

Differences in Creatinine and Ureum Levels 2nd Month and 3rd Month in Tuberculosis Patients of OAT Therapy

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ABSTRACT

Tuberculosis (TB) is an infectious disease caused by the bacterium *Mycobacterium tuberculosis*. Tuberculosis patients who test positive must undergo therapy using Anti-Tuberculosis Drugs (OAT). Treatment is divided into two phases, namely the intensive phase is carried out for 2 months with the consumption of rifampicin (R), isoniazid (H), pyrazinamide (Z), and etambutol (E) and the advanced phase is carried out for 4 months with isoniazid (H) and rifampicin (R) OAT. To find out the difference in creatinine and urea levels in the 2nd and 3rd months. Type of research using quantitative with a prospective cohort research design. The sampling technique uses the purposive sampling method with a sample number of 15. Normality and homogeneity tests were carried out, normal distributed results were obtained and the number of samples did not meet the requirements, so the Wilcoxon statistical test was used. A total of 12 respondents (80.0%) experienced a decrease in urea levels from the 2nd month to the 3rd month. There was a difference in creatinine levels at the 2nd and 3rd months with a p-value of 0.026 ($p < 0.05$), but there was no difference in the urea levels at the 2nd and 3rd months with a p-value of 0.201 ($p < 0.05$).

INTRODUCTION

Tuberculosis (TBC) is an infectious disease caused by acid-resistant bacteria (Kahar, Irnawati, et al., 2023). These bacteria from the group *Mycobacterium* that is *Mycobacterium tuberculosis* (*M. tuberculosis*) (Kahar, Sugihantono, et al., 2023). This tuberculosis spreads from droplets through the air (Kahar, Purlinda, et al., 2022). Tuberculosis is included in infectious diseases (Kahar, Widarti, et al., 2022). Until now, tuberculosis is still a health problem in the world (Anggraeni Novitasari et al., 2022). According to a report from *Global Tuberculosis Report* by WHO in 2022, in 2020 it was 18% from the previous year. Then, in 2021, 6.4 million cases of tuberculosis were reported globally (WHO, 2022). Based on data *Global Tuberculosis Report*, in 2020 the incidence of TB cases in Indonesia is estimated to reach 824,000 cases and there was an increase in cases in 2021 by 969,000 cases. In this data, Indonesia occupies the second position after India, followed by China, the Philippines, Pakistan, Nigeria, Bangladesh, and Congo (WHO, 2022).

Tuberculosis patients who have tested positive must undergo therapy using Anti-Tuberculosis Drugs (OAT). OAT treatment has two phases, namely the intensive phase and the advanced phase. OAT in TB patients is available in drug packages with a fixed dose combination (OAT-KDT), combipak drug packages (loose drugs) packaged in blisters, and single drugs instead of packages or loose drugs (Kemenkes RI, 2016). Tuberculosis patients who take rifampicin-type OAT can have a disruptive effect on kidney function. If kidney function is disturbed, it can cause a decrease in excretion so that metabolic substances accumulate in the blood (Maulana, 2021; lion *et al.*, 2003). Rifampicin, an OAT type of antibiotic that causes interstitial nephritis (Rahman *et al.*, 2020). Rifampicin is able to induce an immune response by creating an immune complex and an inflammatory reaction occurs that results in damage to the interstitial characterized by interstitial edema with interstitial damage to tubule cells (Erlitania S, 2018). Therefore, it is very necessary to have a laboratory examination of urea and creatinine in tuberculosis patients who are undergoing OAT therapy to screen kidney function or to find out the possible degree of kidney damage (Aprianto *et al.*, 2022). Treatment of tuberculosis is also related to the occurrence of kidney disease because the consumption of anti-tuberculosis drugs will have an impact on decreasing kidney function (Kahar et al., 2024).

