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# A clinical investigation on ocular hypertension, primary open angle glaucoma, and normal tension glaucoma as measured central corneal thickness

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**Background and Objective:** Glaucoma refers to a variety of diseases that involve the progressive harm to the optic nerve. The objective of this study is to measure the central corneal thickness in individuals who have been diagnosed with normal-tension glaucoma, primary open angle glaucoma, ocular hypertension, and in those who are healthy.

**Materials and Methods:** In this prospective observational study, individuals with primary open-angle glaucoma, ocular hypertension, and normal tension glaucoma provided data. There are 100 patients in the sample size of the current investigation. The investigation was conducted at Tagore Medical College's radiodiagnosis department in Chennai, Tamil Nadu, India. The poll was conducted between January and December of 2012. After receiving approval from the institute's ethics committee and gaining the parents' signed consent, this study was carried out. Every specimen was collected, and measurements were taken.

**Results:** The participants' ages ranged from 42 to 78 in this study's sample of 100 patients. The ages of the patients ranged from 40 to 49 for 19 individuals, 50 to 59 for 48, 60 to 69 for 20 subjects, and 70+ for 13 subjects. There were 63 men and 37 females in the 100 patients that participated in this research. There was a relationship between age and gender in this research. The peak age group for both men and females was 50–59 years old, with the former group being the largest proportion of cases. There was a robust correlation between age and gender in the statistical study. There were no significant differences between the sexes, and there was also no association with age.

**Conclusion:** The CCT was significantly higher in OHT patients compared to controls and POAG patients in this randomised comparison study, whereas it was significantly lower in normal-tension glaucoma patients. No significant difference is seen between the control group and the patients whose angles are primary open.

*Keyword:* Clinical investigation, ocular hypertension, primary open angle glaucoma

## 1. Introduction

Certain alterations in the optic disc's morphology and anomalies in the visual field are hallmarks of glaucoma, a disease that impacts the optic nerve. Elevated intraocular pressure is a common but not guaranteed symptom [1, 2]. Although other factors are involved, the most notable risk factor is the intraocular pressure because of its unique

pharmacomodulation potential. Both the classification of glaucoma patients and the efficacy of their clinical treatment depend on accurate measurements of intraocular pressure. Making sure the IOP values are achieved using a very exact manner is, therefore, of the utmost importance [1-3].

When it comes to measuring intraocular pressure, Goldmann Applanation Tonometry (GAT) is usually considered the gold standard. A number of studies, including one by Ehlers and colleagues, have shown that the central corneal thickness affects the accuracy of applanation tonometry [2-4]. If the corneal thickness is reduced by 0.45 mm, the intraocular pressure (IOP) recorded in the Ophthalmology Section could be underestimated by as much as 4.7 mmHg. On the other hand, if the corneal thickness were to grow by 0.59 mm, the actual intraocular pressure (IOP) would be 20 mm Hg, but the measurement would be 5.2 mm Hg off. As a result, GAT may provide inaccurately high IOP readings for people with thick corneas and low readings for people with thin corneas [3-5].

While managing glaucoma cases and doing follow-up monitoring, corneal thickness is an important element to consider when setting goal intraocular pressure levels. Notable changes in measures occurred in 55.9% of patients, while major changes in outcomes occurred in 20.2% of patients. As a result of these shifts, glaucoma treatment became more effective. Based on their findings, the researchers concluded that clinical treatment for glaucoma and suspected glaucoma patients was significantly affected by the central corneal thickness [4-6]. The researchers in this study set out to compare the central corneal thickness of healthy controls, those with ocular hypertension, primary open angle glaucoma, and normal tension glaucoma. The impact of CCT on glaucoma patients' clinical care was another area of interest [7-9].

The current research aims to find out how thick the central cornea is in healthy people, those with glaucoma (Both normal-tension and primary open angle), and those with ocular hypertension.

