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A CLINICAL STUDY SHOWING ASSOCIATION OF SERUM LIPIDS WITH PRIMARY OPEN ANGLE GLAUCOMA

Ophthalmology

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ABSTRACT

Introduction: Glaucoma, a multifactorial condition characterized by progressive optic neuropathy and distinctive visual field loss, has become the most common cause of irreversible blindness worldwide. Many cases have shown progress despite of good control of IOP, strengthening the view that other independent risk factors play role in pathogenesis of glaucoma. Few studies have shown association of serum lipids to glaucoma. The objective of the study is to find relation between serum lipid and POAG. **Materials and Method:** The study was conducted on 50 cases of glaucoma and 50 age matched controls. Detailed ophthalmic examinations were performed in all patients. Fasting lipid profile including total cholesterol, triglyceride, Low density lipoprotein(LDL),and high density lipoprotein (HDL) were measured and analyzed between the cases and controls. **Result:** Level of total cholesterol, total triglyceride, and LDL were significantly higher in cases than in contacts with P value <0.05.Level of HDL was lowered in cases than in controls but it was not statistically significant. **Conclusion:** Dyslipidemia is an independent risk factor for POAG. High serum Cholesterol, high triglyceride and high serum LDL correlate significantly with POAG.

KEYWORDS

POAG, Dyslipidemia

INTRODUCTION:

Glaucoma is the leading cause of irreversible blindness worldwide. Primary open angle glaucoma is a chronic and progressive eye disease that is the second leading cause of blindness in India.[4,5] The number of persons aged 40 years and above with glaucoma worldwide was estimated to be 64.3 million in 2013.[3] Primary open angle glaucoma (POAG) is usually asymptomatic till the advanced stages of disease. So identifying risk factors is necessary to reduce the incidence of the disease. Established risk factors include elevated intraocular pressure (IOP)[6],old age [7],ethnic background [8],family history of glaucoma[9], and myopia.

POAG is known to be associated with hypertension and type 2 Diabetes Mellitus. Both diabetes and hypertension are linked to high lipid levels. Recent epidemiological studies have suggested the association of dyslipidemia with glaucoma.[2] Lipid peroxidation leading to oxidative stress may directly damage trabecular meshwork[1] and endothelium of blood vessels supplying optic nerve head affecting ocular hypertension [11].Excess lipid levels could increase episcleral venous pressure and blood viscosity, resulting in a consequent decrease in outflow facility [10].This present study attempts to establish a relation between serum lipids and its components with POAG.

MATERIALS AND METHODS:

This case control study was conducted in the Department of Ophthalmology of a tertiary care hospital in Eastern India from Nov 2018 to Dec 2019.Fifty patients of POAG and fifty healthy volunteers were included in the study. The ethical consent was obtained from Institutional ethics Committee. A written informed consent was obtained from all of them. All participants were over 20 years of age. Individuals with POAG having no other ocular disease were included in this study. Inclusion criteria included an untreated intraocular pressure (IOP) of 21 mm Hg or more with Goldmann Applanation Tonometer,open anterior chamber angles on gonioscopy, glaucomatous optic disc changes (increased cup disc ratio,thinning of the neuroretinal rim, notching)on fundoscopy, and visual field defects characteristics of glaucoma by standard Automated Perimetry with Humphrey Visual Field Analyser. Inclusion criterias for controls were IOP below 21 mm Hg, no glaucomatous changes in the optic disc, no visual loss characteristics of glaucoma.

The exclusion criterias for cases and controls were history of ocular trauma, past history of ocular surgery, persons taking lipid lowering drugs like statins, high myopia(>5D),subluxated, traumatic and complicated cataracts, persons taking oral or systemic beta blockers and chronic steroid use. Demographic data including age, gender ,address were noted. Ophthalmic evaluation like visual acuity with Snellen's chart, anterior segment examination with slit lamp, pupillary reactions, Van-Herick's grading, intraocular pressure measurements by Goldmann Applanation Tonomter. Gonioscopy with Goldmann 3 mirror lens was done to evaluate angle structures.Fundus evaluations and visual field examinations were performed. Primary open angle glaucoma was diagnosed as the basis of raised IOP, optic disc changes and visual field effects.

Twelve hour fasting blood samples were collected for measuring serum lipids and assessed using enzymatic method(autoanalyser).The lipid profile included total cholesterol, triglycerides(TGL),low density lipoprotein(LDL),and high density lipoprotein(HDL). Reference values for lipids were taken from National Cholesterol Education Programme: Adult Treatment Panel III(NCEP:ATP III)guidelines, according to which hypercholesterolemia is defined as total cholesterol >200 mg/dl. Hypertriglyceridemia when triglycerides >150 mg/dl, LDL >130 mg/dl were considered high and HDL <40 mg/dl were considered low.