Urea is a residual product of protein metabolism that is normally transferred from the blood to the kidneys to be filtered by the glomerulus. OAT consumed by tuberculosis patients for a long time can result in kidney damage. This will result in urea accumulating in the blood, resulting in an increase in urea. An increase in urea in the blood can indicate kidney damage in filtration. (Indriani *et al.*, 2017). Creatine is a waste molecule produced from muscle

metabolism. The metabolic process, a small part of creatinine is converted *irreversible* into creatine, which is secreted by the kidneys. The rest of the creatinine metabolism is transported to the kidneys by the bloodstream. The kidneys filter most of the creatinine and excrete it through the urine (Suryawan *et al.*, 2017). Tuberculosis patients who undergo OAT therapy will experience impaired kidney function so that creatinine filtration will be disrupted. This results in an increase in creatinine levels in the blood (Risma & T, 2020). According to Chang's research, anti-tuberculosis drugs can cause impaired kidney function, which occurs during 2 months of treatment (Anonymous *et al.*, 2014). In the first 2 months of rifampicin drug therapy will result in damage to the renal tubules. However, the damage caused by the OAT is *reversible* (can return to normal) so that in 3-4 months it will return to normal (Nursidika *et al.*, 2017).

METHODOLOGY

This type of research uses quantitative research. The design of this study uses a *prospective cohort*, where samples will be examined for creatinine and urea levels at the 2nd month in OAT therapy tuberculosis patients and followed up at the 3rd month. The population in this study is pulmonary tuberculosis patients who are undergoing OAT-KDT therapy in the 2nd month intensive phase at the Tlogosari Wetan Health Center, and the Kedungmundu Health Center from November-January 2023. The sampling technique in this study uses *the purposive sampling* method through predetermined inclusion and exclusion criteria. The *inclusion criteria* consisted of pulmonary tuberculosis patients who underwent OAT-KDT treatment between 5 weeks of treatment to 8 weeks with the age of 15-64 years who took OAT-KDT regularly, and were willing to become research respondents by signing *informed consent*. Meanwhile, the *exclusion criteria* consist of extrapulmonary patients, patients who have a history of kidney failure, patients who have experienced OAT withdrawal, and patients who are not willing to sign *informed consent*. Then, 15 samples were obtained.

The data collected in the form of secondary data consisted of name, age, and gender obtained from the patient's medical record data and primary data obtained from the results of the examination of creatinine and ureum levels in the 2nd and 3rd months. Univariate analysis showed the frequency distribution of respondents based on gender and age criteria. Bivariate analysis tested hypotheses related to the difference in creatinine and urea levels at the 2nd and 3rd months using the normality test, homogeneity test, and Wilcoxon hypothesis test.

RESEARCH RESULT

Research conducted at the Tlogosari Health Center Wetan and Kedungmundu with a sample of 15 pulmonary tuberculosis patients who met the inclusion criteria. Creatinine and urea examination will be carried out in the 2nd month in tuberculosis patients with OAT therapy and carried out *follow up* in the 3rd month as follows:

a. Result

Table 1 Characteristics of Respondents

Age			Gender			
Age group	n	%	Woman		Man	
			n	%	n	%
12 - 25 years old (Teens)	5	33,3%	2	13,3%	3	20,0%
26 - 45 years old (Adult)	4	26,7%	0	0,0%	4	26,7%
46 - 65 years old (Elderly)	6	40,0%	3	20,0%	3	20,0%
Total	15	100,0%	5	33,3%	10	66,7%

Source: Primary Data 2024.

