736 subjects coming for evaluation of refractive errors. **Results:** Out of 2736 subjects 500 subjects had astigmatism of which 46.6% and 53.4% of the subject were male and female respectively. Maximum subjects were from the age group of 5-14 years (36.8%) followed by 15-24 (23.2%) and 25-34 years (19.6%). Minimum subjects were from the age group of >44 years (8%). Cylinder severity viz. $\leq 1DC$, $\geq 1DC-\leq 1.5DC$, $\geq 1.5DC-\leq 2DC$ and $>2DC$ was found in 492 (98.4%), 5 (1%), 2 (0.4%) and 1 (0.2%) subjects respectively. Cylinder severity viz. $\geq 1.5DC$ was reported only among subjects having age >44 years. $\leq 1DC$ cylinder severity was reported maximum among subjects with age group of 5-14 years followed by 15-24 years. Compound myopic astigmatism 54.2% was the most common type of astigmatism among the study subjects followed by simple myopic astigmatism 31.4%. Least common type of astigmatism was mixed type astigmatism 1.4% followed by compound hypermetropic astigmatism 5.4%. Maximum subjects with magnitude $\leq 1DC$ had compound myopic astigmatism 53.2% followed by simple myopic astigmatism 31.2%. Headache, reading difficulty, computer use, driving difficulty was revealed in 96.8%, 92.2%, 41.2% and 29.8%. **Conclusion:** Astigmatism was found more in females 53.4% as compared to males 46.6%. 2. Maximum subjects with astigmatism were from the age group of 5-14 years (36.8%) followed by 15-24 (23.2%) and 25-34 years (19.6%). 3. Compound myopic astigmatism 54.2% was the most common type of astigmatism among the study subjects followed by simple myopic astigmatism 31.4%. Least common type of astigmatism was mixed astigmatism 1.4% type followed by compound hypermetropic astigmatism 5.4%. 4. Simple hypermetropic astigmatism 7.6%, compound hypermetropic astigmatism 5.4% and mixed type of astigmatism 1.4% was associated more with age >35 years while simple myopic astigmatism and compound myopic astigmatism 31.4% and 54.2% respectively was found more in 5-14 and 15-24 year age group. 5. Cylinder severity viz. $\geq 1.5 DC$ was reported only among 1.4% subjects having age >44 years. $<1DC$ cylinder severity was reported maximum 84.4% among subjects with age group of 5-14 years followed by 15-24 years. Headache, reading difficulty, computer use and difficulty in driving was revealed in 96.8%, 92.2%, 41.2% and 29.8% of the subjects respectively.

Keywords: Astigmatism, Refractive Error

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INTRODUCTION

One of the most significant and intriguing feature of the human body is the human eye. The eye comprises of a lens system, a variable aperture system (the pupil)

and a retina that corresponds to the film. The physiological function of human eye is visual perception.¹⁻²

The refractive errors are categorized mainly into spherical or cylindrical. There are three basic types of refractive errors namely: astigmatism, hyperopia and myopia (Borish,1975).³

Astigmatism is a refractive condition in which parallel rays of light entering the eye are brought to a focus at two different focal lines which are perpendicular to each other, instead of focusing to a single focal point. It happens due to meridional variations in the curvature and/or refractive index and/or alignment of the eye's optical components along their principal meridians. Uncorrected astigmatism can lead to substantial reductions in visual performance and can be associated with altered visual and refractive development.⁴

Astigmatism can be classified as total astigmatism (physiologic i.e. anterior corneal plus residual astigmatism); corneal astigmatism (with-the-rule/direct, against-the-rule/inverse or oblique); by degree (as low, medium or high); symmetric/asymmetric astigmatism (when referred to both cornea); irregular astigmatism (e.g. conical cornea); and some special types like lenticular astigmatism; hyperopic astigmatism; myopic astigmatism; mixed astigmatism etc.⁵

Its prevalence is disparate in different parts of the world according to age, sex, ethnicity, and geographical location. Astigmatism is important from various aspects of vision and its development. Foremost, it may cause symptoms such as blurring, asthenopia and headache. Second, the presence of marked astigmatism during the development of the visual system can lead to meridional amblyopia in children.⁶⁻⁷

Finally, this type of refractive error may disturb emmetropization causing a blurred image on the retina.⁸⁻⁹

The consequences of uncorrected astigmatism depend upon clinical measures of distance and near vision. It is also implied that astigmatism may have substantial functional visual impacts that could affect the ability to perform everyday tasks such as reading, computer work and driving, thus affecting the quality of life. It has been shown that astigmatism significantly decreases the functional near vision measures. In young adults, even relatively small levels (1.00 D) of induced astigmatism showed reduced reading performance, in particular for induced ATR astigmatism and smaller print sizes.¹⁰

The present study was conducted to analyse the prevalence of astigmatism and its visual and functional impact in patients attending eye out patient department.

