

## A Tertiary Care Hospital Study of Patients Having Cataract Surgery with Corneal Astigmatism

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### Abstract

**Background:** The only way to treat a cataract, which is an opacity of the eye's lens and one of the leading causes of blindness globally, is through surgery. Both spherical and cylindrical components need to be adjusted during surgery for the greatest postoperative visual performance.

**Aims & Objectives:** This study's objectives were to assess the clinical profiles of patients with astigmatism who were scheduled for cataract surgery at our tertiary hospital and to report the prevalence of corneal astigmatism.

**Material and Methods:** The astigmatism of the cornea was measured in the current cross-sectional study, which was carried out on patients scheduled for cataract surgery.

**Results:** In total, 920 patients with 920 eligible eyes were scheduled for cataract surgery during the study period. Males made up the majority (55.22%) of the population with a gender ratio of 1.23:1 and a mean age of 67.4 13.4. The majority of cataracts (45.43%) and nuclear sclerosis (38.91%) were of the mixed type. Other less frequent kinds included cortical cataract (2.39%), mature cataract (5.22%), posterior sub capsular opacification (7.61%), and developing cataract (0.43%). K1 and K2 had mean keratometry values of 42.10 and 42.45 D, respectively, with a range of 32 to 51 D. Mean astigmatism of the cornea was 0.45 0.41 D, with a range of 0 to 5.31 D. The range of the cylinder was 0-2.25 D, and the mean sphere was 1.25 1.46 D. The mean cylinder was 0.20 0.30 D. In the current investigation, astigmatism was absent in 8.04% of patients, but oblique astigmatism was present in 14.78%. With the rule astigmatism was present in the majority of instances (41.09%), followed by against the rule astigmatism (36.09%).

**Conclusion:** Astigmatism worsens with age, and a sizable portion of patients have preoperative corneal astigmatism of 1D or higher, which might impair the quality of vision after cataract surgery. The majority of them are treatable with straightforward, affordable keratorefractive techniques.

**Keywords:** Preoperative Assessment, Corneal Astigmatism, Cataract Surgery, Keratorefractive Procedures.

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### Introduction:

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The only way to treat a cataract, which is an opacity of the eye's lens and one of the leading causes of blindness globally, is through surgery [1]. The currently recommended method of treating symptomatic cataracts is cataract extraction together with the placement of an artificial Intraocular Lens (IOL) implant [2]. The major goals of cataract surgery nowadays are quick visual recovery, the highest level of uncorrected vision, and the least amount of postoperative astigmatism. Ocular astigmatism is a refractive disorder brought on by uneven corneal and crystalline lens curvatures, lens decentration or tilting, or uneven refractive indices across the crystalline lens [3-5]. According to reports, the proportion of cataract patients who have anterior corneal astigmatism of more than one diopter (D), more than two diopters (D), or both ranges from 32.5 to 45.5%, 21.0 to 26.20 percent, and 8%, respectively. Both spherical and cylindrical components need to be adjusted during surgery for the greatest postoperative visual performance [6,7]. This study's objectives were to assess the clinical profiles of patients with astigmatism who were scheduled for cataract surgery at our tertiary hospital and to determine the prevalence of corneal astigmatism.

**Aims & Objectives:** This study's objectives were to assess the clinical profiles of patients with astigmatism who were scheduled for cataract surgery at our tertiary hospital and to determine the prevalence of corneal astigmatism.

### Material and Methods

The current study, a cross-sectional investigation, was carried out in the central Indian department of ophthalmology. The study was carried out from January to December 2020. The institutional ethical committee gave its clearance for the study.

The presence of patients who have been scheduled for cataract surgery

Patients with corneal disorders, irregular astigmatism, a history of ocular inflammation, and those who have had corneal or intraocular surgery are excluded.

After a formal informed consent was obtained, the study was discussed.

