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ANALYSIS OF BLOOD UREA-NITROGEN TO CREATAININE (BUN/Cr) RATIO AT DIFFERENT STAGES OF CHRONIC KIDNEY DISEASE IN BAITURAHIM HOSPITAL JAMBI

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ABSTRACT

Background: Renal failure is a disease in which the function of the kidneys decreases until they are no longer able to work at all in terms of filtering the body's electrolyte disposal, maintaining the balance of fluids and body chemicals such as sodium and potassium in the blood or urine production. Decreased kidney function indicates an increase in creatinine and urea levels in the blood. GFR or the ability of the kidneys to filter blood can be assessed by measuring serum creatinine levels, blood urea nitrogen levels. Serum blood urea nitrogen (BUN) levels are inversely proportional to GFR. The normal BUN/Creatinine ratio is 10-15:1. The aim of this study was to determine the difference in the average BUN/Creatinine ratio in patients with Chronic Kidney Failure and Stage V Kidney Failure patients undergoing routine hemodialysis.
Method: This research is a quantitative descriptive study by taking secondary data from medical record data on 70 patients treated at Baiturrahim Hospital Jambi for the period February 2022-February 2023. Variables assessed in this study include the severity of kidney failure with the results of urea and creatinine examinations.
Result: Based on research that has been carried out found that the average BUN/Creatinine ratio in patients at non-end stage of CKD was 11.97, while in ESRD patients it was 5.69.
Conclusion: There was a significant difference between the results of the BUN/Creatinine ratio in patients with Chronic Kidney Failure and ESRD (P-value < 0.01) at Baiturrahim Hospital Jambi.

Keywords: Kidney Failure; Blood Urea Nitrogen; Creatinine; BUN/Creatinine Ratio

INTRODUCTION

The kidneys have the main function of filtering and removing waste products from the body's metabolism from the blood and maintaining the balance of fluids and electrolytes (for example calcium, sodium and potassium) in the blood (Ogobuiro & Tuma, 2023). The kidneys produce the active form of vitamin D which regulates the absorption of calcium and phosphorus from food, making bones strong (Chau & Kumar, 2012). Apart from that, the kidneys produce the hormone erythropoietin which stimulates the bone marrow to produce red blood cells, as well as renin which functions to regulate blood volume and pressure (Montero et al., 2016).

Chronic kidney failure is a disease in which the function of the kidney organs decreases until finally they are no longer able to work at all in terms of filtering the body's electrolyte disposal, maintaining the balance of fluids and body chemicals, such as sodium and potassium in the blood or urine production (Dhondup & Qian, 2017; Xiao et al., 2022). Current metabolic processes Kidney conditions are normal, starting when blood enters the glomerulus and is filtered through fine blood vessels called capillaries (Murray & Paolini, 2023). Stage 5 kidney failure is the last stage of chronic kidney

disease. This stage indicates that the kidneys are no longer able to carry out their function properly to filter and remove waste and excess fluid from the body. In the medical world, stage 5 kidney failure is better known as End Stage Renal Disease (ESRD). Generally, the kidney function of ESRD sufferers does not reach 10% of its normal function. This means that the kidneys are barely functioning or even not functioning at all (Healthdirect, n.d.).

In this condition, the patient's kidneys are no longer functioning or have entered the stage of kidney failure. As a result, waste accumulates in the blood and causes various disease symptoms such as itching, muscle cramps, frequent vomiting, loss of appetite, swollen hands and feet, back pain, decreased urine output, shortness of breath and difficulty sleeping. Progressive kidney failure reaches the end stage requiring kidney replacement therapy such as dialysis or transplantation (Arquilla & Newman, 2023; Vaidya & Aeddula, 2023).

Blood tests are carried out with the aim of seeing and identifying health problems that occur due to decreased kidney function. Urine examination is carried out to detect any disorders in the body using urine such as red blood cells, white blood cells, protein and causes of infection and a 24 hour urine examination to see the concentration of creatinine and protein. Blood tests are carried out to measure creatinine and urea levels in the blood (Gounden et al., 2023). Decreased kidney function indicates an increase in creatinine and urea levels in the blood. GFR or the ability of the kidneys to filter blood can be assessed by measuring serum creatinine levels, blood urea nitrogen levels. Serum blood urea nitrogen (BUN) levels are inversely proportional to GFR. The normal BUN creatinine ratio is 10-15: 1. A ratio of >20: 1 indicates an increase in urea production or a decrease in volume (Feinfeld et al., 2002; Parrish et al., 2019).

Research by Tarau et al. (2020) regarding analysis of the BUN/Creatinine ratio in Acute Myocardial Infarction patients at Dr. RSUP. Wahidin Sudirohusodo, Makassar, Indonesia found a significant increase in the levels of urea, creatinine and the BUN/creatinine ratio in patients with Acute Myocardial Infarction (AMI) treated at RSUP Dr. Wahidin Sudirohusodo, Makassar. Measuring the ratio between several laboratory test parameters has now been widely used to assess prognosis in several diseases. The research aims to see the potential of these ratios in predicting disease progression by showing the presence of certain markers using simple tests such as hematological parameters (Simanjuntak et al., 2022; Simanjuntak & Hanum, 2022) to complex tests such as immunological and biochemical test results (Sakdiah et al., 2022; Simanjuntak et al., 2023; Sitanggang et al., 2022).

