

**ORIGINAL RESEARCH**

# A study on prevalence of astigmatism among myopic patients attending tertiary eye hospital

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**ABSTRACT**

**Introduction:** Astigmatism tends not change significantly in refractive surgeries. In the management of myopia and astigmatism, the treatment of astigmatism should consider the predicted astigmatic reduction that would be achieved by treating myopia alone as the relationship between total astigmatism by treating only spherical component of myopia.

**Aims:** To assess the prevalence of astigmatism among myopic patients attending a tertiary eye hospital.

**Materials and methods:** Cross sectional observational study in 200 patients of 10-30 years with myopic refractive error of -0.5 D and above. Spherical power of -0.5 to -3 was considered as low myopia 3 to -6 was considered moderate myopia and greater than -6 was taken as high myopia.

**Results:** Cylindrical power of greater than -0.25 was considered. Out of 200 study sample, 111(55.5%) subjects were from 11-20 years age group followed by 89(44.5%) subjects in 21-30 years age group. There were 104 females(52%) and 96 males (48%), the range of ages that were considered were 11-30 years. There is inverse correlation between myopia and total astigmatism. As the spherical power increased a statistically significant decrease in the cylindrical power was seen with Right eye correlation coefficient,  $r=-0.255$ ;  $p=0.001$ , Left eye  $r=-0.316$ ;  $p=0.001$ . There was no correlation between myopia and corneal astigmatism. Right eye  $r=0.001$ ;  $p=0.995$ , LE  $r=-0.15$ ;  $p=0.838$ . In right eye low myopia eyes, simple myopia was present in 51(20%) whereas 96(80%) had myopia with astigmatism. Among people with moderate myopia, simple myopia was present in 21.4%, 78.6% had myopia with astigmatism. Among high myopia patients simple myopia was present in 9(15.6%) myopia with astigmatism in 27(84.4%). In left eye low myopia eyes, simple myopia was present in 27(21.8%) whereas 97(78.2%) had myopia with astigmatism. Among people with moderate myopia, simple myopia was present in 25.7%, 74.3% had myopia with astigmatism. Among high myopia patients simple myopia was present in 4(11.4%) myopia with astigmatism in 31(88.6%).

**Conclusions:** In our study relationship between myopia and astigmatism is established so potential application in knowing and estimating the progression of spherical and cylindrical power among the population.

**Keywords:** Cylindrical power, High myopia, Astigmatism, myopic patients.

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**INTRODUCTION**

Among the global population with moderate or severe vision impairment (216 million in 2015), the leading causes were uncorrected refractive error followed by cataract. The impact of uncorrected error included social isolation, reduced educational and employment opportunities, increase morbidity and economic distress. The right to site initiation vision 2020 was founded in 1999 with the goal of eliminating avoidable blindness by prioritizing a few particular causes of vision impairment and blindness based on

their distribution, impact on the community, management potential and affordability. One of the five priority issues addressed is refractive error. According to the most recent global estimate 12.8 million children between the ages of 9-15 suffer from refractive error related visual impairment[2]. Myopia currently is widely recognized as a significant public health issue causing significant visual loss and a risk factor for a range of other serious ocular conditions.[1,2] The prevalence of myopia is increasing on global basis, for reasons that

are not understood. Although partial reduction in progression rates have been observed from pharmacologic therapies, optical treatment and behavioral modification we are a long way from being able to reverse the temporal trends of the last few decades, This makes myopia and its associated complications, a high research priority. Studies have been done previously to find out a correlation between myopia and astigmatism. [3,4] But the final results were inconclusive as some studies showed a positive correlation whereas some showed a negative correlation. The aim of this study was to find the prevalence of astigmatism among myopes and to find a possible correlation between myopia and astigmatism among patients attending tertiary eye hospital. A correlation between the spherical and cylindrical power, if any would help us in the understanding and prediction of progression of refractive errors with age. Astigmatism tends not to change significantly in refractive surgeries. [5] In the management of myopia and astigmatism, the treatment of astigmatism should consider the predicted astigmatic reduction that would be achieved by treating myopia alone as the relationship between total astigmatism by treating only spherical component of myopia. Also, the presence and changes in astigmatism have been found by some investigators to be associated with an increased progression of myopia.

## MATERIALS AND METHODS

Cross sectional observational study in 200 patients with a myopic refractive error.