MATERIAL AND METHOD

INCLUSION CRITERIA

1. Age group from 5 years upto age >44 years including both male and females.
2. Patients coming for evaluation of refractive errors.

EXCLUSION CRITERIA

1. History of prematurity in children.
2. Patients with corneal pathologies: ulcer, opacity, degeneration and dystrophy.
3. Pre-existing ocular diseases involving anterior segment: pterygium, uveitis, glaucoma.
4. Retinal pathologies such as diabetic retinopathy, hypertensive retinopathy, retinal vascular occlusion and retinal dystrophy.
5. Pre-existing macular pathologies such as epiretinal membrane, macular hole or age related macular degeneration, cystoid serous retinopathy, maculopathy.
6. Previous intraocular surgery or laser treatment such as cataract surgery, LASIK, glaucoma surgeries or pterygium excision.

Data like name, age, sex, phone number; questionnaire including difficulty in reading, driving, computer reading, complains of headache, history of strabismus was collected. Visual acuity using Snellen's chart and automated refractor, slit lamp biomicroscopy was recorded in OPD.

RESULTS

Out of 2736 subjects 500 subjects had astigmatism of which 46.6% and 53.4% of the subjects were male and female respectively. Hence females were comparatively more as compared to males.

Maximum subjects were from the age group of 5-14 years (36.8%) followed by 15-24 (23.2%) and 25-34 years (19.6%). Minimum subjects were from the age group of >44 years (8%).

Cylinder severity viz. $\leq 1DC$, $\geq 1DC \leq 1.5DC$, $\geq 1.5DC \leq 2DC$ and $>2DC$ was found in 492 (98.4%), 5 (1%), 2 (0.4%) and 1 (0.2%) subjects respectively.

Compound myopic astigmatism 54.2% was the most common type of astigmatism among the study subjects followed by simple myopic astigmatism 31.4%. Least common type of astigmatism was mixed type astigmatism 1.4% followed by compound hypermetropic astigmatism 5.4%.

The most common type of astigmatism in this study is with-the-rule astigmatism WTR (73.2%).

Majority of subjects with magnitude $\leq 1DC$ had BCVA 6/6-6/6P 89.6%. Whereas BCVA of $\leq 6/60$ 0.8 was seen with magnitude $>1DC$.

Headache, reading difficulty, computer use, driving difficulty was revealed in 96.8%, 92.2%, 41.2% and 29.8%.

Majority of subjects in the younger age group 5-24 years had headache 61% and reading difficulty 62.2%.

Majority of subjects in the age group 25-34 years had difficulty in computer use 43.6%. Subjects of age > 25 years presented with driving difficulty 30%.

DISCUSSION

The present prospective study was conducted in the department of Ophthalmology at Netaji Subhash Chandra Bose Subharti Medical College among 2736 subjects coming for evaluation of refractive errors.

PREVALENCE

Out of 2736 subjects examined during the study period we found astigmatism in 18.27% (500) of the subjects. In a study by Emerole CG et al¹¹, a prevalence of 20.9% of astigmatism was found in the study groups. A prevalence of 27.4% of astigmatism was found in the pilot study among patients attending the eye clinic of the University of Nigeria Teaching Hospital, Enugu 12.

Out of 500 astigmatic subjects, 46.6% and 53.4% of the subjects were male and female respectively. Hence females were comparatively more as compared to males in this study.

Similarly Emerole CG et al¹¹ in their study showed that 61.1% of the females were astigmatic in their study.

The higher prevalence of astigmatism in females than males may be due to the fact that the female genders were more in number in this study. Also motherhood and female gender roles in the family and community in the area of domestic chores and peasant farming make more demand on women's vision.

