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ORIGINAL RESEARCH PAPER

A study of serum uric acid level in hypertensive patients

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ABSTRACT

Background*: Various risk factors for development of hypertension, both modifiable and non modifiable ,have been identified to aid in its prevention and management. In recent years, various studies have shown serum uric acid (UA) levels to be an independent predictor for developing hypertension. This study determined the uric acid level in hypertensive patients and established a relation between hypertension and uric acid level.* ***Materials and methods****: It was a case control study done from 1st March 2018 to 31st August 2018,which included a total of 80 newly diagnosed hypertensive cases and 80 normotensive controls matched for age and sex admitted in the Department of Medicine GMCH. The cases were classified into the various stages of hypertension as per the JNC-7 classification criteria.One way ANOVA analysis was performed to compare the differences in mean serum uric acid levels in the various categories.* ***Results****: The mean serum uric acid level among the controls was 5.09±1.33 mg/dl while among the cases was 5.72±1.35 mg/dl. Among the cases, mean serum uric acid in stage 1 and stage 2 HTN were 5.15±0.97 and 6.35±1.45 mg/dl respectively. There was statistically significant differences among the 3 groups, i.e between stage 1 and stage 2 HTN, between control group and stage 1 HTN and between control group and stage 2 HTN, with a p value <.05.* ***Conclusion****: There was statistically significant differences between mean serum uric acid levels of newly diagnosed hypertensive cases and age and sex matched normotensive healthy controls and it tends to rise with the severity of hypertension.*

Keywords*: JNC 7; hyperuricemia; purine.*

INTRODUCTION

In the last two decades, the world has witnessed a significant increase in the prevalence of hypertension, one of the major and leading causes of cardiovascular disease. Studies have shown that each difference of 20 mm Hg of systolic and 10 mm of diastolic Hg was associated with twice the risk of death from heart disease, stroke or other cardiovascular disease.[1]

Various risk factors for development of hypertension, both modifiable and non modifiable ,have been identified to aid in its prevention and management. In recent years, various studies have shown serum uric acid (UA) levels to be an independent predictor for developing hypertension. In India, not many studies are available regarding the association of hypertension and hyperuricemia. This study has been done to assess the level of serum uric acid in hypertensives and to ascertain whether there is a relation between hyperuricemia and hypertension.

Uric acid is a byproduct of purine metabolism produced in blood from endogenous purine (2/3) substances or from diet (1/3). The amount of urate in the body is affected by the balance of its production and excretion. Alcohol and high-purine foods consumption, low water consumption and poorly exercising are contributing factors responsible for hyperuriceamia. Hyperuricemia is defined as a level of serum uric acid level over 7.0 mg/dL.[2]

Uric acid is commonly associated with hypertension. It is present in 25% of untreated hypertensive subjects, in 50% of subjects taking diuretics, and in 75% of subjects with malignant hypertension.[3] The association of hyperuricemia

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with hypertension has long been recognized with early investigators such as Frederick Mahomed, Alexander Haig, and Nathan Smith Davis, hypothesizing that uric acid might be a cause of hypertension or renal disease.[4] Uric acid is thought to play a pathogenic role in hypertension mediated by several mechanisms such as inflammation, vascular smooth muscle cell proliferation in renal microcirculation, endothelial dysfunction and activation of the renin – angiotensin – aldosterone system.[5]

This paper has aimed to study the level of serum uric acid in hypertensive patients and to know the relation in-between.

MATERIALS AND METHODS

The study was a case control study done from 1st March 2018 to 31st August 2018. It included a total of 80 newly diagnosed hypertensive cases and 80 normotensive controls matched for age and sex admitted in the Department of Medicine GMCH. The cases were classified into the various stages of hypertension as per the JNC-7 classification criteria. Blood pressure has been recorded as the average of 2 or more readings at each of the 2 or more visits after initial screening.[6] All the patients were subjected to relevant clinical examinations and laboratory investigations to look for secondary causes of hypertension. All other causes of secondary hypertension were ruled out. Reference Values for Serum Uric Acid levels – 7 mg/dl.[3]

JNC -7 classification of hypertension[7] used in this study.

BLOOD PRESSURE	SYSTOLIC BP	DIASTOLIC
STAGING	(mm Hg)	BP(mm Hg)
NORMAL	<120	AND <80
PREHYPERTENSION STAGE 1	120-139	OR 80-89
HYPERTENSION STAGE 2	140-159	0R 90-99
HYPERTENSION	>160	OR>100
ISOLATED SYSTOLIC HYPERTENSION	>140	AND <89

Statistical analysis

Data was recorded into a preformed and pretested proforma. Statistical analysis was done by MS excel 07 and GRAPHPAD INSTAT software. Data are expressed as mean and standard deviation. One way ANOVA analysis with post test was performed to compare the differences in mean serum uric acid levels in the various categories.

Inclusion criteria: (i) Age >18 years; (ii) Newly detected patients of essential hypertension.