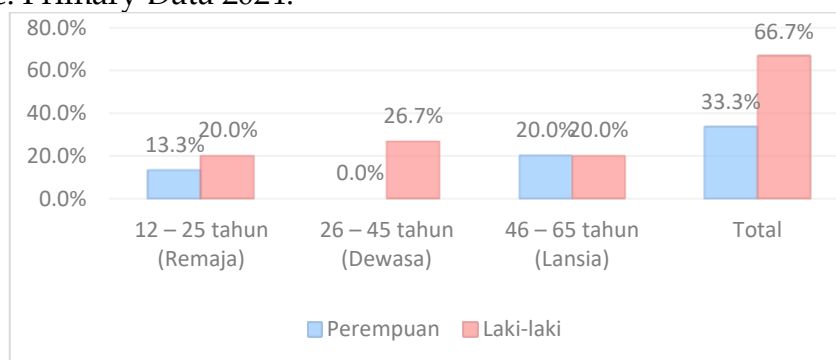


Figure 1 graph of respondent characteristics data

Table 1 and Figure 1 show the distribution of TB patient respondents with the gender of TB patients as many as 10 respondents (66.7%), and 5 respondents (33.3%) are female. Distribution The response of TB patients by age category, obtained 5 respondents (33.3%) aged 12-25 years, 4 respondents (26.7%) aged 26-45 years, and 6 respondents (40.0%) aged 46-65 years. This is in line with previous research, TB patients are more often suffered by male patients (50.2%) with the majority aged 15-54 years (90.5%) (Wibowo et al., 2023).

1) Distribution of Creatine Levels in Month 2 and Month 3

The following is the distribution of creatinine levels in the 2nd and 3rd months based on the results of the study

Table 1 Distribution of Creatine Levels in Month 2 and Month 3

Duration of Treatment	Up to Creatinine						Total			
	<0,67mg/dl		0,67-1,17mg/dl		>1,17mg/dl		N		%	
	<0,51mg/dl		0,51-0,95mg/dl		>0,95mg/dl					
n	%	n	%	n	%	N	%			
Month 2	4	13.3%	9	30.0%	2	6.7%	15	50,0%		
Month 3	5	16.7%	8	26.7%	2	6.7%	15	50,0%		
Total	9	30.0%	17	56.7%	4	13.3%	30	100.0%		

Source: Primary Data, 2024

Based on table 2, the results of the examination of creatinine levels in the 2nd and 3rd months showed that as many as 2 respondents (6.7%) had high levels. The average creatinine levels at the 2nd and 3rd months are as follows

Table 2 Creatinine as much as hasil pemeriksaan

Up to Creatinine	Mean	SD	Min	Max
Month 2	.95	.35	.54	1.78
Month 3	.90	.32	.49	1.68

Source: Primary Data, 2024

Table 3 shows the average results of creatinine values in the 2nd month of 0.95 ± 0.35 mg/dl with a minimum value of 0.54 and a maximum value of 1.78. Meanwhile, the average creatinine level in the 3rd month was 0.90 ± 0.32 mg/dl with a minimum value of 0.49 and a maximum value of 1.68.

2) Distribution of Urea Levels in Month 2 and Month 3

The following is the distribution of creatinine levels in the 2nd and 3rd months based on the results of the study

Table 3 Distribution of Urea Levels in Month 2 and Month 3

Duration of Treatment	When Ureum						Total	
	<18mg/dl		18-45 mg/dl		>45 mg/dL			
	n	%	n	%	n	%	N	%
Month 2	0	0.0%	12	40.0%	3	10.0%	15	50.0%
Month 3	0	0.0%	12	40.0%	3	10.0%	15	50.0%
Total	0	0.0%	24	80.0%	6	20.0%	30	100.0%

Source: Primary Data, 2024

The results of urea level examination in the 2nd and 3rd months in table 4 showed that as many as 3 respondents (10.0%) had high urea levels. The average urea levels at the 2nd and 3rd months are as follows

Table 4 Urea Level Test Results

When Ureum	Mean	SD	Min	Max
Month 2	32.26	10.88	17.00	50.00
Month 3	30.25	10.52	14.00	49.00

Source: Primary Data, 2024

Table 5 shows the average result of the 2nd month urea value of 32.26 ± 10.88 mg/dl with a minimum value of 17.00 and a maximum value of 50.00. Meanwhile, the average creatinine level in the 3rd month was 30.25 ± 10.52 mg/dl with a minimum value of 14.00 and a maximum value of 49.00.