STATISTICAL ANALYSIS:

Mean, Standard deviation and standard error of means were calculated. Statistical analysis were performed using Unpaired t-test and Chi-square test using SPSS Software. P value <0.05 was considered significant.

RESULTS:

In our study a total of 100 participants (50 in glaucoma group and 50 in control group)were included. The age of the patients ranged from 30 to 80 yrs with a mean of 56 years (cases) and 51 yrs(control).The maximum number of cases and controls were within the 50-60 yrs age group. The male to female ratio was 0.78:1 in cases and 0.92:1 in controls.34 out of 50 in POAG group and 28 out of 50 in control group were from urban background.16 out of 50 in POAG group and 22 out of 50 in control group were from rural background.

Table 1 showing demographic characteristics of study population:

Characteristics	Cases(n=50)	Controls(n=50)
Range of age(in years)	35-78	29-73
Mean age(in years)	56.5	51
Gender(Male: Female)	22:28	24:26
Locality(urban: rural)	34:16	28:22

High cholesterol (>200mg/dl) was seen in 26 cases and 8 controls. High triglycerides (>150mg/dl) was seen in 22 cases and 7 controls. High levels of LDL (>130 mg/dl) was seen in 30 cases and 9 controls.(Table 2).HDL was low in 34 cases and 27 controls.

Table 2:Dyslipidemia in cases and controls:

Lipid parameters	Cases(n=50)	Control(n=50)	P value
High Cholesterol	26	8	0.00001

High Triglycerides	22	7	0.00001
High LDL	30	9	0.00001
Low HDL	34	27	0.219

In cases mean cholesterol was 216.95±6.30 mg/dl, mean triglycerides was 154.50±7.82 mg/dl, mean LDL level was 143.2±4.22 mg/dl, and mean HDL was 38.73±1.44 mg/dl. In controls, mean cholesterol was 170.95±5.12mg/dl, mean triglycerides was 109.66±6.34 mg/dl, mean LDL was 104.05±4.70 mg/dl and mean HDL was 39.52±1.80 mg/dl.

Table 3 showing serum lipid values in cases and controls:

Parameters applied	Cases n=50	Control n=50
Mean cholesterol	216.95±6.30	170.95±5.12
Mean triglycerides	154.50±7.82	109.66±6.34
Mean LDL	143.2±4.22	104.05±4.70
Mean HDL	38.73±1.44	39.52±1.80

Level of mean cholesterol, triglycerides and LDL were significantly higher in cases than in controls with p value <o.o5,taking confidence interval 95%.level of HDL was lower in cases than in controls but it was not statistically significant.

DISCUSSION:

In our study the results obtained showed significant relationship between high levels of cholesterol ,LDL, triglycerides to POAG. Many studies have reported an association between hyperlipidemia and POAG.The statins in usage longer than 23 months may significantly reduce the risk of glaucoma.[12] A study by Lin and colleagues which used the Taiwan National Health Insurance Database and comprised of 76,673 Open angle glaucoma cases, showed that 30.5% of OAG cases had dyslipidemia and the adjusted Odd's ratio was more than 1.5 [13].In a case control study conducted by Daveri et al, there was a positive association between POAG and dyslipidemia (OR=7.14 for hypercholesterolemia and OR=16.9 for Hypertriglyceridemia). Conclusion was drawn that hyperlipidemia can be a risk factor for POAG.[14] In a Beijing eye study ,about 3251 individuals (age>45years) had their complete ophthalmic examination. Blood serum lipids were also measured. After adjustment of various factors(such as age ,sex ,residence ,income level ,BMI ,cigarette smoking ,diastolic blood pressure, and blood sugar) the effect of dyslipidemia on the incidence of ophthalmic diseases was studied. Results showed in dyslipidemic patients, IOP was significantly increased[15].In a study done by Chisholm and Stead in 1988 on 183 patients (92 women and 91 men) with glaucoma, with the aim of surveying serum lipid levels, it was found that only triglycerides in female adults was significantly high[16].All these results point to a combined effect of dyslipidemia with hypertension or diabetes in pathogenesis of glaucoma .In our study we find that dyslipidemia is an independent risk factor for glaucoma, after monitoring these confounding factors. A significant relationship was found between high triglycerides , LDL and cholesterol to POAG. Further research may help us in understanding the mechanism by which dyslipidemia leads to POAG. Various study showing increased levels of lipid peroxides in aqueous humour, trabecular meshwork and Schlemm's level in POAG cases compared with control eyes suggest that lipid peroxidation by increasing oxidative stress is responsible for destruction of the trabecular meshwork and Schlemm's canal.

CONCLUSION:

The current study suggests that dyslipidemia is significantly associated with an increased risk of POAG. High serum cholesterol ,high serum triglycerides, and high serum LDL correlate significantly with POAG. So an early detection and treatment of dyslipidemia may decrease the incidence of POAG.

Conflict of interest: Nil
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