Maximum subjects were from the age group of 5-14 years (36.8%) followed by 15-24 (23.2%) and 25-34 years (19.6%). Minimum subjects were from the age group of >44 years (8%) in the present study. The mean age in our study is 22.16 years.

According to Emerole CG et al 2013¹¹, the mean age of subjects in this study was 44.5 years. This difference in age might be due to the inclusion criteria as they have done study on adult age group only.

Compound myopic astigmatism was the most common type of astigmatism among the study subjects followed by simple myopic astigmatism. Least common type of astigmatism was mixed type followed by compound hypermetropic astigmatism.

In the present study, cylinder severity viz. ≤ 1 DC, $1 < DC \leq 1.5$ DC, $1.5 < DC \leq 2$ DC and > 2 DC was found in 492 (98.4%), 5 (1%), 2 (0.4%) and 1 (0.2%) subjects respectively. Cylinder severity viz. > 1.5 DC was reported only among subjects having age > 44 years. < 1 DC cylinder severity was reported maximum among subjects with age group of 5-14 years followed by 15-24 years.

Emerole CG et al(2013)¹¹ in their study showed that Astigmatism of ≤ 1.00 DC was found in 96.1% of the study groups. The range of astigmatic refractive power was $- 0.25$ DC to 3.50 DC. These findings are similar to our study which was -0.25 DC to 4 DC.

The most common type of astigmatism in this study is with-the-rule WTR astigmatism (73.2%). Oblique type of astigmatism in this study was only found in 2.4% of the subjects. In our study a strong association between with-the-rule astigmatism and myopia was seen especially in the younger age group 5-24 years (59.8%).

Arvind H. et al (2004)¹³ found the prevalence of against-the-rule increases with age and with-the-rule astigmatism decreases with age. It was seen increased li laxity with age causing flattening of the vertical

corneal meridian, thereby decreasing with-the-rule astigmatism and increases against-the-rule astigmatism ATR.

Out of 2736 subjects who presented to OPD for refraction 500 were observed to have astigmatism. In our study only 451 subjects 90.2% subjects got 6/6-6/6P best corrected visual acuity after complete cycloplegic refraction. 448 subjects 89.6% with 6/6-6/6P as BCVA had magnitude of ≤ 1 DC. Along with magnitude of astigmatism, axis of astigmatism also had visual impact; significant reduction in vision and blurring of vision was seen maximally with with-the-rule astigmatism and least with against-the-rule astigmatism. Vincent and Michael J Collins (2014)¹⁴ in their study revealed the influence of astigmatic blur upon visual function. It was even seen that higher magnitude of astigmatism typically results in greater decrements in visual performance, this was found due to cylindrical power and conditions such as age of the subject, power of accommodation, axis of orientation). Headache, reading difficulty, computer reading and difficulty in driving was revealed in 96.8%, 92.2%, 41.2% and 29.8% of the subjects respectively.

CONCLUSION

Astigmatism is one of the most common refractive errors accounting to be 18.27% managed in clinical ophthalmic practice. From lower degrees of with-the-rule WTR astigmatism 73.2% in children, there is a trend towards higher magnitudes of against the-rule ATR astigmatism 24.4% in adults and especially the elderly. However, the majority of this change tends to occur after the age of > 44 years with subjects demonstrating a relatively stable refractive astigmatism profile into their 40s.

Astigmatism has strong impact on the functional life in terms of headache, reading difficulty, computer use and driving difficulty. Headache along with asthenopic symptoms was seen in younger age group 5-24 years 61% while reduced reading performance involving reading difficulty and reduced reading speed was seen in age groups 5-24 years 62.2% and > 30 years 34.8% respectively. Subjects 43.6 %with computer based work had reduced work performance affecting their work life.

Majority of subjects > 25 years 30% of age predominantly the male population with astigmatism experienced difficulty in driving mainly in sub optimal conditions. Thus, an important finding from this work suggests that utilizing data from individuals > 44 years and younger may give a more consistent measure of astigmatism providing greater power to identify genetic and environmental factors contributing to the refractive error.

Astigmatism also influences the quality of life. Hence the significant visual and functional impacts of astigmatism emphasize the importance of its reliable clinical management.

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