3) Difference in Creatinine and Urea Levels at Month 2 and Month 3

Table 6 Crosstab Test of Creatinine and Urea Levels on Characteristics

Karakteristik	Kreatinin						Ureum							
	<0,67mg/dl		0,67-1,17mg/dl		>1,17mg/dl		Total	18-45 mg/dl		>45 mg/dl		Total		
	n	%	n	%	n	%		n	%	n	%			
Jenis kelamin														
Laki-laki	1	6.7%	6	40.0%	2	13.3%	9	60.0%	6	40.0%	3	20.0%	9	60.0%
perempuan	3	20.0%	3	20.0%	0	0.0%	6	40.0%	6	40.0%	0	0.0%	6	40.0%
Total	4	26.7%	9	60.0%	2	13.3%	15	100.0%	12	80.0%	3	20.0%	15	100.0%
Usia														
12 – 25 tahun	2	13.3%	3	20.0%	0	0.0%	5	33.3%	5	33.3%	0	0.0%	5	33.3%
26 – 45 tahun	0	0.0%	3	20.0%	1	6.7%	4	26.7%	2	13.3%	2	13.3%	4	26.7%
46 – 65 tahun	2	13.3%	3	20.0%	1	6.7%	6	40.0%	5	33.3%	1	6.7%	6	40.0%
Total	4	26.7%	9	60.0%	2	13.3%	15	100.0%	12	80.0%	3	20.0%	15	100.0%

Source: Primary Data, 2024

The data of this study used the Shapiro-Wilk test because the number of samples used < 50. The normality test is used to determine the distribution of data, the results of the normality test are as follows

Table 7 Results of the Normality Test

Until	Shapiro-Wilk		
	Statistics	df	Say.
2nd Month Creatinine	.891	15	.069
3rd Month Creatinine	.886	15	.059
2nd Month Urea	.941	15	.400
3rd Month Urea	.946	15	.465

Source: Primary Data, 2024

Table 7 obtained the results of the normality test with the signification of creatinine in the 2nd month and the 3rd month were normally distributed with signification values of 0.069 and 0.059 ($p > 0.05$). Then, urea levels showed the results of the normality test that were normally distributed with significance values of 0.400 and 0.465 ($p > 0.05$). Even though it shows normality data but does not meet the requirements, the number of samples must be more than 30, so the Wilcoxon nonparametric statistical test is used.

Table 8 Homogeneity Test Results

Until	Levene Statistic	df	Say.
Creatinine	.120	1	.731
Ureum	.033	1	.858

Source: Primary Data, 2024

Table 8 shows the homogeneity test of the data with the significance value of creatinine levels in the 2nd and 3rd months of 0.731 and the significance of urea levels in the 2nd and 3rd months of 0.858 ($p > 0.05$) which means that the data are homogeneous between creatinine and urea levels for the 2nd and 3rd months. Although the data is homogeneous because the number of samples is not met to perform parametric statistical tests, Wilcoxon's nonparametric statistical tests are used.

The results of the normality test and homogeneity test showed a normal distribution, but the sample used still did not meet the requirements, so the nonparametric test of the wilcoxon test was used.

Table 9 Wilcoxon Test Results

Until	Ranks	N	Percentage (%)	Mean Rank
Creatinine	Negative ranks	13	86%	99.00
	Positive ranks	2	14%	21.00
	Ties	0		
	Asymp.Sig.			.026
Ureum	Negative ranks	11	73%	82.50
	Positive ranks	4	27%	27.50
	Ties	0		
	Asymp.Sig.			.201

Source: Primary Data, 2024

The results of the wilcoxon test in table 9 showed that the p value of creatinine levels in the 2nd and 3rd months was 0.026 ($p < 0.05$), indicating that there was a difference in creatinine levels between the 2nd and 3rd months. The p value of urea levels in the 2nd and 3rd months was 0.201 ($p < 0.05$) indicating that there was no difference in ureum levels in the 2nd and 3rd months. So, it can be concluded that there is a difference in creatinine levels in the 2nd and 3rd months. However, there is no difference in urea levels at the 2nd and 3rd months.