**Inclusion criteria:** patients 10-30 years with myopic refractive error of  $-0.5$  D and above.

**Table.1: Demographic distribution in present study.**

Age intervals	Frequency	Percentage
11-20	89	44.5
21-30	111	55.5
Total	200	100
<b>Gender</b>		
Male	104	52
Female	96	48

Out of 200 study sample, 111(55.5%) subjects were from 11-20 years age group followed by 89(44.5%) subjects in 21-30 years age group. There were 104 females(52%) and 96 males (48%) in the study, the range of ages that were considered were 11-30 years

**Table-2: Types of Astigmatism in both eyes in present study**

Right eye	Frequency	Percentage
Simple myopia	38	19
Simple myopic astigmatism	6	3
Compound myopic astigmatism	156	78
<b>Left eye</b>		
Simple myopia	40	20
Simple myopic astigmatism	6	3
Compound myopic astigmatism	154	77

**Exclusion criteria:** patients who underwent any ocular surgeries, index myopia and pathological myopia, other ocular pathology. Patients between the age 10-30 years and both sexes who were coming to ophthalmology OPD at a tertiary eye hospital of Sarojini devi eye hospital Hyderabad were studied. 200 subjects having myopia and myopic astigmatism were taken into consideration. Brief history was taken along with important demographic factors. All the participants have undergone a thorough ophthalmology examination. Vision including objective and subjective refractive were done to get the best corrected visual acuity. Subjective refraction was done using illuminated snellens chart, trial frame and trial lenses. Objective refraction was done by cycloplegic retinoscopy using a retinoscope and automated refractometer. Keratometric data was recorded using Bausch and Lomb keratometer axial length were recorded using ultrasound biometry. Detailed anterior segment evaluation was done along with fundus evaluation using slit lamp bio microscopy/indirect ophthalmoscopy. The following parameters were assessed in each and their significance verified by statistical means: Prevalence of astigmatism among myopes. Prevalence of astigmatism error among low moderate and high myopes. Correlation between myopia and total astigmatism using Pearson's correlation coefficient. All details of participants were kept under strict confidentiality. Microsoft excel was used to enter data and statistical analysis.

## RESULTS

In this study 200 patients with myopia and myopic astigmatism were analyzed

Among the 400 eyes of 200 patients simple myopia was present in 78 eyes(19.5%) simple myopic astigmatism in 12 (3%) compound myopic astigmatism in 310(77.5%). Therefore, in our study only 19.5% of myopes had simple myopia whereas 80.5% had myopia with astigmatism.

**Table.3: Correlation of myopia with total and corneal astigmatism of right eye**

Correlations		RE CYL	RE Kv-Kh
	Pearson correlation	0.255	0.001
<b>RE SPH</b>	P- Value	0.001	0.995
	N	156	194

**Table.4: Correlation of myopia with total and corneal astigmatism of left eye**

Correlations		LE CYL	LE Kv-Kh
	Pearson correlation	0.316	0.015
<b>LEE SPH</b>	P- Value	0.001	0.838
	N	153	194

Our study found an inverse correlation between myopia and total astigmatism. As the spherical power increased a statically significant decrease in the cylindrical power was seen with Right eye : correlation coefficient ,  $r=-0.255$ ;  $p=0.001$ : Left eye  $r=-0.316$ ;  $p=0.001$

There was no correlation between myopia and corneal astigmatism. Right eye  $r=0.001$ ;  $p=-0.995$ , LE  $r=-0.15$ ;  $p=0.838$ .

**Table.5: Correlation of right and left eye**

RE myopia RE type	Simple myopia	Compound myopic astigmatism	total
Low myopia	24(20%)	96(80%)	120 (100%)
Moderate myopia	9(21.4%)	33(78.6%)	42(100%)
High myopia	5(15.6%)	27(84.4%)	32(100%)
LE myopia LE type			
Low myopia	27(21.8%)	97(78.2%)	124 (100%)
Moderate myopia	9(25.7%)	26(74.3)	35(100%)
High myopia	4(11.4%)	31(88.6%)	35(100%)

In right eye low myopia eyes, simple myopia was present in 24(20%) whereas 96(80%) had myopia with astigmatism. Among people with moderate myopia , simple myopia was present in 21.4%, 78.6% had myopia with astigmatism. Among high myopia patients simple myopia was present in 9(15.6%) myopia with astigmatism in 27(84.4%). In

left eye low myopia eyes, simple myopia was present in 27(21.8%) whereas 97(78.2%) had myopia with astigmatism. Among people with moderate myopia , simple myopia was present in 25.7%, 74.3% had myopia with astigmatism. Among high myopia patients simple myopia was present in 4(11.4%) myopia with astigmatism in 31(88.6%).

