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Original Research Article

A Study on a Comparative Analysis on Serum Uric Acid Levels in the Spectra of Hypertension

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Abstract:

Introduction: Hyperuricemia in prehypertension and hypertension may be either a cause or a result. Hyperuricemia has been reported to excite smooth muscles in the artery wall and promote endothelial dysfunction, both of which are important in the etiology of hypertension. In turn, hypertension may cause renal dysfunction, resulting in a decrease in GFR and renal urate excretion. Though studies demonstrate higher uric acid levels in both the prehypertensive and hypertension groups, there are few research that examine the association of uric acid levels in the prehypertensive and hypertensive groups.

Aim of the study: (1) To assess the existence of asymptomatic hyperuricemia in normotensive, prehypertensive, and hypertensive individuals. (2) To compare the serum Uric Acid levels in different Hypertensive categorization groups, both subjectively and quantitatively.

Materials and Methods: A prospective observational research was conducted at SCB Medical college and Hospital, cuttack on 300 patients chosen at random from outpatient clinics in the Department of Medicine and Surgery at SCB Medical college and Hospital, cuttack. The participants were tested for hypertension and categorized according to the JNC VII Recommendation (Normotensive, Pre-hypertensive, Hypertensive-stage I & II). Other information were documented, such as the occurrence of hypertension and diabetes mellitus. They had their anthropometric measures taken and their BMI computed. In these individuals, serum Uric Acid, fasting blood glucose, and serum cholesterol were all measured. All data was gathered and analyzed using a proforma created specifically for this project. S. Uric Acid 6.8mg/dl is used to treat hyperuricemia. Conclusion: The results of my investigation support previous research on the relationship between uric acid and hypertension. Uric acid levels are increased in all hypertension populations. Stage II hypertension has the highest association among hypertensive categories. It has also been shown that as the stage of hypertension advances, so do the mean uric acid levels. The mean values grow sharply from stage I to stage II. This shows that uric acid may play an important part in the pathophysiology of hypertension problems, since it is well known that higher grades of hypertension are linked with a larger degree of end organ damage. Asymptomatic hyperuricemia (S. Uric acid 6.8 mg/dl) is substantially related with all of the components of metabolic syndrome, consistent with previous research.

Conclusion: The relationship between serum uric acid levels and hypertension is a key paradigm in identifying many variables implicated in hypertension pathogenesis. The necessity for this stems from the fact that hypertension is a significant cause of illness and death in our nation, and it is getting more frequent. As further research is conducted, it is possible that medications that decrease uric acid will have a role in the primary prevention of hypertension or the secondary prevention of consequences.

Introduction

Alfred Baring Garrod [1] identified hyperuricemia when he observed a high amount of uric acid content in gout patients. Some researchers see hyperuricemia as a beneficial feature, owing to the discovery that uric acid may serve as an antioxidant, inhibiting superoxide, peroxynitrite, and iron-catalyzed oxidation processes. Recent investigations in the Western world, however, have demonstrated that asymptomatic hyperuricemia is related with poor prognosis in people with

cardiovascular disease and renal insufficiency [2]. Uric acid levels are linked to prehypertension, hypertension, and other components of the metabolic syndrome. Hyperuricemia in prehypertension and hypertension may be either a cause or a result. Hyperuricemia has been reported to excite smooth muscles in the artery wall and promote endothelial dysfunction, both of which are important in the etiology of hypertension. In turn, hypertension may cause renal dysfunction, resulting in a decrease in GFR and renal urate excretion. Though studies demonstrate higher uric acid levels in both the prehypertensive and hypertension groups, there are few research that examine the association of uric acid levels in the prehypertensive and hypertensive groups. A quantitative association may also serve as a predictor of the degree of endothelial dysfunction in these people [3]. As a result, investigations are needed to quantify uric acid levels in both prehypertensive and hypertensive populations (with stage I and II as subgroups) to observe whether larger amounts of uric acid are detected when BP levels rise.

Aim of the Study

1. To evaluate for the presence of Asymptomatic Hyperuricemia in Normotensive, Pre hypertensive and

Hypertensive Population

2. To compare qualitatively and quantitatively, the serum Uric Acid levels in various Hypertensive classification groups.

Materials & Methods

A prospective observational research was conducted at SCB Medical college and Hospital, cuttack on 300 patients chosen at random from outpatient clinics in the Department of Medicine and surgery at SCB Medical college and Hospital, cuttack.

Normotensive, prehypertensive, and hypertensive individuals were eligible.

Exclusion criteria:

Hyperuricemia, Gout, Leukemia, chemotherapy, and Renal Failure.

The participants were examined for hypertension and categorized according to the JNC VII Recommendation (Normotensive, Pre-hypertensive, Hypertensive-stage I & II). Other information was documented, such as the occurrence of hypertension and diabetes mellitus. They had their anthropometric measures taken and their BMI computed.

