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ASSESSING THE BLOOD LEVELS OF URIC ACID AND VITAMIN D IN PATIENTS WITH GLAUCOMA IN INDIAN SUBJECTS

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ABSTRACT

Background: Glaucoma is an eye disorder that causes damage to the optic nerve due to oxidative stress and inflammation. It is frequently associated with elevated IOP (intraocular pressure). Vitamin D is a fat-soluble vitamin with anti-inflammatory effects, whereas uric acid (UA) is an antioxidant molecule that scavenges nitrogen radicals and superoxide in plasma.

Aim: The current study aims to investigate blood levels of uric acid and vitamin D in people with glaucoma from an Indian background.

Methods: The current study compared 90 people with a confirmed diagnosis of glaucoma to 90 age- and gender-matched controls. In all the individuals, blood levels of uric acid and vitamin D were measured using the enzymatic technique and RIA (radioimmunoassay), respectively. The data gathered were assessed statistically.

Results: The study found that the mean blood vitamin D level in the test group was 23.40±6.54 ng/mL, lower than the control group's value of 29.26±2.56 ng/mL. The test group had reduced uric acid levels (4.55±1.17 mg/dL) compared to the control group (5.85±1.72 mg/dL).

Conclusion: The current study suggests that uric acid and vitamin D levels are considerably lower in persons with glaucoma than in healthy participants, emphasizing the need of regular serum uric acid and vitamin D levels in subjects suspected of glaucoma. Furthermore, these findings might help ophthalmologists monitor and manage glaucoma patients.

Keywords: Glaucoma, Radioimmunoassay, serum Uric acid, Vitamin D.

INTRODUCTION

Glaucoma is a dangerous and common eye disease that affects over 70 million people worldwide, with approximately 10% of cases resulting in bilateral blindness. It is also the leading cause of irreversible blindness globally. The healthcare burden for glaucoma is growing as the population expands and effective causative therapy becomes increasingly difficult to attain. Elevated intraocular pressure (IOP), family history, central corneal thickness, advanced age, and a larger cusp-to-disc ratio are some of the key risk factors for glaucoma. Among these risk factors, IOP is adjustable, and lowering it has been shown to successfully delay the progression of glaucoma. Increased IOP is thought to be caused by an imbalance in the eye's ability to drain and generate aqueous humor. 1

The most accurate biomarker for assessing vitamin D levels is 25-hydroxyvitamin D [25(OH)D]. Vitamin D has also been linked to neuroprotective functions, particularly those of the optic nerve, as well as anti-inflammatory effects by suppressing cytotoxic T-cells and T-helper cells and decreasing IL-2, 6, 8, and 12 production. Uric acid (UA) is primarily created in the vascular endothelium, intestines, and liver through purine metabolism. It is a very potent antioxidant, accounting for over half of the antioxidant capacity of human blood plasma.

Furthermore, uric acid is an important antioxidant that may inhibit the creation of the potent oxidant peroxynitrite, scavenges superoxide and nitrogen radicals, has metal chelating activities, and is a strong antioxidant. Furthermore, it is theorized that uric acid protects the central nervous system from oxidative injury. 3

Despite the role of uric acid and vitamin D in antioxidant defense and neuroprotection, there is less research on vitamin D and uric acid levels in glaucoma patients. 4 As a result, the current study intended to investigate blood uric acid and vitamin D levels in Indian glaucoma patients. Furthermore, the study indicates a possible relationship between IOP and serum levels, which gives crucial information about glaucoma treatment and pathogenesis.

MATERIALS AND METHODS

The current cross-sectional clinical investigation sought to determine blood levels of uric acid and vitamin D in Indian glaucoma patients. Furthermore, the study identifies a potential link between IOP and serum levels, which provides important insights into glaucoma care and pathology. The study subjects were from the Outpatient Department of Biochemistry of the Institute. All individuals provided verbal and written informed consent before to participation.

The study compared 90 glaucoma patients aged 40 to 70 years to 90 age and gender-matched control persons who did not have glaucoma. The study's inclusion criteria were participants with any form of glaucoma, save glaucoma caused by trauma, and aged 40 to 70. The study excluded patients with self-reported systemic disorders such as carcinomas, renal diseases, metabolic syndrome, autoimmune diseases, hypertension, diabetes, hyperuricemia, and acute infectious infections.

Following final inclusion, a thorough history was obtained from all glaucoma patients, and all data were collected using a pre-designed structured proforma. In biochemical tests, 6ml of blood was taken by venipuncture from the antecubital vein. Vitamin D levels in the serum were measured using the RIA (radioimmunoassay),5 whereas serum uric acid levels were measured using the autoanalyzer's enzymatic technique. 6

The collected data was evaluated statistically using SPSS software version 24.0 (IBM Corp., Armonk, NY, USA) for descriptive measures, Student t-test, ANOVA (analysis of variance), Pearson correlation coefficient, and Chi-square test. The data were presented as mean and standard deviation, as well as frequency and percentage. A p-value of less than 0.05 was considered.