All cases underwent a full ophthalmological evaluation, general/systemic examination, and history taking (current, prior medical/surgical) (visual assessment, slit lamp anterior segment examination and ophthalmoscopy through the dilated pupils). IOL measured the curvature of the cornea. An experienced technician collected the keratometry readings for the successive patients, and an average of three measurements of the parameters was analysed. Corneal astigmatism (CA) was classified as either with the rule (WTR) or against the rule (ATR) depending on whether the meridian of maximum curvature was within 308 of the vertical 908 or the horizontal 1808, or as oblique (OBL) if it was neither WTR nor ATR. Microsoft Excel was used to construct and collect the data. Descriptive statistics were used in the statistical analysis.

### Results

In total, 920 patients with 920 eligible eyes were scheduled for cataract surgery during the study period. Males made up the majority (55.22%) of the population with a gender ratio of 1.23:1 and a mean age of 67.4 13.4. The majority of cataracts (45.43%) and nuclear sclerosis (38.91%) were of the mixed type. Other less frequent kinds included cortical cataract (2.39%), mature cataract (5.22%), posterior sub capsular opacification (7.61%), and developing cataract (0.43%).

**Table 1: General characteristics**

Characteristic	Numbers (n) / Mean $\pm$ SD	Percentage (%)
Number of patients/ Number of eyes	920	
Age range (years)	14-82	
Mean age (years)	67.4 $\pm$ 13.4	
Gender		
Male	308	55.22%
Female	412	44.78%
Gender ratio (Male: Female)	1.23:1	
<b>Types of cataracts</b>		
Mixed type	418	45.43%
Nuclear sclerosis	358	38.91%
Posterior sub capsular opacification	70	7.61%
Mature cataract	48	5.22%
Cortical cataract	22	2.39%
Developmental cataract	4	0.43%

K1 and K2 had mean keratometry values of 42.10 and 42.46 D, respectively, with a range of 32 to 51 D. The range of corneal astigmatism was 0-5.32 D, with a mean of 0.40 0.41 D. The range of the cylinder was 0-2.25 D, and the mean sphere was 1.25 1.46 D. The mean cylinder was 0.20 0.30 D.

**Table 2: Keratometry values**

Keratometry values	Value / Mean $\pm$ SD
Mean keratometry (D)	
K1	42.10
K2	42.46
Mean corneal astigmatism (D)	0.46 $\pm$ 0.41
Range of corneal astigmatism (D)	0- 5.31
Range of Keratometry	32-51
Mean sphere (D)	1.26 $\pm$ 1.46
Mean cylinder (D)	0.20 $\pm$ 0.30
Range of cylinder (D)	0-2.25

In the current investigation, astigmatism was absent in 8.04% of patients, but oblique astigmatism was present in 14.78%. With the rule astigmatism was present in the majority of instances (41.09%), followed by against the rule astigmatism (36.09%).

**Table 3: Distribution of different types of corneal astigmatism**

Types of astigmatism	Numbers (n)	Percentage (%)
With the rule	378	41.09%
Against the rule	332	36.09%
Oblique astigmatism	136	14.78%
No astigmatism	74	8.04%

## Discussion

Spherical refractive errors have become far less common thanks to improvements in IOL power computation, but postoperative

astigmatism remains a concern for both patients and ophthalmologists since it might result in symptoms of impaired vision [8-10]. Age-related changes in ATR and WTR are thought to be caused by a

number of causes, including physiological changes in the corneal curvature, pressure from the eyelids, pressure from intraocular pressure, and pressure from the extraocular muscles. Making limbal or corneal relaxing incisions during cataract surgery or implanting toric IOLs are two typical ways to treat preexisting corneal astigmatism [11]. Axis phacoemulsification, opposite clear corneal incisions (OCCI), limbal relaxing incisions (LRI), excimer laser refractive procedures, femtosecond laser-assisted astigmatic keratotomy, and toric intraocular lens (IOL) implantation are a few of the methods available to reduce preexisting corneal astigmatism. 185 participants, 225 eyes, and 61.3% of the eyes investigated by Chaudhary M. were female eyes. The subjects' average age was 64.45 ± 12.89 years. The average amount of astigmatism in the cornea was 0.84 ± 0.80 D. 16.9% of people had corneas with no discernible astigmatism, compared to 65.3% who had astigmatism between 0.25 and 1.50 diopters and 17.8% who had astigmatism of at least 1.50 D. 44.4% of the eyes had astigmatism that was with-the-rule (axis of the correcting cylinder 180°), 40.04% of the eyes had astigmatism that was against-the-rule (ATR) (correcting minus cylinder 90°), and 12.9% of the eyes had oblique astigmatism [12-14]. A little more than two thirds of cataract patients had astigmatism of 1 D or less before surgery. 50.3% of the 3597 eyes tested by Sharma A et al. were female, with a mean age of 59.12 ± 15.19. All patients' average corneal astigmatism was 1.17 ± 1.15 D. (range 0–12.5 D). 99 eyes (2.78%) had no astigmatism, 1062 eyes (29.83%) had with-the-rule astigmatism, 1843 eyes (51.72%) had against-the-rule astigmatism, and 555 eyes (15.59%) had oblique astigmatism. As people aged, there was a tendency for their astigmatism to gradually shift from with the rule (WTR) to against the rule (ATR). In developing nations in particular, 56.69% of eyes had corneal

