

A Cross Sectional Study To Determine The Prevalance Of Occludable Angles In Hypermetropes

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Abstract: Background: Hypermetropic eyes are generally smaller in globe volume, resulting in crowding of anterior chamber when the lens size is normal. The aim of this study is to document the prevalence of occludable angles in hypermetropes visiting tertiary eye care centre of western region of India and to highlight the importance of screening for angle closure suspects in high risk groups. Material And Methods: This cross sectional study is based on clinical study of patients attended by M & J Western Regional Institute of Ophthalmology. The study group was divided into two subgroups: patients who are hyperopic on refraction and patients who are either emmetropic or myopic. Relative risk and Odd's ratio was calculated for relation between refractive error and occludable angle. Result: Risk of Occludable angle in hypermetropes = 0.23. Risk of Occludable angle in myopes and emmetropes = 0.06. Relative risk in hypermetropes = 4.15 i.e. hypermetropes have nearly 4 times risk of developing occludable angle than myopes and emmetropes. Relative risk in myopes and emmetropes = 0.24 i.e. myopes and emmetropes have 0.24 times risk of developing occludable angle than hypermetropes. Odd's ratio in the first group = 5.1 i.e. the possibility for a patient with occludable angle being a hypermetrope. Odd's ratio in the second group = 0.2 i.e. the possibility for a patient with occludable angle being a myope or an emmetrope. Conclusion: When occludable angle is detected on gonioscopy in > 270 degrees, a peripheral iridectomy can be performed as a prophylactic measure and patients can be given a liberal follow up. A society like India where people have less awareness regarding glaucoma being a silent thief and not understanding the importance follow up examination in glaucoma, gonioscopy should be made a part of routine examination and peripheral iridototomy done as necessary. [Choudhary T Natl J Integr Res Med, 2022; 13(2): 43-46, Published on Dated: 10/02/2022]

Key Words: Hypermetropes, Ocludable Angles, Gonioscopy

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Introduction: Glaucoma accounts for 12.8% blindness of the country with 45 to 55 % of primary glaucoma being PACG⁴. Angle closure glaucoma is correlated with many risk factors, such as hyperopia, shallow anterior chamber depth (ACD), short axial length, increased lens thickness and female gender. Numerous studies have reported that narrow angles and primary angle closure glaucoma occur more frequently in hypermetropic eyes than emmetropic or myopic eyes. Primary angle closure suspects are individuals with occludable angles in primary position, without compression on gonioscopy, with normal intraocular pressure (IOP), optic disc and visual fields.

Material & Methods: This is a cross sectional study is based on clinical study of patients attended by M & J Western Regional Institute of Ophthalmology, Civil Hospital Ahmedabad during the study period of July 2019 to June 2021. After a written and informed consent, the patients

underwent testing for: Visual acuity with correction on Snellen's chart. Anterior segment evaluation including Van Herick's technique on Slit Lamp Bio microscope. IOP evaluation using Perkin's Applanation Tonometry. Dilatation and fundus examination. Refraction by Streak Retinoscope. Gonoscopic examination by 2 mirror gonioprism and recording by Shaffer's grading. Ultrasound bio microscopy. The study group was divided into two subgroups: patients who are hyperopic on refraction and patients who are either emmetropic or myopic. Recorded information was statistically analysed. Relative risk and Odd's ratio was calculated for relation between refractive error and occludable angle.

Chi square test was applied for correlation between degree of hypermetropia and occludable angle. The study has been done after obtaining approval from institutional ethics committee of BJMC Ahmedabad and as per the declaration of Helsinki.