Exclusion criteria: (i) Patients with gout; (ii) Patients on uricosuric drug; (iii) Patients on drugs which increase serum uric acid level e.g salicylates (>2gm/day), diuretics, ethambutol, Pyrazinamide, etc other than uricosuric drug; (iv) Patients with renal failure; (v) Lymphoproliferative or myeloproliferative disorders; (vi) Secondary hypertension and pregnancy induced hypertension.

RESULTS

In the present study, out of 80 controls, 57.5% were males and 42.5% were females while among the 80 cases, 45(56.25%) were males and 35(43.75%) were females (**Table 1**).

Table 1 Sex distribution in study group

		TOTAL	PERCENTAGE(%)
CONTROL	MALE	46	57.5
	FEMALE	34	42.5
CASE	MALE	45	56.25
	FEMALE	35	43.75

In the present study, out of 80 cases, 42 patients had stage 1 hypertension and 38 had stage 2 hypertension. Out of 42 cases of stage 1 HTN, 24 were males and 18 were females, while among the 38 cases of stage 2 HTN, 21 were males and 17 were females (**Table 2**).

Table 2 Sex distribution according to stage of hypertension

	MALE	FEMALE	TOTAL
STAGE 1	24	18	42
STAGE 2	21	17	38

The mean serum uric acid level among the controls was 5.09±1.33 mg/dl while among the cases was 5.72±1.35 mg/dl. There was statistically significant difference between the two groups (p value<.05) (**Table 3**).

Table 3 Mean serum uric acid level in controls and cases

	CONTROL	CASES
MEAN±SD(mg/dl)	5.09±1.33	5.72±1.35

In the present study, mean serum uric acid level in controls was 5.09±1.33mg/dl while among the cases was 5.72±1.35 mg/dl. Mean serum uric acid in stage 1 and stage 2 HTN were 5.15±0.97 and 6.35±1.45 respectively (**Table 4**). There was statistically significant differences among the 3 groups, i.e between stage 1 and stage 2 HTN, between control group and stage 1 HTN and between control group and stage 2 HTN, with a p value <.05.

Table 4 Mean serum uric acid in controls and cases (according to stage of hypertension)

value	CONTROLS	STAGE 1 HTN	STAGE 2 HTN	P
MEAN (mg/dl)	5.09±1.33	5.15±0.97	6.35±1.45	<0.05

DISCUSSION

The mean serum uric acid level among the controls was 5.09±1.33 mg/dl while among the cases was 5.72±1.35 mg/dl. Among the cases, mean serum uric acid in stage 1 and stage 2 HTN were 5.15±0.97 and 6.35±1.45 mg/dl respectively.

This result is similar to those of Neki et al[8] and Perlstein et al[9] who reported a mean uric acid level of 5.8±1.3 mg/dl and 5.8±0.9 mg/dl respectively in the hypertensive patients. Similar results were documented by Strasak et al[10] and Kashem et al[11] (5.7±1.2 and 5.8±1.5 mg/dl respectively). Raina S et al also found the mean serum uric acid level was significantly higher in the cases (5.5±1.7 mg/dl) than in the controls (4.9±1.1 mg/dl; P<.05), which is similar to our result.[12]

In a similar study by Reddy et al, it was reported the mean serum uric acid levels were found to be 4.78(2.32) mg/dl, 4.42(1.38) mg/dl, 6.57(1.55) mg/dl and 4.44(1.44) mg/dl in controlled hypertension, stage 1 hypertension, stage 2 hypertension and isolated systolic hypertension respectively. There was significant difference between stage 2 hypertension with the stage 1 hypertensive, isolated systolic hypertensive and well controlled hypertensive patients with the p values of .001, .001 and .002 respectively.[4]

N. S. Neki and Tamilmani, in a case control study comprising of a total of 200 essential hypertensive patients, categorized into Stage 1 or Stage 2 hypertension (based on JNC VII classification) and 200 normotensive controls also observed that the value of mean SUA (serum uric acid) was 5.8 mg% in cases and 4.4 mg% in the control group. The mean values of SUA were 5.37 mg% & 6.39 mg% respectively in stage-1 & stage-2 HTN, which was statistically significant and in consistent with the results of the present study.[8]

Ouppatham S et al in their study of 5,564 subjects, observed a significant and positive correlation both between serum uric acid and SBP(r=0.186, P < .001) and between serum uric acid and DBP(r=0.255, P < .001).[13]

Poudel B et al[14] and Shrivastav et al[15] also found higher levels of serum uric acid levels in newly diagnosed hypertensive patients as compared to healthy normotensive individuals.

Lee et al[16] also found a positive correlation between hyperuricemia and hypertension.

