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The Relationship Between Creatinine Levels and Blood Pressure Levels

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ABSTRACT

Background: Sustained elevation of systemic blood pressure has the potential to progressively impair renal microvascular integrity, ultimately leading to a decline in glomerular filtration capability. Serum creatinine concentration serves as a fundamental biochemical marker in evaluating renal functional efficiency. Nevertheless, empirical investigations specifically scrutinizing the relationship between serum creatinine parameters and discrete stages of hypertension remain limited. **Objective:** To investigate and evaluate the association between blood pressure stratification and serum creatinine levels among hospitalized/outpatient clinical samples. **Research Methods:** An analytical descriptive observational study adopting a cross-sectional framework was conducted utilizing secondary medical record data. A purposive sampling technique was applied to select hypertensive cases who underwent blood uric acid testing during the January–December 2025 timeframe. Data were thoroughly interpreted through quantitative descriptive analysis. **Research Results**: The overall mean blood uric acid concentration reached 7.25 mg/dL (ranging between 2.5 and 12.5 mg/dL). Mean systolic and diastolic blood pressure measurements recorded 152.75 mmHg and 86.88 mmHg, respectively. Hyperuricemia was identified more frequently in male patients and subjects presenting with grade 2 hypertension. **Conclusion**: A statistically significant direct correlation exists between hypertension classification levels and serum creatinine levels. Higher blood pressure categories generally correspond to increased serum creatinine values, although the degree of association is relatively modest.

Keywords: Blood Pressure Stages, Serum Creatinine, Renal Function.

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Introduction

Blood pressure basically reflects the magnitude of the hemodynamic force generated by the heart's pump when distributing blood through arteries (Nurhaedah et al., 2023). If systemic blood vessel resistance soars beyond conventional limits, the hypertensive state risks triggering fatal damage to the target organ, which includes cerebrovascular disorders, myocardial injury, and decreased renal excretion performance (Rahayu & Indriyani, 2021). According to a report by the World Health Organization (WHO, 2021), an estimated 1.28 billion adults globally suffer from hypertension, and this epidemiological figure is projected to soar to around 1.5 billion people by 2030 (Kartika & Ikhwani, 2024).

Referring to the 2018 European Society of Cardiology (ESC) guidelines, blood pressure levels are classified on the basis of systolic and diastolic values which include the normal range, pre-hypertension, to hypertension of levels I, II, and III (Octavianie et al., 2022). The worsening development of the hypertension stage can aggravate vascular complications in the kidneys, thereby disrupting the glomerular filtration rate. Therefore, serum creatinine level analysis is used as a reliable biochemical biomarker to detect a decrease in nephron filtration capacity early (Nurchayati et al., 2018). Creatinine is a residual product of phosphocreatine breakdown in muscle tissue that is constantly excreted through renal filtration; therefore, the accumulation of its concentration in the blood circulation indicates a failure or disturbance in the glomerular filtration rate (Fitriany et al., 2025).

A study conducted by Rahayu and Indriyani (2021) on 40 hypertensive patients showed that 37.5% (15 respondents) had creatinine levels above normal threshold values, leading to early signs of hypertensive nephropathy. However, existing scientific publications so far are generally limited to reporting creatinine profiles in aggregate without mapping the relationship in depth with the level of hypertension stages. Based on the research gap, this study was conducted to evaluate the correlation between the classification of blood pressure stages and fluctuations in patients' serum creatinine concentrations.

Research Methods

This analytical observational study carried a cross-sectional approach based on the patient's medical records at Patut Patuh Patju Hospital, West Lombok, for the period of May-June 2026. A total of 35 subjects were selected using the purposive sampling method based on the completeness of blood pressure history and blood creatinine examination. Blood pressure was positioned as an independent variable, while serum creatinine level acted as a dependent variable. All quantitative data were processed using SPSS, including descriptive analysis to describe the sample distribution as well as a Spearman Rank correlation test (95% confidence level, $\alpha = 0.05$) to assess the significance of the relationship between variables.

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Research and Discussion Results

The results of tracing medical records from 35 patient subjects at Patut Patuh Patju Hospital which include data on serum creatinine levels, systolic/diastolic blood pressure, and blood pressure level grouping are shown in Table 1.

Table 1. Serum Creatinine Level Profile and Patient Blood Pressure Classification.