astigmatism of less than 1.0 D, which can be treated with straightforward, affordable keratorefractive procedures [15]. While 40.49% of the patients had corneal astigmatism greater than 1.0 D, toric intraocular lenses may be helpful. Similar results were seen in the current investigation. Gupta PS. investigated 370 eyes from 370 individuals, with a mean age of 60.43 ± 9.9 years and a male to female ratio of 50.54%. K, K1, and K2 had respective means of 44.23 ± 1.65 D, 43.75 ± 1.68 D, and 44.71 ± 1.74 D. Nearly 82.16 percent of the people under study had mean corneal astigmatism of 1.5 D. The corneal astigmatism was oblique in 17.83%, with the rule (WTR) in 27.29%, and against the rule (ATR) in 52.16%. Both in boys and females, astigmatism gradually changes over time from WTR to ATR, reaching its peak in the sixth decade of life [16]. Similar results were seen in the current investigation. According to Moulick PS et al study, 's the mean CA of 223 eyes from 223 patients—with a mean age of 61 ± 10 years (ranging from 29 to 90 years)—was 0.88 ± 0.61 (95% CI, 0.80-0.96) and oblique astigmatism (OBL) in 27.8%, 51.1%, and 21.1% of cases, respectively. ATR surpasses WTR between 40 and 50 years and reaches 100% by 80 years. Up to 60 years, a trend of decreased negative CA was observed; after that, it increased up until 90 years. 17.5% of eyes had CA less than 0.25 diopters (D), 63.7% had CA between 0.25 and 1.25 D, and 18.8% of eyes had CA greater than 1.50 D. 1000 eyeballs belonging to 880 patients were examined in the Joshi RS study. It was 65.1 ± 10.12 years on average. The astigmatism was 0.89 ± 0.63 D on average. There were 179 eyes (17.9%) with astigmatism between 1.00 and 1.49 D, 34 eyes (3.4%) with astigmatism between 2.00 and 2.5 D, and 20 eyes (2%) with astigmatism more than 3 D. 325 eyes (32.5%) had astigmatism more than one D overall. Astigmatism was present against the rule in 44.6% of instances, oblique astigmatism in 32% of

cases, and with the rule in 20.7% of cases. Contrary to expectations, astigmatism grew worse with age and peaked between ages 60 and 69. The corneal curvature of men's eyes was flatter than that of women's [16]. The mean intraocular lens power was  $21.05 \pm 1.0D$ , and the mean axial length was 25.59 mm. Expectations for higher eyesight quality are increasing as a result of advances in cataract surgery technology. [17] It not only reduces dependence on spectacle but also raises standard of living. Astigmatism after surgery may be brought on by the procedure itself or be a carryover from corneal astigmatism. The use of small phacotips and smaller incisions has significantly decreased surgically caused astigmatism. However, the preoperative corneal astigmatism still poses a problem for the ultimate visual result.

### Conclusion

For the best visual outcomes and patient satisfaction following cataract surgery, a preoperative assessment of corneal astigmatism is crucial. Astigmatism worsens with age, and a sizable portion of patients have preoperative corneal astigmatism of 1D or higher, which might impair the quality of vision after cataract surgery. The majority of them are treatable with straightforward, affordable keratorefractive techniques.

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