Ankit Vakil et al studied 100 patients and found that in stage 1 HTN out of 28 patients, 21 patients have high SUA level, while in stage 2 HTN out of 72 patients, 44 patients have high SUA level. They found that there is definite relation in SUA levels between hypertensive patients and normotensive patients and there is a directly proportional relation in the levels of SUA in relation to the duration and severity of hypertension.[17]

In a similar study by Mishra et al, statistically significant difference (p value <.05),was found between mean serum uric acid of newly diagnosed hypertensive cases and normotensive healthy controls.[18]

Mangesh Tiwaskar in his study of 100 patients found a positive correlation between hyperuricemia and hypertension in newly diagnosed hypertensive patients.[19]

CONCLUSION

Although, serum uric acid levels were found to be within the normal range, there was statistically significant differences between mean serum uric acid levels of newly diagnosed hypertensive cases and age and sex matched normotensive healthy controls and it tends to rise with the severity of hypertension. However, further studies with a larger sample size is required to arrive at a definite conclusion.

Conflict of Interest: None.

Ethical Clearance: Taken.

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REFERENCES

1. Gaciong Z, Sinski M, Lewandowski J. Blood pressure control and primary prevention of stroke: summary of the recent clinical trial data and meta-analyses. Curr Hypertens Rep 2013 Dec;15(6):559-74.
2. Khanna D, Fitzgerald JD, Khanna PP, Bae S, Singh MK, Neogi T, et al. 2012 American College of Rheumatology guidelines for management of gout. Part 1: systematic nonpharmacologic and pharmacologic therapeutic approaches to hyperuricemia. Arthritis Care Res (Hoboken) 2012 Oct;64(10):1431-46.
3. Ragab G, Elshahaly M, Bardin T. Gout: an old disease in new perspective–a review. J of advanced research. 2017 Sep 1;8(5):495-511.
4. Feig DI, Kang D-H, Johnson RJ. Uric acid and cardiovascular risk. N Engl J Med 2008 Oct 23;359(17):1811-21.
5. Nguedia JC. The Relationship between Uric Acid and Hypertension in Adults in Fako Division, SW Region Cameroon. J Nutr Food Sci 2014 Jan 27 9600.1000257.php?aid=223886.
6. Carey RM, Whelton PK. Prevention, detection, evaluation, and management of high blood pressure in adults: synopsis of the 2017 American College of Cardiology/American Heart Association hypertension guideline. Annals of internal medicine 2018 Mar 6;168(5):351-8.
7. Johnson RJ, Kang D-H, Feig D, Kivlighn S, Kanellis J, Watanabe S, et al. Is there a pathogenetic role for uric acid in hypertension and cardiovascular and renal disease? Hypertension 2003 Jun 1;41(6):1183-90.
8. Neki NS, Gupta H, Mani T. A Study of Association of Hyperuricemia with Progressive Diabetic Nephropathy. JIMSA 2015;28(1):13-9.
9. Perlstein TS, Gumieniak O, Williams GH, Sparrow D, Vokonas PS, Gaziano M, et al. Uric acid and the development of hypertension. Hypertension 2006 Dec;48(6):1031-6.
10. Strasak A, Ruttmann E, Brant L, Kelleher C, Klenk J, Concin H, et al. Serum uric acid and risk of

cardiovascular mortality: A Prospective Long-Term Study of 83 683 Austrian Men. Clin Chem 2008 Feb 1;54(2):273-84.

11. Kashem M, Hossain M, Ayaz K, Alam M, Khan M, Alam A, et al. Relation of serum uric acid level And essential hypertension among patients without metabolic syndrome. J Dhaka Med Coll 2011 Sep 13;20(1):5-8.
12. Raina S, Agarwal VK, Kapoor D, Sharma KN. Hypertension as determinant of hyperuricemia: a case control study from the Sub-Himalayan Region in North India 2018 Jan;66:14-8.
13. Ouppatham S, Bancha S, Choovichian P. The relationship of hyperuricemia and blood pressure in the Thai army population. Journal of postgraduate medicine 2008 Oct 1;54(4):259.
14. Poudel B, Yadav BK, Kumar A, Jha B, Raut KB. Serum uric acid level in newly diagnosed essential hypertension in a Nepalese population: a hospital based cross sectional study. Asian Pac J Trop Biomed 2014 Jan;4(1):59-64.
15. Shrivastav C, Sharma S, Suhalka ML, Kaur M. Hyperuricemia and essential hypertension: a case control study in Southern Rajasthan. Int J Res Med Sci 2016 Jan;4(1):78-83.
16. Lee JJ, Ahn J, Hwang J, Han SW, Lee KN, Kim JB, et al. Relationship between uric acid and blood pressure in different age groups. Clinical hypertension 2015 Dec;21(1):14.
17. Vakil A, Vrkariya P, Barafiwala V, Gamit K, Doctor N. Study of serum uric acid level in hypertension. IOSR-JDMS 2017 Apr;16(4):69-73.
18. Mishra A, Gupta P, Gupta A, Verma SK, Chaurasia AK, Sharma D. Prevalence and association of hyperuricemia in patients of newly diagnosed essential hypertension. International J of Contemporary Medical Research 2017 Nov;4:404-6.
19. Tiwaskar M. Hypertension and hyperuricemia: a compelling correlation. Assoc Physicians India 2018 Jan;66(1):11-2.