**Table.6: Comparison of correlation coefficient with other studies**

	Correlation coefficient	P value
This study	-0.25/-0.31	0.001
Michela Fresina et al[18]	-0.28	0.0001
Kaye SB et al[19]	0.38	0.0008

**Table.7: Comparison of age group with other studies**

	Age groups
This study	10-30 years
Michela fresina et al[18]	4-59 years
Kaye SB et al[19]	21-55 years

## DISCUSSION

The principle aim of this study was to find the prevalence of astigmatism among myopes and to find out if there was a correlation between myopia and astigmatism. In this study spherical power of -0.5 to -3 was considered as low myopia 3 to -6 was considered moderate myopia and greater than -6 was taken as high myopia. Cylindrical power of greater than -0.25 was considered. Out of 200 study sample, 111(55.5%)

subjects were from 11-20 years age group followed by 89(44.5%) subjects in 21-30 years age group. There were 104 females(52%) and 96 males (48%), the range of ages that were considered were 11-30 years . Among the 400 eyes of 200 patients simple myopia was present in 78 eyes(19.5%) simple myopic astigmatism in 12 (3%) compound myopic astigmatism in 310(77.5%). Therefore , in our study only 19.5% of myopes had simple myopia whereas

80.5% had myopia with astigmatism. Among the low myopia eyes, simple myopia was present in 51(20%) whereas 193(80%) had myopia with astigmatism. Among people with moderate myopia, simple myopia was present in 18%, 78.6% had myopia with astigmatism. Among high myopia patients simple myopia was present in 9(15.6%) myopia with astigmatism in 58(84.4%). A study in Asia by Natung *et al.* reported a prevalence of 55.56% among patients who visited a hospital in North-East India.[6] Studies in Africa have also reported a prevalence of 50% and above for refractive error.[7,8,9] This high prevalence shows that vision impairment caused by URE is a major public health challenge; hence, adequate provisions are needed in developing countries such as PNG. In contrast, Kaiti *et al.* and Bhardwaj *et al.* reported a lower prevalence of refractive error in Nepal and India, respectively.[10,11] This difference can be attributed to the greater number and availability of eye care personnel in the catchment area of these facilities. Furthermore, Abraham and Megbelayin did not exclude other ocular comorbidities in their study.[9] The cylindrical power determined through cycloplegic refraction and subjective refraction was taken as total astigmatism. The difference between the keratometric values between the two principal meridians as determined by keratometer was taken as corneal astigmatism. Our study found an inverse correlation between myopia and total astigmatism. As the spherical power increased a statistically significant decrease in the cylindrical power was seen with Right eye: correlation coefficient,  $r = -0.255$ ;  $p = 0.001$ ; Left eye  $r = -0.316$ ;  $p = 0.001$ . There was no correlation between myopia and corneal astigmatism. Right eye  $r = 0.001$ ;  $p = -0.995$ , LE  $r = -0.15$ ;  $p = 0.838$ . The likelihood of the aged having a visual impairment is high compared to children, youth, and younger adults, as reported by previous studies.[12,13,14,15] On the other hand Kaye SB, Patterson *et al.* who analysed refractive and keratometric data for 105 eyes of 105 patients with myopia and astigmatism who attended a photorefractive keratectomy (PRK) assessment clinic showed that there was a strong correlation between total astigmatism (A) and degree of myopia. This could be represented by a linear regression line in the form  $A = -0.13 * \text{myopia} + 0.86$  (at the corneal plane). The refractive data of the patients having PRK were also analysed before and after treatment.

Scott A *et al.* studies on Astigmatism and other refractive errors showed that astigmatism was associated with higher degree of myopia. This finding is similar to studies in hospitals in developing countries with reports that myopia is the leading type of refractive error followed by hyperopia and astigmatism.[7,8,9,16] The high prevalence of astigmatism instead of myopia can be attributed to the difference in geographical locations and

ethnicity.[17] Nonetheless, globally, myopia is the most prevalent type of refractive error.[17]

## CONCLUSIONS

The attraction of cataract surgery, vitreousness of eye banking, the mass appeal of glaucoma awareness walks, and the glamor of the gadget-driven diabetic retinopathy screening have pushed the major problem of uncorrected refractive error to the background. It would help immensely in knowing the association and relationships between various aspects of refractive errors to curate treatment and follow up accordingly. There is still scope for research in this aspect as there is no definitive known established association yet. Clearly further investigation of the relationship between myopia and astigmatism is needed as it has potential application in knowing and estimating the progression of spherical and cylindrical power among the population. It also has application in refractive surgeries. It would be wise for eye care professionals, civil society, and the relevant government departments to realize the immense economic burden of uncorrected refractive errors and the simple and cost effective solutions that it has.

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