

The Effects of Beta Blocker (Metoprolol) & Calcium Channel Blockers (Amlodipine) on Serum Uric Acid Levels in the Patients of Hypertension

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ABSTRACT

Hypertension is one of the leading health hazards which increases cardiovascular mortality and morbidity all over the world. Hyperuricemia associated with hypertension can cause the development of gout, especially in the female gender. Different antihypertensive drugs have different effects on serum uric acid levels.

Aims & Objective: To compare the effects of beta blockers (metoprolol) and calcium channel blocker (amlodipine) on serum uric acid level in the patients of hypertension.

Methodology: This study was conducted at the Medical OPD of Bhattai Dental & Medical College Mirpurkhas from July 2021 to December 2021. A total of 100 hypertensive patients were selected under inclusion and exclusion criteria and divided into two groups with equal numbers of patients. Group A patients used beta blockers (metoprolol) and group B patients used calcium channel blockers (amlodipine) for the treatment of hypertension for three months' duration. Serum uric acid was measured by the PAP uricase method before the start of treatment and after completion of the treatment research phase. Statistical analysis was done by SPSS version 22.

Results: The mean serum uric acid level of male patients in group A was 7.4 ± 0.4 mg/dl and that of female patients in group A was 6.2 ± 0.1 mg/dl before the start of research. After three months of complete treatment phase, the mean serum uric acid level of male patients in group A was 7.1 ± 0.35 mg/dl and that of female patients in group A was 6.0 ± 0.31 mg/dl. The mean serum uric acid level of male patients in group B was 7.2 ± 0.38 mg/dl and that of female patients in group B was 6.1 ± 0.28 mg/dl before the start of research. After three months of the complete treatment phase, the mean serum uric acid level of male patients in group B was 7.0 ± 0.22 mg/dl and that of female patients in group B was 5.91 ± 0.27 mg/dl. There was no significant change in serum uric acid observed in either group under study.

Conclusion: This study concluded that metoprolol (beta blocker) or amlodipine (calcium channel blocker) have no significant effect on serum uric acid levels in hypertensive patients.

Keywords: Hypertension, Serum Uric Acid, Beta blockers, Calcium Channel blockers,

INTRODUCTION

Premature cardiovascular death due to hypertension is one of the most common problems in the world nowadays.¹ The incidence of hypertension and cardiovascular diseases is increasing day by day all over the world.² The current incidence is 33% of deaths due to hypertension all over the world.³

There are some factors due to which hypertension is still a treatable problem. Uric acid is also one factor associated with an increased incidence of hypertension.⁴ The first link between serum uric acid and hypertension was reported in 1879, but various studies have now confirmed that uric acid level is directly proportional to hypertension.^{5,6,7} The numerous processes that contribute to the development of hypertension by uric acid include oxidative stressors, inflammation, endothelial dysfunction, and activation of the renin-angiotensin aldosterone system.^{8,9,10,11} The xanthine oxidoreductase polymorphism has also been linked to hypertension, however the genetics of key urate transporters have not been linked to the development of hypertension.^{12,13,14}

The intracellular production of uric acid is mediated by xanthine oxidoreductase, while the uric acid regulation and excretion process is mediated by urate transporters.^{15,16} Metoprolol is the cardio selective beta blocker, while amlodipine is the calcium channel blocker used for the treatment of hypertension.¹⁷ Some researchers postulated that calcium channel blockers are more safe and beneficial as compared to beta blockers in patients with hypertension along with an increased level of serum uric acid.^{18,19}

This study was designed to compare the effects of beta blockers (metoprolol) and calcium channel blockers (amlodipine) on serum uric acid levels in patients with hypertension.

METHODOLOGY

This study was conducted from July 2021 to December 2022 at the Department of Medicine at Bhattai Dental & Medical College

Mirpurkhas. A total of 100 patients with hypertension were selected on a non-probability basis. Total cases were divided into 2 groups, with 50 cases in each group. Group A labeled those cases which received Metoprolol as antihypertensive, and Group B labeled those cases which received Amlodipine as antihypertensive.

This study included male and female subjects aged 40–50 years with body weights of 80 kgs, systolic blood pressures of 140–150 mmHg and diastolic blood pressures of 100–110 mmHg, normal HbA1c%, and serum uric acid levels of less than 8.0 mg/dl in males and less than 6.5 mg/dl in females.

Participants under the age of 40 or over the age of 50, with a body weight of more than 80 kg, a systolic blood pressure greater than 150 mm Hg, a diastolic blood pressure greater than 110 mm Hg, and patients with myocardial infarction, cardiomyopathy, renal failure, liver disorders, or diabetes mellitus were excluded from this study.

The study duration was six months but the trial was given three months regularly and after taking consent from patients, patients were divided into two groups; patients of group A received Tb. Metoprolol 50mg once a day while patients of group B received Tb. Narvasac 5mg once a day for three months. The blood pressure was measured by a digital sphygmomanometer.

The 5 cc blood sample was drawn for estimation of serum uric acid level. HbA1c% LFT was done before the start of treatment and the second sample was done for estimation of serum uric acid after the completion of three months of therapy. The ECG and Troponin T tests were done to exclude any cardiac pathology. The serum uric acid level was estimated by the enzymatic (PAP-uricase) 19 method on a chemical autoanalyzer.

The data was statistically analyzed on SPSS version 22 by applying the student t test. The graphs and tables were generated by Microsoft Word and Excel.