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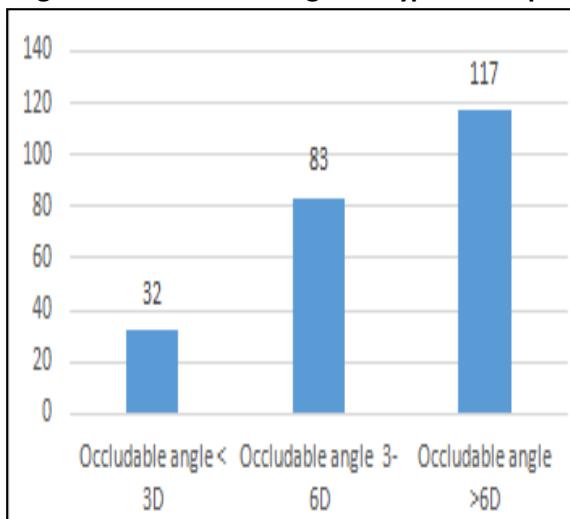
Results: A total of 2640 patients participated in our study; in which 1503 were males and 1137 were females. The age group distribution comprised of 546 patients in the age group 18-30 years, 1200 in 30-50 years, 779 participants in 50-70 years and 115 in the age group greater than 70 years. Of the 2640 participants, based on clinical refraction by streak retinoscope, 998 were hypermetropes, 1071 were myopes and 372 were emmetropes. Hypermetropes were subdivided into three groups: < 3D hyperopia (n=363), 3-6D hyperopia (n=403) and >6D hyperopia (n=232).

Most frequent Van Herick's grading in Hypermetropes was Grade 1 and in Myopes and Emmetropes was Grade 4. Mean IOP in Hypermetropes was 15.47 ± 0.463 mmHg.

Mean IOP in myopes was 13.29 ± 0.118 mmHg and that in emmetropes was 12.76 ± 0.58 mmHg. Out of the 2640 study population, 324 (12.27%) had occludable angle on gonioscopy.

Out of 998 hypermetropes, 232 (23.24%) had occludable angle on gonioscopy.

Figure 1: Occludable Angle In Hypermetropes



Out of 1071 myopes, 72 (6.72%) had occludable angle and of 571 emmetropes, 20 (3.50%) had occludable angle.

Prevalence of occludable angle in males (n= 1503) is 9.91% while in females (n= 1137) is 15.39%.

To calculate the association between hypermetropia and occludable angle in our study, we calculated the Relative Risk (RR) and Odd's ratio.

Table 1: Association Between Hypermetropia And Occludable Angle

| | Occludable Angle Present | Occludable Angle Absent |
|--------------------------------|--------------------------|-------------------------|
| Hypermetropes (Group1) | 232 | 766 |
| Myopes and Emmetropes (Group2) | 92 | 1550 |

Risk of Occludable angle in hypermetropes = 0.23
Risk of Occludable angle in myopes and emmetropes = 0.06.

Relative risk in hypermetropes = 4.15 i.e. Hypermetropes have nearly 4 times risk of developing occludable angle than myopes and emmetropes.

Relative risk in myopes and emmetropes = 0.24 i.e. myopes and emmetropes have 0.24 times risk of developing occludable angle than hypermetropes.

Odd's ratio in the first group = 5.1 i.e. the possibility for a patient with occludable angle being a hypermetrope.

Odd's ratio in the second group = 0.2 i.e. the possibility for a patient with occludable angle being a myope or an emmetrope.

Chi-square test is done to assess whether an association exists between two variable i.e. the degree of hypermetropia and presence of an occludable angle. The null hypothesis is there is no association between degree of hypermetropia and occludable angles. The chi-square statistic is 140.0458. The p-value is <0.00001. The result is significant at $p < 0.05$.

Discussion: Our study aims at finding a relation between occludable angle and hypermetropes and other risk factors associated with occludable angle. In a study by George et al on ocular biometry in occludable angles and angle closure glaucoma, 143 (5.01%) of 2850 subjects had occludable angles¹³. Xiaohong Liu et al showed that 45 (2.42%) subjects who had at least 2 quadrants with iridotrabecular contact in the chosen eye of the 1859 participants⁴. In Meiktila Eye Study by Casson et al, the prevalence of occludable angle in the Burmese Population was 5.7% (95% CI 4.72 to 6.62)¹⁴. Subba Rao et al on

assessment of occludable angle in angle closure glaucoma patients having high risk showed that of the 100 cases, 18 (18%) patients had occludable angles and 72 had open angles³.

