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COMPARISON ON THE RESULT OF KIDNEY FUNCTION TEST IN HEMODIALYZED PATIENTS SERUM WITH AND WITHOUT DILUTION

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ABSTRACT

A kidney is an important organ in the human body, the body will have problems if the kidney does not work properly. Treatments for the disease may include hemodialysis. Hemodialyzed Patients often have high creatinine, urea, and uric acid levels. This condition may affect the quality of laboratory results. According to The Beer-Lambert's Law, the portion of the light absorption will depend on how many molecules interact with it. However, the theory cannot be applied to a solution with high concentration. This condition can trigger inaccurate results which may be harmful to the patients because it can cause errors in diagnosis, treatment, and disease monitoring. This condition can be handled by diluting the concentrated serum. A serum sample was diluted with a physiological saline solution (NaCl). This study aims to determine the level of kidney function test in hemodialyzed patient's serum with and without dilution. This research was Pre-experimental Design methods with One-Group Pretest-Posttest Design. The research sample was used serum of hemodialyzed patients with creatinine level of more than 10 mg/dL, urea level of more than 256 mg/dL, and uric acid level of more than 12mg/dL, amounted to 40 samples. The test results were analyzed descriptively and statistically using Paired Sample T-Test. The mean of creatinine and uric acid levels increase 2.29 mg / dL (16.72%) and 4.02 mg / dL (44.47%) respectively, while the mean urea decrease 19.52 mg / dL (6.38 %).The results tested with Paired Sample T-Test showed a significant 0.000 (<0.05) which means there was a difference in kidney function tests in hemodialyzed patients with and without dilution.

Keywords : Kidney Function Test, Hemodialysis, Without Dilution, Dilution.

INTRODUCTION

Kidney has a strategic role in the body to remove water and metabolic waste in the form of urine and produce the hormone erythropoietin which plays a role in the formation of red blood cells. This important role will cause problems if the kidney experiences a failure[1]. The results of Riskesdas (2013) showed that 0.2% of the population in Indonesia experience kidney failure and the prevalence in the Special Region of Yogyakarta is 0.3%. In Indonesia, kidney disease treatment is

the second-largest financing from health insurance (BPJS) after heart disease [2,3]. Kidney function can be evaluated with a variety of laboratory tests, some kidney function tests are urea, creatinine, and uric acid levels.

The method of examining kidney function which is used as a standard examination in the laboratory is the spectrophotometric method. This is due to the spectrophotometric method having a smaller error rate compared to the strip method[4]. The principle used in spectrophotometric measurements is bypassing light with a certain wavelength on a glass object or container called a cuvette. Inside the cuvette, there is a reaction result between the sample and the reagent that forms a certain color. Some of the light will be absorbed and the rest will be missed. The absorbance value of the absorbed light will be proportional to the concentration of the solution in cuvette[5]. These provisions do not apply to concentrated solutions. A Higher concentration of some solutions gives disproportionate results, causing greater deviation. Deviations are also clearly observed at a greater concentration on the absorbance curve with concentration[6].

Urea is the largest nitrogen product that is formed in the liver and excreted through the kidneys. Urea originates from diet and endogenous proteins that have been filtered by the glomerulus and partially reabsorbed by tubules[7]. The classical method for urea examination requires conversion to ammonia by specific urease enzymes. Plasma analysis for urea concentration may be the most common examination performed in a clinical biochemical laboratory[4]. Urea has a normal value of 10-50 mg / dL in the body.

Creatinine is the final product of creatine metabolism. Creatine is mostly found in musculoskeletal, where it is involved in energy storage as creatine phosphate (CP). In the synthesis of ATP from ADP, creatine phosphate is converted into creatine by the enzyme creatine kinase (CK) catalyst. Reference values for creatinine are 0.6 to 1.3 mg / dL for men and 0.5 to 1.0 mg / dL for women.

Uric acid is the end product of purine catabolism that comes from the degradation of purine nucleotides that occur in all cells. Veins are produced by cells that contain xanthine oxidase, especially the liver and small intestine[8].

Samples that have urea levels of more than 256 mg / dL, creatinine of more than 10 mg / dL and uric acid of more than 12 mg / dL are considered nonlinear, so dilution must be done to give better results. Dilution is done by adding physiological NaCl solution (1: 1) then the results of the measurement are multiplied by two[9].

Test of urea, creatinine and uric acid are often done in hospital laboratories. This examination is usually used as one of the parameters to monitor hemodialysis therapy because in the pre-hemodialysis state, high levels of urea, creatinine and uric acid are often found. As a result, accurate results are needed. Based on this background, the researcher intends to conduct a study entitled "Comparison on the Results of Kidney Function Tests in Hemodialyzed Patients serum with and without Dilution".

RESEARCH METHOD

This is pre-experimental design research with a One-Group Pretest-Posttest Design[10]. This research was conducted in January - March 2018 in the Laboratory of Bhakti Ibu Special Hospital for Mother and Children, Golo street No. 33, Umbulharjo, Yogyakarta. This study used 40 serum samples of hemodialyzed patients with urea levels of more than 256 mg / dL, creatinine of more than 10 mg / dL and uric acid of more than 12 mg / dL which were obtained from the clinical laboratory of RSUP Dr. Sardjito, RSUD Wates, RSUD dr. Tjitrowardojo and Panti Rapih Hospital Yogyakarta.