## Materials and Methods

Patients with ocular hypertension, primary open-angle glaucoma, or normal tension glaucoma were the subjects of this prospective observational study. One hundred patients are part of the present study's sample. The research took place at Tagore Medical College's Department of Radiodiagnosis in Chennai, Tamil Nadu, India. From 2012 to 2012, we conducted this poll. After receiving approval from the institute's ethics committee and gaining the parents' signed assent, this study was carried out. We collected all the specimens and made note of their dimensions.

### Inclusion Criteria

- Individuals with POAG have an unregulated
- Glaucoma and ocular hypertension

### Exclusion Criteria

- Secondary glaucoma
- Coronal pathology
- History of intraocular surgery

## Results

The research was conducted at the Department of radio Diagnosis, Tagore Medical College, located in Chennai, Tamil Nadu, India. The poll was conducted between January 2012 and December 2012.

**Table 1:** Age wise distribution

| Sr. No. | Age | *Sample* |
|---|---|---|
| 1. | 40-49 Years | 21 |
| 2. | 50-59 Years | 48 |
| 3. | 60-69 Years | 23 |
| 4. | >= 70 Years | 10 |
| 5. | Total | 100 |

In a group of 100 patients, the age range was between 42 and 78 years, with an average age of 57.12±9.17 years. The patient population was distributed across several age groups as follows: 21 patients were between the ages of 40 and 49, 48 patients were between the ages of 50 and 59, 23 patients were between the ages of 60 and 69, and 10 patients were over the age of 70.

Clinical investigation, ocular hypertension, primary open angle glaucoma

**Table 2:** Gender distribution

| Sr. No. | Gender | Sample |
|---|---|---|
| 1. | Males | 60 |
| 2. | Females | 40 |
| 3. | Total | 100 |

Among a group of 100 individuals, 60 were identified as male while the remaining 40 were identified as female.

**Table 3:** Study groups

| Sr. No. | Study Groups | Sample |
|---|---|---|
| 1. | Normal | 34 |
| 2. | NTG | 20 |
| 3. | POAG | 31 |
| 4. | OHT | 14 |
| 5. | Total | 100 |

Among the cases analysed, 34 were categorised as Normal, 20 as NTG, 31 as POAG, and 14 as OHT.

**Table 4:** Significant managerial changes after an IOP alteration

| | Changes | | Total |
|---|---|---|---|
| | No | Yes | |
| NTG | 13 | 6 | 19 |
| POAG | 18 | 8 | 26 |
| OHT | 10 | 9 | 19 |
| Total | 43 | 21 | 64 |

After adjusting intraocular pressure for central corneal thickness, Table 4 showed that glaucoma patients showed significant changes. Nineteen of the total instances showed statistically significant shifts in the measured variables. The percentage of cases where the OHT group demonstrated statistically significant changes in measurements was highest. In addition, the studies were significantly different from one another, and the measures showed a marked shift.

**Table 5:** Results after changing intraocular pressure significantly vary.

| | Significant of outcome changes | | Total |
|---|---|---|---|
| | No | Yes | |
| NTG | 20 | 1 | 21 |
| POAG | 26 | 2 | 28 |
| OHT | 15 | 2 | 17 |
| Total | 59 | 5 | 64 |

Adjusting intraocular pressure (IOP) for central corneal thickness (CCT) caused variations in glaucoma patient outcomes, as seen in Table 5. There were five cases when the results were significantly different. The OHT group had the most significant alterations in measures in 26.67 percent of these instances. Additionally, the importance of the changes in the outcome differed significantly among the research groups.

## Discussion

The central corneal thickness is thinner in normal tension glaucoma patients compared to healthy controls, according to recent studies. However, as contrasted with control subjects, those suffering from ocular hypertension exhibit a greater CCT. We find that central corneal thickness is correlated with controls with normal-tension glaucoma. Patients with normal tension glaucoma, controls, primary open-angle glaucoma, and ocular hypertension will have their central corneal thickness compared in this study. The objective is to examine how CCT varies between these groups and how it affects the diagnosis and treatment of glaucoma, especially with regard to intraocular pressure measurements [9-11].