In a study by Nwosu et al, 227 (35.0%) of the 648 eyes had occludable angles¹⁵. The population-based data from Asia is suggestive of high prevalence of narrow angles in both the mainland⁴⁵ and Singaporean Chinese⁴⁶ populations (36.9% and 10.6% among those >=50 y, respectively).

This variability in the result could be attributed to differing sample size in different studies and demographic characteristics of the study population. In our study, 23.24% hypermetropes had occludable angle when compared to myopes (6.72%) and emmetropes (3.50%).

In the Jiangning Eye Study⁴, out of 45 subjects with occludable angle, 3 subjects had myopia, 10 subjects had emmetropia and 32 subjects had hypermetropia.

In subjects with occludable angle, 6.7%, 22.2% and 71.1% had myopia, emmetropia and hypermetropia respectively. The Liwan Eye Study reported that prevalence of occludable angle was minimally affected by increasing prevalence of myopia⁴⁶.

A study in tertiary eye hospital in Nigeria showed 65% of their study population were hypermetropic and 35% of study population having occludable angle¹⁵.

Our study also showed that prevalence of occludable angle in males (n= 1503) is 9.91% while in females (n= 1137) is 15.39%. Narrow anterior chamber angles have consistently been shown to correlate strongly with age and female sex in mainland Chinese and in other ethnic groups^{43,14}.

Quigley et al described that due to shallow anterior chambers of female in general, there was a predominance of females with pupillary block glaucoma. The Nigerian Study shows no gender predilection for narrow angles¹⁵.

According to a study on association of refractive error with glaucoma in a multi-ethnic population, each 1-D reduction in SE (standard error) was associated with a 22% decrease in the odds of

PACG (OR, 0.78; 95% CI, 0.77-0.80) and with increases in the odds of open-angle glaucoma ranging from 1.23 (95% CI, 1.20-1.26) for PIGM (pigmentary glaucoma), to 1.07 (95% CI, 1.03-1.11) for PEX (pseudoexfoliation glaucoma), and to 1.05 (95% CI, 1.04-1.06) for OHTN (ocular hypertension). In addition, they observed a stronger association between myopia and POAG (primary open angle glaucoma) among non-Hispanic whites (OR, 1.12; 95% CI, 1.11-1.13) and NTG among Asians (OR, 1.17; 95% CI, 1.15-1.20) and non-Hispanic whites (OR, 1.19; 95% CI, 1.15-1.22).

Myopia was associated with an increased prevalence of all forms of open-angle glaucoma and OHTN, whereas hyperopia was associated with a substantially increased prevalence of PACG⁵⁴.

It is worth noting that in our study, mean IOP of hypermetropic patients was similar to that of normal IOP of the respective cohorts. This suggests that screening for glaucoma based merely on IOP measurement cannot be fully effective.

Also, Ultrasound bio microscopy is a supplementary tool to evaluate the anterior segment in the patients; more useful in secondary angle closure glaucoma.

It is evident that the AC depth in hyperopes is lesser than myopes and emmetropes, though the results are not statistically significant.

The lens thickness also showed no statistically significant difference between the two groups.

However, we did observe a statistically significant association between occludable angle and hyperopia.

Conclusion: The strengths of our study include a large sample size and use of established standardized protocols for glaucoma screening.

We observed following major results in our study: Overall prevalence of occludable angles was higher in hypermetropes. Hypermetropes have nearly 5 times risk of having occludable angle than myopes and emmetropes.

Prevalence of occludable angle is significantly greater in females in the study population. PACG

is quite common (approx 1% of population) and the current study strongly recommends that gonioscopy should be made an integral part of the routine ophthalmological evaluation for early detection of patients who would have angle closure disease in future.

When occludable angle is detected on gonioscopy in > 270 degrees, a peripheral iridectomy can be performed as a prophylactic measure and patients can be given a liberal follow up.

Limitation of the study is that it is a hospital based study; not a community based to clearly define the prevalence or magnitude of problem.

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