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### RESEARCH ARTICLE

#### RISK FACTORS FOR DEVELOPMENT OF PHACOMORPHIC GLAUCOMA IN MATURE CATARACT - A HOSPITAL BASED STUDY, JHANSI

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#### Abstract

**Aim:** To study the roles of axial length and anterior chamber depth as risk factors for the development of phacomorphic glaucoma in eyes with mature cataract.

**Material and Methods:** This is a prospective case-control study done in the year 2023 at Department of Ophthalmology, MLB Medical College, Jhansi. Phacomorphic glaucoma was diagnosed by Intraocular Pressure of more than 21 mmHg, intumescent cataract with signs and symptoms of phacomorphic glaucoma, axial length and anterior chamber depth. All patients examined by slit lamp examination.

**Results:** The Mean Intra ocular pressure of phacomorphic glaucoma was  $49 \pm 8$  mmHg and of mature cataract was  $15 \pm 6$  mmHg. Vision was Light perception in phacomorphic glaucoma and Hand movement observed was mature cataract. The mean axial length was  $23.08 \pm 0.32$  mm among phacomorphic glaucoma, shorter than mature cataract, where the mean axial length was  $23.71 \pm 0.78$  mm.

**Conclusion:** Patients with shorter axial lengths are at increased risk for phacomorphic glaucoma.

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#### Introduction:-

Cataract and glaucoma are leading causes of visual impairment in Asia. In Mongolia, cataract and glaucoma contribute to 36% and 35% of blindness respectively.[1] As both are diseases of advancing age, they can co-exist and under certain circumstances, one disease may even lead to the other. Lens induced glaucomas may occur by different mechanisms. 1. Phacomorphic glaucoma is caused by intumescent lens and it is a type of secondary angle closure glaucoma, which is most common type. 2. Phacolytic glaucoma is a secondary open glaucoma in which lens proteins leaked in anterior chamber. 3. Phacotopic glaucoma in which hyper mature cataractous lens may subluxate.

Delay in the extraction of mature cataracts can result in phacomorphic glaucoma, a type of secondary angle closure caused by the forward displacement of an intumescent (swollen and white) cataract giving rise to pupillary block or iridocorneal angle closure. In India, phacomorphic glaucoma accounts for 3.9% of all cataract extractions.[2] Though phacomorphic glaucoma develops in the presence of a mature cataract, not all patients with mature cataract necessarily go on to develop phacomorphic glaucoma.

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Various population studies have established advancing age, female gender, shallow anterior chamber depth (ACD), short axial length (AL) and Chinese ethnicity as risk factors for primary angle-closure suspects, primary angle closures and primary angle closure glaucomas.[3-9]

Cataract extraction is usually indicated if visual gain is expected after the surgery. However not all patients with mature cataracts can afford the surgery, especially in developing countries, and for those in the lower social economic class where they usually seek medical attention from public institutions where they are likely to be put on a long waiting list. During this period, cataracts may progress from an immature state to a mature cataract and subsequently develop phacomorphic glaucoma. It is important to identify which of these patients with mature cataracts are at an increased risk of phacomorphic glaucoma; so priority may be given to them to prevent such complication.

Phacomorphic glaucoma can occur in both eyes with shallow or deep anterior chambers as the pathology is the intumescent cataract rather than the angle configuration like in primary angle closures. This study investigated the roles of axial length and anterior chamber depth as risk factors for the development of phacomorphic glaucoma in eyes with mature cataract.

### **Method and Material:-**

This was a prospective case-control study done in the year 2023 at Department of Ophthalmology, MLB Medical college, Jhansi. It was done from oct 2022 to feb 23. It was performed under the Helsinki Declaration of 1975, as revised in 2000. The necessary permission from the Ethical and Research Committee was obtained for the study.

60 patients were evaluated to do this study and were divided into two groups:

Group 1 - 30 patients were with phacomorphic glaucoma, considered as cases.

Group 2 - 30 patients were with mature cataracts but without phacomorphic glaucoma, considered as controls.

Controls were selected such that age and sex matches with cases.

Phacomorphic glaucoma was diagnosed by Intraocular Pressure of more than 21 mmHg, intumescent cataract with symptoms such as unilateral transient blurring of vision, colored halos around light, headache, brow ache and eye ache on the affected side, self termination of attack due to physiological miosis and signs as demonstration of shallow anterior chamber open angle as identified by slit lamp examination. Those patients presented to OPD with features of phacomorphic glaucoma were considered as cases.

A Mature cataract is defined as the stage where there is a complete opacification of lens i.e., whole of the cortex is involved. Lens become pearly white in color. Such a cataract is also labeled as 'ripe cataract'.

### **Inclusion criteria**

All patients between the age group 50-80 years who presented to the OPD of MLB medical College Jhansi with the complaint of diminution of vision and on examination were found to have either mature cataract or phacomorphic glaucoma.

### **Exclusion criteria**

1. Patients outside the age group of 50-80 years .
2. Patients with other retinal disorders.
3. Patients with recent intraocular surgery .
4. Patients with the history of trauma.
5. Mentally or physically unfit patients.

Details regarding all the studied population such as age, sex, socioeconomic status were noted. Cases and controls affected eyes were examined by measuring Intraocular Pressure, axial length, anterior chamber depth, Best corrected visual acuity (BCVA). Intra ocular Pressure (IOP) was measured using Goldman Applanation Tonometry, BCVA was assessed by using Snellen chart and Both Axial length and anterior chamber depth was measured using contact A-scan ultrasonography.