One hundred patients, ranging in age from forty-two to seventy-eight, were a part of this research. The mean plus or minus the standard deviation revealed an average age of 57.12 plus or minus 9.17 years. The patients' ages were as follows: 19

were in the 40-49 age bracket, 48 were in the 50-59 age bracket, 20 were in the 60-69 age bracket, and 13 were 70 and up. One hundred patients, including sixty-three men and thirty-seven females, were enrolled in this study. There was a relationship between age and gender in this research. The 50-59 age bracket had the most patients overall, both for men and women. There was a robust correlation between age and gender in the statistical study. Neither gender nor age was shown to be significantly correlated in the study. Among the patients analysed, 36% were deemed normal, 20% were classified as non-TG, 29% as POAG, and 15% as OHT. There were 352 healthy controls, 13 people with ocular hypertension, and 30 people with primary open-angle glaucoma in the research [12-14].

The results showed no statistically significant correlation between the gender of the participants or their study group. After accounting for standard deviation, the survey indicated that men had an average age of 56.92±8.77 years and females 57.46±9.94 years. Results showed no statistically significant difference in mean values across sexes [13-15]. The study found that the mean ± SD age of the OHT group was marginally older than that of the NTG, POAG, and normal groups. There was no statistically significant difference in the means of the groups, though. Patients with Normal-Tension Glaucoma had an age distribution comparable to that of the Coptic Retinitis Pigmentosa group, while, patients with Primary Open-Angle Glaucoma were much older than those with Ocular Hypertension. Among NTG, POAG, and Controls, the current study found no significant difference [14-16].

No statistically significant relationship was discovered in this investigation between the original study groups and the reclassification of those groups. There was statistical significance in the difference that was found. No patients in the NTG group showed any statistically significant changes in their results. On the other hand, between 3 and 57% of patients in the POAG group and 25% in the OHT group experienced a notable improvement in their result [15-17]. A significant change in outcome was observed in 6.45% of all glaucoma cases. The statistical analysis confirmed a significant difference. The relationship between Goldmann applanation tonometry and central corneal thickness has been the subject of multiple studies. Proving beyond a reasonable doubt, CCT significantly affects the precision of applanation tonometry. The intraocular pressure for central corneal thickness has subsequently been addressed with subsequent formulations [16-18].

According to the Early Manifest Glaucoma Trial, a one millimetre mercury (mmHg) shift in intraocular pressure during follow-up is directly proportional to a ten percent shift in disease progression. In the study, 8.5% of participants decided to change their prescription, 2.1% delayed or included laser therapy, and 3.2% forwent glaucoma surgery. The lack of a long-term follow-up to maintain the validity of the clinical findings regarding the treatment of these variations with CCT adjusted intraocular pressure (IOP) was one of the study's limitations [17-19]. After adjusting for central corneal thickness, patients with glaucoma were categorised according to their intraocular pressure. In 22.7% of cases, patients with NTG were reclassified as POAG patients, and in 25% of cases, patients with OHT were classed as Normal. Researchers at Copt RP found that almost a quarter of people who had ocular hypertension and normal tension glaucoma were misdiagnosed [20-23]. In addition, primary open-angle glaucoma was later detected in 31% of patients with NTG, and normal eye pressure was diagnosed in 56% of patients with OHT [22-24].

## Conclusion

Patients with normal-tension glaucoma, in contrast to controls and those with primary open-angle glaucoma, exhibit significantly thinner central corneas, according to a randomised comparison study. Patients with ocular hypertension, in contrast to controls and POAG patients, exhibited a noticeably bigger CCT, according to this study. Patients undergoing primary open-angle procedures did not differ significantly from those in the control group. Misdiagnosis of primary open-angle glaucoma patients as normal-tension glaucoma patients and

of normal patients as ocular hypertension patients leads to incorrect management and is the main constraint in accurately diagnosing and monitoring glaucoma patients. This is because intraocular pressure influences central corneal thickness measurement and the use of an applanation tonometer. When a patient's corneal thickness significantly differs from the normal range, it becomes extremely important for ophthalmologists to assess the corneal central thickness in order to diagnose and treat glaucoma or suspected of glaucoma.

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**Conflict of Interest**
None

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