DISCUSSION

Pulmonary tuberculosis is a disease that is known as one of the main killers worldwide in the category of bacterial infectious diseases. This disease is caused by a bacterium called *Mycobacterium tuberculosis* (Anggita et al., 2024). These bacteria are rod-shaped, aerobic, and resistant to environmental acidity (Suharyati & Widiyanto, 2019). Liver function disorders are one of the side effects of the use of OAT that are often complained about by pulmonary tuberculosis patients where liver cells are damaged due to toxic chemicals. Impaired liver function is often indicated by increased levels of transaminase in the body. It is important to note that not every patient who uses OAT will experience hepatotoxicity, but when it does, it can cause serious and permanent liver damage, and can even lead to death if not detected in the early stages (Chairini & Widodo, 2020).

Characteristics Responden

a) Gender

Table 1 shows the distribution of TB patient respondents with the gender of TB patients as many as 10 respondents (66.7% %), and 5 respondents (33.3% %) are female. In the research Pratiwi & Suryanto, (2017) The results were obtained that male patients (53.0%) were more than female patients (47.0%). This can be caused by environmental factors and patient habits. Men tend to have strenuous activity, lack of rest, and unhealthy lifestyles such as drinking alcohol and smoking can result in a decreased immune system so that they are susceptible to tuberculosis bacterial infection (Wibowo et al., 2023). However, this is contrary to research Nisak *et al.* (2021) As many as 51.5% are female and 48.5% are male because now there are many women who are active outside where there is a possibility of direct contact with tuberculosis patients.

Table 6 shows that creatinine levels by gender, as many as 2 respondents (13.3%) male have high creatinine levels, as many as 6 respondents (40.0%) male have normal creatinine levels, and 1 other respondent (6.7%) has low creatinine levels. Respondents with a female gender with low creatinine levels were 3 respondents (20.0%) and 3 respondents (20.0%) had normal creatinine levels. Then, urea levels based on gender, as many as 3 respondents (20.0%) were males had high urea levels and as many as 6 respondents (40.0%) had normal creatinine levels. Respondents with female sex as many as 6 respondents (40.0%) had normal urea levels.

b) Age

The results of the study based on age in table 1 were obtained from 5 respondents (33.3%) aged 12 – 25 years, 4 respondents (26.7%) aged 26 – 45 years, and 6 respondents (40.0%) aged 46 – 65 years. In line with research conducted by Fortuna *et al.* (2022) that patients in the age category (15-64 years) and Wibowo *et al.* (2023) TB patients are mostly found in patients aged 35 – 54 years because they are in the productive age who do a lot of intensive activities so they are prone to suffer and contract tuberculosis infection (Ristanti, 2020). However, the research conducted (Pratiwi & Suryanto, (2019) The most age is between 16-25 years old.

Table 6 shows the results of creatinine examination based on the age of the respondents in table 4.8, respondents aged 12 – 25 years had low creatinine levels as many as 2 respondents (13.3%), 3 respondents (20.0%) had normal creatinine levels, respondents with the age of 26 – 45 years had normal creatinine levels as many as 3 respondents (20.0% %) and 1 respondent (6.7%) had high creatinine levels, and respondents aged 46 – 65 years had low creatinine levels as many as 2 respondents (13.3%), 3 respondents (20.0%) with normal creatinine levels, and 1 respondent (6.7%) with high creatinine levels.

Then, the results of the uruem examination based on the age of the respondents in table 4.9, 5 respondents (33.3%) with the age of 12 – 25 years had

normal urea levels, respondents aged 26 – 45 years had normal urea levels as many as 2 respondents (13.3%), high urea levels as many as 2 respondents (13.3%), and respondents with the age of 46 – 65 years had normal urea levels as many as 5 respondents (33.3%), 1 respondent (6.7%) with high urea levels.