Serum samples collected were then divided into 2 parts. The first part was the serum of hemodialysis patients who were directly examined. The second was the treatment of hemodialyzed patient serum plus physiological NaCL solution with a ratio of 1:1, e.g., 0.01 ml serum and 0.01 ml physiological NaCL solution. Then, the examination was performed and the results were multiplied by two.

The data obtained were analyzed descriptively, presented in bar charts and statistically tested by Paired Sample T-Test with a significant level of 5%.

FINDINGS

The average data differences in the test results of creatinine, uric acid and serum urea levels of hemodialyzed patients with and without dilution can be seen in the bar diagram of Figure 1 below.

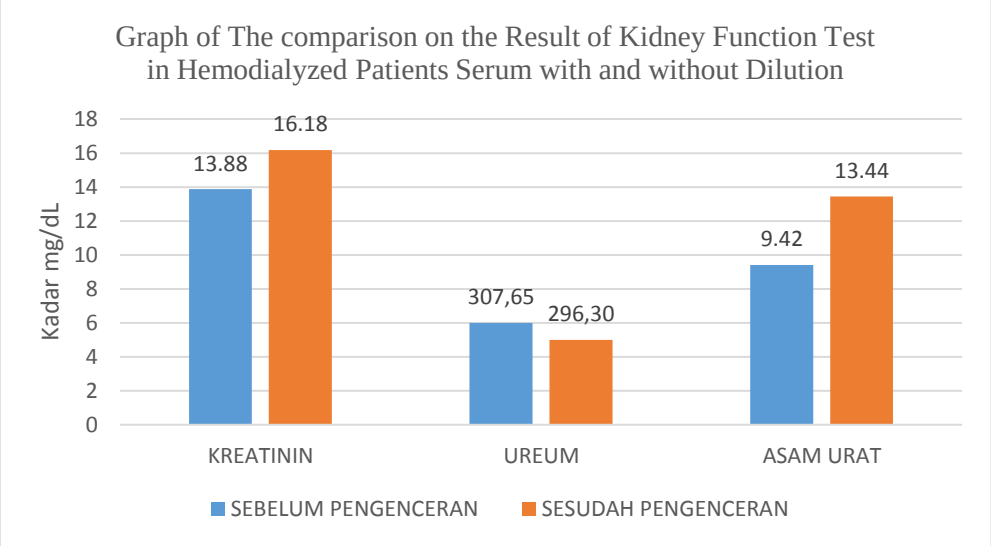

Figure 1. Average Results of Creatinine Level Checks

Based on Figure 1, it is shown that the mean serum levels of hemodialyzed patients without dilution on examination of creatinine levels is 13.88 mg / dL, uric acid level is 9.42 mg / dL and urea levels is 307.65 mg / dL respectively. The mean serum level of hemodialysis patients with dilution is 16.18 mg / dL for creatinine levels, and 13.44 mg / dL for uric acid levels, 296.30 mg / dL for urea levels, respectively. The mean difference in creatinine levels is 2.29 mg / dL (16.72%), uric acid levels is 4.02 mg / dL (44.47%) and urea levels is 19.52 mg / dL (6.38%).

The data obtained were tested for normality with the provisions of a significant value of >0.05 (5%). Data normality test used the One-Sample Kolmogorov-Smirnov Test.

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Table 1. Statistic Data Test

No	Statistic Test	Parameter	P	Significant		Conclusion
				Without Dilution	With Dilution	
1	*One-Sample Kolmogorov-Smirnov Test*	*Creatinine*	>0.05	0.795	0.550	Data Normally Distributed
		Urea	>0.05	0.622	0.927	Data Normally Distributed
		Uric Acid	>0.05	0.646	0.688	Data Normally Distributed
2	*Uji Paired Sample T-Test*	*Creatinine*	<0.05	0.000		There is a significant difference
		Urea	<0.05	0.002		There is a significant difference
		Uric Acid	<0.05	0.000		There is a significant difference

Source: Primary Data, 2018.

Based on table 1, the Kolmogorov-Smirnov Test value for creatinine, urea, and uric acid levels data without dilution has more than a significance value of 0.05 so that the data are normally distributed.

Data were statistically analyzed using different analysis of Paired Sample T-Test with a significance level of 5% to determine whether there were differences in the results of renal function tests in hemodialyzed patients with and without dilution. Based on table 1, the results of the Paired Sample T-Test are

obtained with a significant value of 0.000. This significant value is less than 0.05, so the conclusion of this statistical test is that there are differences in the results of renal function tests (creatinine, urea, and uric acid levels) in hemodialyzed patients with and without dilution.

Conclusion

1. The mean value increase in creatinine and uric acid levels is 2.29 mg/dL (16.72%) and 4.02 mg / dL (44.47%) respectively, while the mean decrease in urea level is 19.52 mg / dL (6 , 38%).
2. There are differences in the results of renal function tests (levels of urea, creatinine and uric acid) in the serum of hemodialyzed patients with and without dilution.

Recommendation

1. It is needed to conduct further research on the treatment of dilution in the serum of hemodialyzed patients with variations of dilution and grouping of serum with uniform concentrations.
2. Serum dilution treatment can be applied to clinical laboratory management as a way to treat serum in hemodialyzed patients with urea levels of more than 256 mg / dL, creatinine of more than 10 mg / dL and uric acid of more than 12 mg / dL and before results are issued.

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