Sample Code	Up to creatinine	Blood Pressure Values	Blood Pressure Degree
MR	0,81	117/76	Normal
AB	0,38	115/79	Normal
AN	1,45	105/68	Normal
HE	0,71	112/69	Normal
NRH	0,87	129/67	Prehypertensive
MT	1,63	120/68	Prehypertensive
MH	0,50	128/73	Prehypertensive
RW	0,73	124/62	Prehypertensive
M	0,90	133/67	Prehypertensive
ST	0,73	131/69	Prehypertensive
SF	1,27	129/84	Prehypertensive
NS	0,75	112/89	Prehypertensive
SN	0,78	150/80	Hypertension Grade 1
HS	0,84	155/78	Hypertension Grade 1
SR	0,81	144/87	Hypertension Grade 1
SK	1,31	143/74	Hypertension Grade 1
PN	0,52	150/97	Hypertension Grade 1
MN	1,01	144/66	Hypertension Grade 1
MI	0,76	141/87	Hypertension Grade 1
MY	1,54	149/89	Hypertension Grade 1
SL	0,79	157/89	Hypertension Grade 1
AS	2,94	155/77	Hypertension Grade 1
MA	1,09	141/88	Hypertension Grade 1
SK	0,51	145/78	Hypertension Grade 1
BR	1,43	158/69	Hypertension Grade 1
KS	1,71	150/90	Hypertension Grade 1
MK	1,03	140/86	Hypertension Grade 1
MS	2,68	183/94	Hypertension Grade 1
NR	0,83	209/106	Hypertension Grade 1
NK	0,86	162/83	Hypertension Grade 1
HD	1,54	163/80	Hypertension Grade 1
MS	5,33	182/102	Hypertension Grade 1
IB	1,30	160/82	Hypertension Grade 1
AM	1,08	163/105	Hypertension Grade 1
SA	0,70	163/66	Hypertension Grade 1
Minimum **Maximum** **Average**	**0,38** **5,33** **1,20**		

Based on the empirical data presented in Table 1, the lowest serum creatinine level was recorded at 0.38 mg/dL and the highest level reached 5.33 mg/dL, with an average population of 1.20 mg/dL. Regarding the distribution of blood pressure levels, there were 4 patients (11%) with normal blood pressure, 8 patients

(23%) with prehypertension, 15 patients (43%) with type I hypertension, and 8 patients (23%) in the category of type II hypertension.

Table 2. Intervariable Spearman Rank Correlation Test Results

Variable	Correlation Coefficient (r)	Value p	Remarks
Up to creatinine	0,338	0,047	Significant
Blood Pressure Degree			

The results of the non-parametric statistical estimation of Spearman's Rank in Table 2 resulted in a correlation coefficient value (r) of 0.338 with a significance (p-value) of 0.047. Given the $p < 0.05$, it can be concluded that there is a statistically significant unidirectional relationship between serum creatinine concentration and the patient's blood pressure degree, although the level of closeness is classified as weak.

Discussion

Based on data processing on 35 subjects at Patut Patuh Patju Hospital, the average serum creatinine level was at 1.20 mg/dL, where patients with hypertension status (degrees I and II) dominated up to 66% of the total population. The retention of residual creatinine metabolites in the blood is a sensitive indicator that reflects a decrease in the glomerular filtration rate (LFG) in the kidneys (Amalia et al., 2023).

Statistical findings showing a significant positive correlation ($r = 0.338$; $p = 0.047$) indicate that an increase in the degree of hypertension tends to be accompanied by an increase in serum creatinine levels. Pathophysiologically, high blood pressure that persists for a long period of time triggers renal arteriolosclerosis and parenchymal ischemia, which gradually damages the integrity of the nephron. This damage to the filtration unit promotes fluid-sodium retention while triggering the activation of the renin-angiotensin-aldosterone (RAAS) system, thereby exacerbating the condition of hypertension repeatedly (Rahayu & Indriyani, 2021).

Although proven to have statistical significance, the amount of $r = 0.338$ leads to a correlation with a low level of tightness. This proves that the high concentration of blood creatinine is not only influenced by blood pressure levels alone, but is also modulated by other physiological variables such as age stratum, muscle mass index, protein consumption level, and adherence to antihypertensive drug consumption. These findings are in line with the results of studies by A. Syahril and Irmayanti (2022) and Angraini (2024) regarding the relationship between hypertension stages and blood nitrogen residue product levels, and strengthened by the research of Haryanti et al. (2025) which recorded a significant unidirectional correlation ($r = 0.511$) between blood pressure levels and serum creatinine in the risk group of subjects.

Conclusion

A. Conclusion

1. It was found that there was a statistically significant positive correlation between blood pressure stage and serum creatinine levels (r = 0.338; p = 0.047), although the relationship was relatively weak.

B. Suggestions

1. For the Next Researcher: The next researcher is encouraged to take into account confounding factors such as age group, gender, and body mass index (BMI), as well as expand indicators of monitoring renal function through urea examination and eGFR.
2. For the Community: It is recommended to conduct regular blood pressure checks and routine monitoring of kidney function via serum creatinine tests as an early anticipatory measure for hypertensive nephropathy.
3. For Academics: The results of this study are expected to enrich the medical laboratory research literature related to vascular pathophysiology and renal complications.

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