RESULTS

This study was done on 100 hypertensive patients (52 males and 48 females) with an age range of 40 to 50 years under the guidelines of inclusion and exclusion criteria. The mean age of patients was 46 ± 1.21 years. The mean body weight of all subjects was 73 ± 2.14 kg. The mean HbA1c% level was 5.1 ± 0.4 %.

The gender split was as follows: group A had 28 males and 22 females, whereas group B had 24 men and 26 females. Before starting therapy, the mean systolic B.P of group A patients was 146 ± 2.31 mmHg, while the mean systolic B.P of group B patients was 147 ± 1.98 mmHg. Before starting therapy, group A patients had a mean diastolic B.P of 106 ± 2.1 mmHg while group B patients had a mean diastolic B.P of 106 ± 1.76 mmHg. After three months of antihypertensive medication, group A patients' mean systolic B.P was 126 ± 3.11 mmHg, whereas group B patients' mean systolic B.P was 124 ± 2.78 mmHg. After three months of antihypertensive medication, group A patients' mean diastolic B.P was 89 ± 3.37 mmHg, whereas group B patients' was 86 ± 2.13 mmHg.

Before the commencement of the study, male patients in group A had a mean blood uric acid level of 7.4 ± 0.4 mg/dl and female patients had a mean serum uric acid level of 6.2 ± 0.1 mg/dl. After three months of comprehensive therapy, male patients in group A had a mean serum uric acid level of 7.1 ± 0.35 mg/dl, whereas female patients had a mean serum uric acid level of 6.0 ± 0.31 mg/dl.

Before the study, the mean blood uric acid level of male patients in group B was 7.2 ± 0.38 mg/dl and female patients in group B was 6.1 ± 0.28 mg/dl. After three months of comprehensive therapy, male patients in group B had a mean blood uric acid level of 7.0 ± 0.22 mg/dl and female patients had a mean serum uric acid level of 5.91 ± 0.27 mg/dl.

Antihypertensive medicines had no significant (p value less than 0.05) influence on blood uric acid levels, according to this research.

Table 1: Blood Pressure & Serum Uric Acid Levels at Level-0 & Level-I of Patients of Group A

Parameter	Group A at level-0	Group A at level-I	P.Value
Systolic B.P (mmHg)	146 ± 2.31	126 ± 3.11	$< 0.05^*$
Diastolic B.P (mmHg)	106 ± 2.1	89 ± 3.37	$< 0.05^*$
S. Uric Acid (mg/dl) (Males)	7.4 ± 0.4	7.1 ± 0.35	0.31
S. Uric Acid (mg/dl) (Females)	6.2 ± 0.1	6.0 ± 0.31	0.867

(*P. Value < 0.05)

Table 2: Blood Pressure & Serum Uric Acid Levels at Level-0 & Level-I of Patients of Group B

Parameter	Group B at level-0	Group B at level-I	P.Value
Systolic B.P (mmHg)	147 ± 1.98	124 ± 2.78	$< 0.05^*$
Diastolic B.P (mmHg)	106 ± 1.76	86 ± 2.13	$< 0.05^*$
S. Uric Acid (mg/dl) (Males)	7.2 ± 0.38	7.0 ± 0.22	0.08
S. Uric Acid (mg/dl) (Females)	6.1 ± 0.28	5.91 ± 0.27	0.710

DISCUSSION

Uric acid is a weak acid, and urate ions exist at normal blood PH.²⁰ During purine degradation, the metabolites like xanthine and hypoxanthine compounds are degraded and form urate compounds by the action of Xanthine Oxido Reductase (XOR).²¹ There are two isoforms of XOR: (A) Xanthine dehydrogenase (predominant form) and (B) Xanthine Oxidase.²² Hyperuricemia is defined as serum uric acid levels greater than 6 mg/dl in females and greater than 7 mg/dl in males.²³

The decreased excretion of uric acid is the most common cause of hyperuricemia.²⁴ Renal failure, hypothyroidism, and

hypertension patients who use beta blockers as treatment agents are common causes of the decreased level of uric acid in urine.^{25,26} Serum uric level may rise during ischemic heart disease and stress due to xanthine oxidase stimulation.²⁷

In the pathogenesis of hypertension by uric acid, by alteration of renin-angiotensin aldosterone system (RAAS), dysfunction of the endothelial system, stress, and systemic inflammation are the contributory factors.^{8,9,10} Some studies have postulated that ischemia of renal arterioles is also a pathogenic factor for hypertension with hyperuricemia, but the exact mechanism is still not known.²⁸

Gender, like female gender, has a strong biological correlation with hyperuricemia in postmenopausal women as compared to premenopausal women.²⁹

J. Tang et al (2021)³⁰ Liu J et al (2021)³¹ reported that beta blockers increased the serum uric acid level while calcium channel blockers decreased the serum uric acid level. Our study does not correlate with this research. In our study, there were no significant effects of beta blockers as well as calcium channel blockers on serum uric acid in our study population. But maybe our research period is limited. That was only for three months while these scientists performed their studies for more than one year of experiments.

Our findings are consistent with the findings of Lutfu Askin et al. (2015)³², who concluded that the use of beta blockers for the treatment of hypertension has no significant effect on serum uric acid levels.

There are some limitations in this study; there is a short duration of study, which needs a long duration of study, and a large sample size for study. In our study, almost no postmenopausal women were included. In the future, there could be a study design on the comparison of the effects of these hypertensive drugs on serum uric level in premenopausal and postmenopausal women.

CONCLUSION

This study concluded that metoprolol (beta blocker) or amlodipine (calcium channel blocker) have no significant effect on serum uric acid levels in hypertensive patients.

Conflict of Interest: There is no conflict of interest

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