1) 2nd and 3rd Month Creatinine Levels

Based on table 2, creatinine levels in the 2nd month were mostly found to have normal creatinine levels as many as 9 respondents (30.0%) with an average level of 0.95 mg/dl. Then, creatinine levels in the 3rd month as many as 8 respondents (26.7%) obtained normal creatinine levels with an average level of 0.90 mg/dl. The results of the examination are in line with Nursidika *et al.* (2017) In his research, he said that most patients in the early phase of treatment had normal creatinine levels. This is in accordance with research Herman *et al.*, (2024) patients undergoing early-phase OAT therapy (100.0%) have normal creatinine levels. This can be because TB patients consume OAT regularly, can follow the doctor's advice, and eat nutritious food (Denrison & Erdiana, 2020). Then, the type of OAT recommended by the government is still safe even though there is a slight increase and is still at a normal value if it is in accordance with the rules and supervised by health workers (Aminah, 2013).

Table 3 shows that the average creatinine level of the respondents in the 2nd month was higher than the creatinine level in the 3rd month, the 3rd month decreased by 0.05 mg/dl. Creatine levels in the 2nd month are higher than in the 3rd month due to the OAT consumed by patients in the initial phase and the advanced phase having different doses, OAT containing rifampicin is consumed daily by the patient in the initial phase but in the advanced phase is only consumed three times a week (Aminah, 2013).

2) 2nd Month and 3rd Month Urea Rate

The results of the examination of urea levels in the 2nd month in table 4 of 12 respondents (40.0%) showed that most of them had normal urea values with an average of 32.26 mg/dl. Then, the urea level in the 3rd month as many as 12 respondents (40.0%) had normal urea levels with an average of 30.25 mg/dl. Urea levels were found to be normal in other studies with 38 respondents (88.4%) (Harison, 2019). In the research conducted by Djasang & Saturiski (2019) A total of 25 respondents (83.3%) had normal urea levels that did not experience a significant increase. Patients who can undergo therapy regularly, maintain their diet, and follow the doctor's recommendations will have normal urea levels (Purba, 2019).

High levels of urea in the blood can also be caused by toxic effects from the body due to decreased kidney function (Djasang & Saturiski, 2019). Another factor in the increase in urea levels occurs in tuberculosis patients who are undergoing treatment due to impaired urea excretion that accumulates in the blood as a result of rifampicin, causing disturbances in kidney function (Djasang

& Saturiski, 2019). Another study also found that there was an increase in urea levels in 42 respondents caused by impaired urea excretion in the body (Aminah, 2013). This will trigger high urea levels because urea is a residual substance from protein metabolism that occurs continuously. As a result of high urea levels in the blood, it will also be difficult to excrete if kidney function is disturbed (Djasang & Saturiski, 2019). Another factor that can cause an increase in urea levels is consuming foods high in protein needed by TB patients (Dhanny & Friina, 2022). This will trigger high urea levels because urea is a residual substance from protein metabolism that occurs continuously. As a result of high urea levels in the blood, it will also be difficult to excrete if kidney function is disturbed (Djasang & Saturiski, 2019).

3) Difference in Creatinine and Urea Levels

The normality test used in the results of this study uses the Shapiro-Wilk test because the number of samples used < 50 . The results of the normality test in table 7 were obtained with the significance values of creatinine in the 2nd month and the 3rd month were normally distributed with significance values of 0.069 and 0.059 ($p > 0.05$). Then, urea levels showed the results of the normality test that were normally distributed with significance values of 0.400 and 0.465 ($p > 0.05$). The results of the normality test are used to determine the hypothesis test. The hypothesis test in this study was carried out using the Wilcoxon nonparametric statistical test.

The results of the *Wilcoxon* test in table 8 showed that *the p value of* creatinine levels in the 2nd and 3rd months was 0.026 ($p < 0.05$), indicating that there was a difference in creatinine levels between the 2nd and 3rd months. Table 3 also shows that the creatinine results in the 2nd month have a mean (mean \pm SD) of 0.95 \pm 0.35 mg/dl with a minimum value of 0.54 and a maximum value of 1.78. Meanwhile, the creatinine level in the 3rd month had an average (mean \pm SD) of 0.90 \pm 0.32 mg/dl with a minimum value of 0.49 and a maximum value of 1.68.