In these individuals, serum Uric Acid, fasting blood glucose, and serum cholesterol were all measured. All data was gathered and analyzed using a proforma created specifically for this project. S. Uric Acid 6.8mg/dl is used to treat hyperuricemia.

Result & Analysis

Table 1: Distribution of Subjects According to Hypertensive Groups

Stage of HT	No of Subjects
Normotension	75
Prehypertension	25
Stage I Hypertension	33
Stage Ii Hypertension	17

Table 2: Distribution in Age Groups

Age Group(No)	Number Of Patients
30- 39(1)	39 (26%)
40-49(2)	52 (34.7%)
≥50(3)	59 (39.3%)

Table 3: Mean Age Groups

	Number	Mean Age
Normotensive	75	43
Hypertensive	75	49.31
p= 0.000 statistically significant		

Table 4: Mean Age among Hypertensive

Hypertensive group	Number	Mean Age
Normotension	75	43
Pre Hypertension	25	50.4
Stage I Hypertension	33	49.91
Stage II Hypertension	17	46.53
Total	**150**	**46.15**

Table 5: Sex Distribution

	Males	Females
Normotensive	41	34
Hypertensive	30	45
p=0.072 not statistically significant		

Table 6: Mean Height and Weight

		No of subjects	Mean
Weight	Hypertensive	75	66
	Non- Hypertensive	75	61.79
Height	Hypertensive	75	164.29
	Non- Hypertensive	75	163.25
p= 0.028 statistically significant			

Table 7: Mean BMI

	No of subjects	Mean BMI
Hypertensive	75	24.26
Non Hypertensives	75	22.57
P=0.000 statistically significant		

Table 8: Mean FBS

	No of Subjects	Mean FBS
Hypertensive	75	134.60
Normotensive	75	117.97
p= 0.000 statistically significant		

Table 9: Mean Cholesterol Levels

	No of Subjects	Mean Cholesterol
Hypertensive	75	191.05
Normotensive	75	156.8
P= 0.000 Statistically Significant		

Table 10: Mean Serum Cholesterol levels among Hypertensive Groups

	No of Subjects	Mean Cholesterol
Normotension	75	156.8
Pre Hypertension	25	179.84
Stage I Hypertension	33	172.61
Stage Ii Hypertension	17	243.35

Table 11: Mean Serum Uric Acid

	No	Mean	SD	Standard Error of Mean
Hypertensive	75	5.55	2.014	0.233
Normotensive	75	4.09	1.036	0.12
p= 0.000 statistically significant				

Table 12: Test of Significance

	Levene's Test for Equality of Variances	t-test for Equality of Means
Significance(p)	0	0

Table 13: Mean Serum Uric Acid among HypertensiveGroups

	MEAN S. URIC ACID
Normotension	4.09
Pre Hypertension	4.86
Stage I Hypertension	5.08
Stage Ii Hypertension	7.46

Table 14: Frequency of Hyperuricemia

Hyperuricemia	Frequency	Percentage
Absent	128	85.3
Present	22	14.7

Table 15: Distribution of Hyperuricemia among Hypertensive Groups

	UA< 6.8		UA≥6.8	
	Number	**Percent**	**Number**	**Percent**
Normotension	74	57.8	1	4.5
Pre Hypertension	23	18	2	9.1
Stage I Hypertension	27	21.1	6	27.3
Stage Ii Hypertension	4	3.1	13	59.1
p= 0.000 statistically significant				

Table 16: Mean SBP and DBP amongHyperuricemic Subjects

		No of Subjects	**Mean BP**
SBP	Hyperuricemia	22	156.77
	Normal	128	122.87
DBP	Hyperuricemia	22	97.09
	Normal	128	81.91
p= 0.000 statistically significant			

Table 17: Mean Weight and Height among Hyperuricemic Subjects

		No of Subjects	**Mean**
Weight	Hyperuricemia	22	70.91
	Normal	128	62.69
Height	Hyperuricemia	22	163.73
	Normal	128	163.78
p=0.002 statistically significant			

Table 18: Mean BMI among HyperuricemicSubjects

	No of Subjects	**Mean BMI**
Hyperuricemia	22	26.25
Normal	128	22.93
p= 0.000 statistically significant		

Discussion

In the research, 300 people who went to our hospital's outpatient department for minor illnesses were screened. Males and females (47.3% and 52.3%, respectively) were included in the study group. The research group's age ranged from 30 to 60 years old, with a decade distribution of 39.3%, 34.7%, and 26.0%. 75 of the individuals were determined to be normotensive, whereas the others had an abnormal blood pressure. The prehypertensive, stage I hypertension, and stage II hypertensive groups were 17%, 22%, and 11%, respectively.

The research group's average age was 46.15 years. The mean age distribution of normotensive, prehypertensive, stage I hypertension, and stage II hypertensive patients was 43, 50.4, 49.9, and 46.53 years, respectively. The age distribution was determined to be statistically significant using ANOVA, indicating that age corresponds with blood pressure level, with normotensives being younger than hypertensives.