RESULTS

The current cross-sectional clinical investigation was designed to examine blood uric acid and vitamin D levels in Indian glaucoma patients. Furthermore, the study demonstrates a possible link between IOP and serum levels, which provides important insights into glaucoma care and pathology.

The current study compared 90 patients with a verified diagnosis of glaucoma to 90 age and gender-matched controls. The research individuals in cases and controls had a mean age of 52.53±8.09 and 50.82±8.85 years, respectively, with an age range of 40-70 years. The age difference was not statistically significant ($p>0.05$). In cases, there were 53.34% (n=48) men and 46.66% (n=90) females, whereas in controls, there were 51.12% (n=46) males and 48.88% (n=44) females, with a statistically non-significant difference at $p>0.05$ (Table 1).

The study found that the average blood vitamin D level in cases was 23.40±6.54 ng/mL, with a range of 10.6-43.41 ng/mL. In the control group, serum levels were 29.26±2.56 ng/mL, with a range of 24.10-35.93 ng/mL which depicted a statistically significant difference with $p<0.05$ between vitamin D level in two groups of study subjects (Table 2).

Serum uric acid levels in cases subjects were 4.55±1.17 mg/dL, with a range of 2.7-7.6 mg/dL. In control group subjects, the mean uric acid level was 5.85±1.72 mg/dL, with a range of 3.3-9.9 mg/dL, indicating a statistically significant difference ($p<0.05$) between the two groups of study subjects (Table 2).

The study's findings revealed that those with glaucoma had significantly lower levels of blood uric acid and vitamin D than those without glaucoma. These links between uric acid, vitamin D, and glaucoma can provide important insights into disease pathogenesis and may affect future treatment approaches.

DISCUSSION

The current study compared 90 participants with a verified diagnosis of glaucoma to 90 age- and gender-matched controls. The research individuals in cases and controls had mean ages of 52.53±8.09 and 50.82±8.85 years, respectively, with an age range of 40-70 years, which was not statistically significant ($p>0.05$). In cases, there were 53.34% (n=48) men and 46.66% (n=90) females, whereas in controls, there were 51.12% (n=46) males and 48.88% (n=44) females, indicating a statistically insignificant difference ($p>0.05$).

These findings were equivalent to those of Kim KE et al7 in 2020 and Lolekha P et al8 in 2015, who investigated participants with glaucoma and demographics similar to the current study in their separate investigations.

Serum vitamin D levels in cases were 23.40±6.54 ng/mL with a range of 10.6-43.41 ng/mL. In the control group, serum levels were 29.26±2.56 ng/mL with a range of 24.10-35.93 ng/mL, indicating a statistically significant difference ($p<0.05$) between the two groups of study participants. These results were similar with the findings of Vieru et al.9 in 2016 and Li et al.10 in 2017 where The authors also observed lower vitamin D levels in glaucoma patients, which is consistent with the current study's findings.

The study found a statistically significant difference ($p<0.05$) in serum uric acid levels between cases and control groups. Cases had a mean serum uric acid level of 4.55±1.17 mg/dL, with a range of 2.7-7.6 mg/dL, while control group subjects had a mean of 5.85±1.72 mg/dL and a range of 3.3-9.9 mg/dL. These findings were consistent with the findings of van der Schaft J et al11 in 2013 and McKinnon SJ12 in 2012, in which the authors reported mean serum uric acid levels equivalent to the current investigation.

It was also depicted from the results of the present study that subjects with glaucoma have significantly lower levels of serum uric acid and vitamin D compared to control group subjects without glaucoma. These correlations between uric acid, vitamin D, and glaucoma can give vital insight into disease pathophysiology and may influence future treatment options. These findings were consistent with those of DeLuca GC et al13 in 2013 and Li S et al14 in 2019, who reported results for serum uric acid and vitamin D that were equivalent to those of the current investigation.

The study found that individuals with glaucoma have considerably lower levels of uric acid and vitamin D compared to healthy individuals. This highlights the need of routinely measuring blood uric acid and vitamin D levels in those suspected of having glaucoma. Furthermore, these findings might help ophthalmologists monitor and manage glaucoma patients.

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Characteristics	Cases	Controls	p-value
Mean age (years)	52.53±8.09	50.82±8.85	>0.05

Age range (years)	40-70	40-70	
Gender n (%)			
Males	48 (53.34)	46 (51.12)	>0.05
Females	42 (46.66)	44 (48.88)	
Total	90 (100)	90 (100)	

Table 1: Gender and age distribution of study subjects

Parameters	**Cases**	**Controls**	**p-value**
Mean vitamin D (ng/ml)	23.40±6.54	29.26±2.56	**<0.05**
Range (vitamin D)	10.6-43.41	24.10-35.93	
Mean UA (mg/dl)	4.55±1.17	5.85±1.72	**<0.05**
Range	2.7-7.6	3.3-9.9	

Table 2: Biochemical parameters in two groups of study subjects