The *p value of* urea levels in the 2nd and 3rd months was 0.201 ($p < 0.05$), indicating that there was no difference in urea levels in the 2nd and 3rd months. Table 5 shows the results of the 2nd month urea value with an average (mean \pm SD) of 32.26 \pm 10.88 mg/dl with a minimum value of 17.00 and a maximum value of 50.00. Meanwhile, the 3rd month urea level with an average (mean \pm SD) of 30.25 \pm 10.52 mg/dl with a minimum value of 14.00 and a maximum value of 49.00.

Previous research conducted by Nursidika *et al.* (2017) In OAT therapy patients for less than 2 months, as many as 14 respondents (47.0%) had creatinine levels with an average of 0.96 mg/dl, while OAT therapy patients for more than 2 months as many as 16 (53.0%) had creatinine levels with an average of 0.86 mg/dl. This is because patients who have been treated for 2 months will be

examined for Acid-Resistant Bacilli (BTA), if the test results are negative, the treatment dose will be lowered by taking OAT 3 times a week. The reduction in the dose of OAT is to reduce the risk of nephrotoxicity because the body is not exposed to OAT continuously every day (Nursidika et al., 2017).

In the research Djasang & Saturiski (2019) Tuberculosis patients who are undergoing OAT treatment will experience an increase in the initial phase even though it is still within normal limits. So, patients who are undergoing treatment in the 2nd month will have an increase in creatinine and urea levels will decrease in treatment for more than 2 months. The increase in creatinine and urea levels is caused by the consumption of rifampicin-type OAT consumed by patients in the intensive phase every day for 2 months. Thus, rifampicin is able to cause an immune response by creating an immune complex and causing an inflammatory reaction so that damage to the interstitial is characterized by interstitial edema and interstitial damage to tubule cells (Erlitania S, 2018). In tuberculosis patients who take rifampicin, they will experience damage to the renal tubules. However, it can return to normal in 3-4 months of treatment (Nursidika et al., 2017).

CONCLUSIONS AND RECOMMENDATIONS

The creatinine level at the 2nd month had an average of 0.95 mg/dl with a minimum value of 0.54 and a maximum value of 1.78. Meanwhile, creatinine levels in the 3rd month had an average of 0.90 mg/dl with a minimum value of 0.49 and a maximum value of 1.68. The urea level in the 2nd month with an average of 32.26 mg/dl with a minimum value of 17.00 and a maximum value of 50.00. Meanwhile, the urea level in the 3rd month with an average of 30.25 mg/dl with a minimum value of 14.00 and a maximum value of 49.00.

The frequency of creatinine level results based on age 12-25 years showed low (13.3%) and normal (20.0%) results. Ages 26-45 showed normal (20.0%) and high (6.7%) outcomes. The age of 46-65 years showed low (13.3%), normal (20.0%), and high (6.7%). The frequency of creatinine results by gender showed that male results had low (6.7%), normal (40.0%), and high (13.3%) results, while women had low (20.0%) and normal (20.0%) results. The frequency of urea level results based on age 12-25 years showed low (13.3%) and normal (20.0%) results. Ages 26-45 showed normal and high results. The age of 46-65 years indicates low, normal, and high. The frequency of urea results by gender showed that male results had normal (40.0%), and high (20.0%) results, while women had normal results (40.0%).

A total of 13 respondents (86.7%) who were on treatment in the 2nd month had creatinine levels higher than the creatinine level in the 3rd month with a difference with a *p-value* of 0.026 ($p < 0.05$). A total of 12 respondents who were undergoing treatment in the 2nd month had urea levels higher than in the 3rd month, but there was no difference with a *p-value* of 0.201 ($p < 0.05$).

For TB patients who feel complaints due to consuming OAT-KDT, they can submit to the doctor in charge for an evaluation. Health workers can conduct periodic kidney function checks starting from before treatment, intensive phase, advanced phase, and after OAT-KDT treatment to monitor the patient's kidney function so that it can be used as evaluation material related to therapy and coordinate with the doctor in charge. For the next researcher, it can use more accurate kidney function parameters such as *Glumerular Filtration Rate* (GFR) and use a larger sample number.

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