The research does, however, make an intriguing discovery that within the hypertensive population, stage II hypertensives seem to be younger than those with lower degrees of hypertension in the study group. This is a concerning discovery, and further research is required to determine if this tendency exists in the general population or is only an accidental finding in this study. There was no link discovered between sex groups and the development of hypertension.

An analysis of the anthropometric measures indicated that hypertensives are more obese than normotensives (66 vs. 61.29 kg), and this was statistically significant (p=0.028). Using post hoc analysis, it was shown that this association applied best when comparing weight between the Normotension and Stage II Hypertension groups, and not between the other groups. However, no association was found between height and blood pressure levels. BMI was found to be greater in hypertensives, as predicted (p=0.00). The average BMI was 24.26, compared to 22.57 in normotensive patients. Post hoc analysis revealed that this link was strongest between all hypertension groups and Stage II hypertensives, i.e. these participants had a very high BMI (27.26).

Among the other biochemical measures, FBS and serum cholesterol levels in the hypertension group were significantly higher (134.60 vs 117.97 & 191.05 vs 156.80, respectively). Multiple comparisons among hypertension groups were made in this correlation. In terms of FBS, the difference between stage II hypertension (mean FBS- 168.3 mg/dl) and the other groups was significant. A similar connection found for serum cholesterol (S. Cholesterol in Stage II

Hypertension=243.34 mg/dl). Furthermore, there was a substantial difference in cholesterol levels between the normotensive and prehypertensive groups.

The primary variables in this research are S. Uric acid and Hyperuricemia. The relationship between uric acid levels and hypertension was determined to be statistically significant (p=0.00) using Levene's test and independent t-test. In other words, as blood pressure rises, so does the mean serum uric acid level (5.55 mg/dl in hypertensives vs. 4.09 mg/dl in normotensives).

In rising levels of blood pressure, the mean serum uric acid levels in the hypertension groups are 4.09, 4.86, 5.08, and 7.46 (in mg/dl). In post hoc multiple comparing analyses across the hypertension groups, there was a statistically significant increase in uric acid levels in Stage I & II hypertensives (p=0.001 & 0.000, respectively). Serum uric acid levels were greater in Stage II hypertension, which was statistically significant across all groups.

Hyperuricemia was seen in 14.7% of the 300 participants and increased with rising blood pressure, with almost 60% of them in Stage II hypertension. The relationship between hyperuricemia and hypertension was determined to be statistically significant (p=0.000) using Pearson's chi-square test. Hyperuricemia was related with greater mean SBP (156 mm Hg) and DBP (97 mm Hg), both of which were almost at Stage II Hypertension levels.

The link between hyperuricemia and weight was statistically significant (p=0.002) in terms of anthropometric measurements. The hyperuricemic participants' average weight was 70.79 kg, compared to 62.69 kg in the normal group. The connection for Height was not statistically significant (p=0.9> 0.05). The link between hyperuricemia and body mass index was statistically significant (p=0.000). The hyperuricemic participants' average BMI was 26.25 kg, compared to 22.93 kg in the normal ones.

These findings are comparable with those of Cannon et al [4], who investigated the relationship between uric acid and hypertension level (54). Their research found hyperuricemia in 25% of untreated hypertensive people, half of those on therapy, and almost all of those with malignant hypertension.

Another research, conducted by Bulpitt et al [5], found increased levels of uric acid in half of hypertension participants at the national level. Fang et al [6]. Analyzed data from the First National Health and Nutrition Examination Survey (NHANES I) Epidemiologic Follow-up Study (NHEFS) in a landmark experiment. A total of 6000 people were analyzed, and the relationship between serum uric acid and cardiovascular risk variables was investigated. Our findings were similar with their study's findings, which revealed a substantial relationship between uric acid and variables such as blood sugar, serum cholesterol, and BMI.

Conclusion

My study's results support previous research on the relationship between uric acid and hypertension. Uric acid levels are increased in all hypertension populations. Stage II hypertension has the highest association among hypertensive categories. It has also been shown that as the stage of hypertension advances, so do the mean uric acid levels. The mean values grow sharply from stage I to stage II. This shows that uric acid may play an important part in the pathophysiology of hypertension problems, since it is well known that higher grades of hypertension are linked with a larger degree of end organ damage.

Asymptomatic hyperuricemia (S. Uric acid 6.8 mg/dl) is substantially related with all of the components of metabolic syndrome, consistent with previous research. The relationship between serum uric acid levels and hypertension is a key paradigm in identifying many variables implicated in hypertension pathogenesis. The necessity for this stems from the fact that hypertension is a significant cause of illness and death in our nation, and it is getting more frequent. As further research is conducted, it is possible that medications that decrease uric acid will have a role in the primary prevention of hypertension or the secondary prevention of consequences.

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