### Statistical Analysis

All analyses were performed using statistical software Graph pad. Differences of means were analyzed using the t-test and paired t-test where appropriate and forward stepwise binary logistic regression was implemented for analysis of the variables: axial length and anterior chamber depth in association with the development of phacomorphic glaucoma. The critical value of significance was set at  $P < 0.05$  for all tests. All means were expressed as mean  $\pm$  standard deviation.

### Results:-

In this prospective study, 30 cases and 30 controls were considered with phacomorphic glaucoma and mature cataract without phacomorphic glaucoma respectively. All the studied population were selected in the age group of 50-80 years. Cases and Control groups were considered such that M:F ratio was 1:1. The mean age of Group 1 was  $67 \pm 6.2$  and Group 2 was  $66.4 \pm 5.5$  (Table-1). On BCVA assessment using Snellen chart shown poorer visual acuity among phacomorphic glaucoma (Group 1) when compared to mature cataract (Group 2), It was Light perception among Group 1 and Hand movement was observed in Group 2. Axial length and Anterior Chamber Depth were lesser in Phacomorphic Glaucoma when compared to Mature cataract (Table-2). There was statistical significance in the axial lengths between group 1 and 2. There was no statistical significant difference of Anterior chamber depth between phacomorphic glaucoma and mature cataract.

**Table 1:-**

CHARACTERISTICS	GROUP 1	GROUP 2
AGE	$67 \pm 6.2$	$66.4 \pm 5.5$
SEX		
Male	31	31
Female	29	29
INTRAOCULAR PRESSURE	$49 \pm 8$	$15 \pm 6$

**Table 2:-**

Features	Group1	GROUP2	p-value	significance
Axial length	$23.08 \pm 0.32$	$23.71 \pm 0.78$	0.0008	statistically significant
Axial chamber depth	$2.35 \pm 0.81$	$2.70 \pm 0.83$	0.1789	not significant

### Discussion:-

Phacomorphic glaucoma is a type of lens induced glaucoma, where its pathophysiology is secondary angle closure glaucoma that may occur as result of hyper mature cataract formation. Gifford has recommended before cataracts changes to hypermature, early extraction of lens is needed.[10]

Risk factors responsible for phacomorphic Glaucoma are age above 60 years[11,12] female gender[12,13] Axial length  $< 23.7$  mm[14], narrow anterior chamber. In the present study the mean age of Group 1 was  $67 \pm 6.2$  and Group 2 was  $66.4 \pm 5.5$ . Low Socioeconomic group people are predominantly affected by Phacomorphic glaucoma.[15] The Mean Intra ocular pressure of Phacomorphic glaucoma was  $49 \pm 8$  mmHg and of mature cataract was  $15 \pm 6$  mmHg in this study. Diagnosis of glaucoma mainly by IOP measurement above 21 mmHg[12], whereas average of presenting is above 40 mmHg. Gonioscopy is a good diagnostic method for the diagnosis of Phacomorphic glaucoma, but it should not be used in the presence of corneal edema from the acute IOP elevation. Lee JW et al[11] observed that the mean IOP among Phacomorphic glaucoma was  $49.5 \pm 11.8$  mmHg and among control eyes were  $16.7 \pm 1.7$  mmHg. On BCVA assessment using Snellen chart shown poorer visual acuity among Phacomorphic glaucoma (Group 1) when compared to mature cataract (Group 2). It was Light perception among Phacomorphic glaucoma patients and Hand movement was observed in mature cataracts without phacomorphic glaucoma as per this study. Visual acuity among Phacomorphic glaucoma in this study is similar to Lee JW et al[11] documented as there is poor vision between acute attack and dense cataract, averaging light perception only. In this study Axial length and Anterior Chamber Depth were lesser in Phacomorphic Glaucoma when compared to Mature cataract. Axial length was statistically significant in between group 1 and 2. There was no statistical significance in Anterior chamber depth between phacomorphic glaucoma and mature cataract. Lee SJ et al[16] reported that anterior chamber depth is less than 2mm. In contrast to the study Tomey KF et al[17] documented that Either shallow or deep anterior chamber

cause phacomorphic glaucoma. Short axial length in relation to primary angle closure glaucoma, like short axial length decreases while the risk of primary angle closure gets doubled.[17] It is supported by many studies.[18,11] Main treatment of Phacomorphic glaucoma is by extraction of cataractous lens. Treatment is the main goal to reduce the IOP, which in turn eliminates the symptoms related to Glaucoma. Surgical treatment may delay in such conditions where there is an acute attack presenting with corneal edema and High IOP. In such conditions need to stabilize the eye by medical treatment, later can go with removal of cataractous lens. Medical treatment includes Beta blockers, alpha -agonists and carbonic anhydrase inhibitors. Argon Laser Peripheral Iridoplasty also can be used to reduce IOP, has few side effects than oral or intravenous acetazolamide and hyperosmotics.[18] Before cataract extraction, there is a need to reduce the IOP by using Intravenous mannitol.[20,12]

### Conclusion:-

Phacomorphic glaucoma usually results in elderly age, short axial length or shallow anterior chamber. Raise in Intraocular Pressure is the one responsible for symptoms. Axial length measurement is a easy predictor for diagnosing phacomorphic glaucoma. In the setting of limited healthcare resources in an area where phacomorphic glaucoma is prevalent, patients with axial length shorter than their population mean may be considered to receive earlier elective cataract extraction to prevent phacomorphic glaucoma.

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