METHODS

This research was conducted using a quantitative descriptive design. The population of this study is medical record data of patients undergoing treatment or treatment with symptoms of CDK at non-end stage and ESRD at Baiturrahim Hospital, Jambi from February 2022 to February 2023. The sampling technique in this study was purposive sampling, which is sampling technique with certain considerations. This research sample was taken by determining the subjects who underwent laboratory examination.

The data collection technique in this research begins with obtaining research recommendation permission from the Jambi Health Polytechnic, followed by obtaining research recommendation permission from the development and training section of Baiturrahim Hospital Jambi. Research ethical approval was obtained from the ethics commission at the Jambi Health Polytechnic. Purposive sampling technique was used in this study and all samples were divided into

two groups, CDK stages 1-4 and ESRD, according to each patient's medical record.

RESULTS AND DISCUSSION

This research was conducted on 70 patients with CDK at non-end stage and 70 patients with and ESRD who underwent dialysis at Baiturrahim Hospital Jambi at the period February 2022 – February 2023. The following results were obtained:

Table 1. Distribution of Kidney Failure Patients based on age

Age group	CKD (stage 1-4)		ESDR	
	N	%	N	%
Teenager	1	1,43	3	4,29
Mature	9	12,86	16	22,86
Elderly	30	42,86	26	37,14
Seniors	30	42,86	25	35,71

Table 1 shows that the elderly group (45-56 years) and the senior group (>56 years) provided the largest proportion in this research. Meanwhile, the youth group (<25 years) is the smallest age group in number (<5%). This proportion is not much different if analyzed based on the two groups of the type of kidney failure observed.

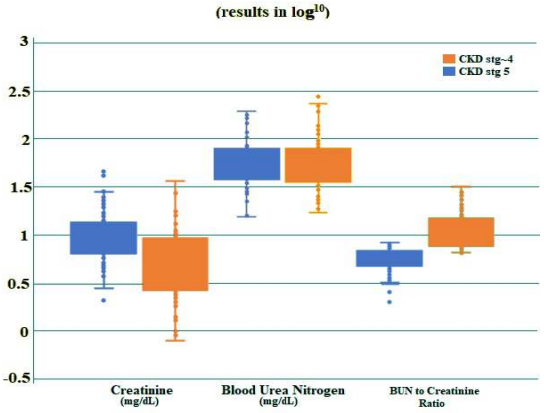

Figure 1 Analysis of Independent T test data sample test

Figure 1 showed the independent test calculation results for the sample test showed the total result data for 70 patients. The average value of Blood Urea Nitrogen (BUN) results for non-end stage CDK patients is known to be 66.98, while for ESRD patients it is 63.27. Descriptively, it can be concluded that there is a difference in the average Blood Urea Nitrogen results of patients with non-end stage CDK and ESRD. Based on the Independent T test calculation, the results obtained are >0.05, so as is the basis for decision making in the Independent sample test, it can be concluded that no there is a significant (real) difference between the average Blood Urea Nitrogen results in patients with non-end stage CDK and ESRD.

The average value of creatinine results for non-end stage CDK patients is known to be 6.70, while for ESRD patients it is 11.71. Descriptively, it can be concluded that there is a difference in the average Creatinine results in Non-end stage CDK and ESRD patients. Based on the analysis of Independent T test data, the results were <0.05, so as is the basis for decision making in the Independent sample test, it can be concluded that there is significant (real) difference between the average Creatinine results in non-end stage CDK and ESRD patients.

Jameil (2019) reported similar facts from the results of measuring BUN levels that there was no difference between the two groups. However, the study found a much higher average BUN level, namely non-end stage CDK = 458.8 mg/dL, and ESRD = 425.5 mg/dL. This is also similar to another study conducted by Andrews et al., (2019) which showed a higher mean creatinine level in ESRD (121.3 mg/dL).

Otherwise, the study also gave very similar results regarding creatinine levels, which were significantly different, as well as the height of the levels given. Creatinine levels for non-end stage CDK showed a mean value of 6.94 mg/dL, which was significantly lower than the mean for ESRD (10.16 mg/dL).

The average value of the BUN/Creatinine ratio for non-end stage CDK patients was found to be 11.97, while for ESRD patients it was 5.69. Descriptively, it can be concluded that there is a difference in the average BUN/Creatinine results in patients with non-end stage CDK and ESRD. Based on the analysis of Independent T test

data, the results were <0.05, so as is the basis for decision making in the Independent sample test, it can be concluded that there is a significant (real) difference between the average BUN/Creatinine results in non-end stage CDK and ESRD patients.

These results are similar to previous research (Jameil, 2019) which found that patients with ESRD had higher creatinine levels than patients with non-end stage CKD. Likewise, this study also provided the same facts for urea levels which were not different in the two groups. The difference found in this study was the finding of the BUN/Cr ratio which showed lower levels in patients with ESRD compared to the ratio in patients with non-end stage CDK.

CONCLUSION

From the study it can be concluded that there is a significant (real) difference between the average Blood Urea Nitrogen/Creatinine Ratio between non-end stage CDK patients and ESRD patients. Blood Urea Nitrogen/Creatinine Ratio has better predictive potential for differentiating CDK stages compared to creatinine and urea levels.

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CONFLICT OF INTEREST

There is no potential conflict of interest in this research.

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