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The Overview Of Uric Acid Levels In Patients With Drug-Resistant Tuberculosis At Respira Lung Hospital Yogyakarta

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Abstract

Drug-resistant tuberculosis (DR-TB) is a global health problem requiring long-term treatment with a combination of second-line anti-tuberculosis drugs. Several drugs, including pyrazinamide and ethambutol, may increase uric acid levels and potentially cause hyperuricemia. This study aimed to describe uric acid levels among DR-TB patients at Respira Yogyakarta Lung Hospital. A quantitative descriptive design with a cross-sectional approach was used based on secondary data from medical records of DR-TB patients during January 2020–December 2025. Samples were selected using purposive sampling based on inclusion and exclusion criteria, resulting in 30 samples. The data included age, sex, uric acid levels, treatment regimen, and treatment duration and were analyzed descriptively. The results showed that most patients were male (60%) and belonged to the pre-elderly age group (43.3%). The mean uric acid level was 5.97 mg/dL, with a maximum value of 13.0 mg/dL. A total of 21 patients (70%) had normal uric acid levels, 8 patients (26.7%) had elevated levels, and 1 patient (3.3%) had a low level. The most commonly used treatment regimen consisted of clofazimine, bedaquiline, ethambutol, ethionamide, isoniazid, levofloxacin, and pyrazinamide. In conclusion, most DR-TB patients had uric acid levels within the normal range, although some patients experienced elevated uric acid levels during treatment.

Keywords: Drug-Resistant Tuberculosis, Hyperuricemia, Uric Acid Levels

INTRODUCTION

Tuberculosis (TB) is one of the most deadly infectious diseases that continues to pose a serious threat to public health worldwide. This disease is caused by *Mycobacterium tuberculosis*, a bacterium that primarily attacks the lungs but can also infect various other organs. Although currently available therapy can cure most cases, TB remains one of the infectious diseases with a high prevalence. Based on the *Global Tuberculosis Report 2023* issued by WHO, approximately 10.6 million new TB cases were recorded in 2022, an increase compared to 10.3 million cases in the previous year. During the COVID-19 pandemic, many health services experienced disruptions, resulting in decreased TB screening and treatment efforts in various countries. Globally, the Southeast Asia region accounted for approximately 45% of all TB cases, followed by Africa (24%), the Western Pacific (17%), the Eastern Mediterranean (8.6%), the Americas (3.2%), and Europe (2.1%) (WHO, 2023).

Drug-Resistant Tuberculosis (DR-TB) is a condition in which *Mycobacterium tuberculosis* is no longer sensitive to anti-tuberculosis drugs (ATDs). Forms of resistance include *Rifampicin-Resistant Tuberculosis (RR-TB),* which refers to resistance to rifampicin. *Multidrug-Resistant Tuberculosis* (MDR-TB), which refers to resistance to *isoniazid* and *rifampicin*, and *Extensively Drug-Resistant Tuberculosis (XDR-TB),* which is MDR-TB with additional resistance to the *fluoroquinolone* group and at least one Group A drug, such as *levofloxacin* or *moxifloxacin, bedaquiline,* and linezolid (WHO, 2020).

Indonesia is one of the countries with the highest burden of TB and Drug-Resistant Tuberculosis (DR-TB) in the world. In 2022, it was estimated that 2.2% of new TB patients and 25% of previously treated TB patients in Indonesia were DR-TB patients. Notification of Rifampicin-Resistant Tuberculosis (RR-MDR TB) in Indonesia was 7,876 patients, with 392 pre-XDR-XDR patients. This case notification figure remains far below the national DR-TB estimate of 28,000 cases. In addition to the low DR-TB notification rate, Indonesia also continues to face challenges in achieving treatment initiation among DR-TB patients. Of the total 12,531 DR-TB patients identified in 2022, only 8,089

patients (65%) initiated second-line TB treatment (Ministry of Health of the Republic of Indonesia. 2024).

TB treatment, and particularly DR-TB treatment, often uses anti-tuberculosis drugs (ATDs) involving a combination of several pharmacological agents, including both first-line and second-line drugs. Drugs such as *Pyrazinamide* and *Ethambutol* have metabolic side effects, one of which is an increase in uric acid levels (hyperuricemia) through the mechanism of inhibiting uric acid secretion in the kidneys or increasing uric acid reabsorption in the renal tubules Widada (2021). Physiologically, uric acid is the end product of purine metabolism, which is primarily excreted through the kidneys; when excretion is impaired or production increases, uric acid levels in the blood can increase and cause clinical complications (Susilawati, 2023).

Hyperuricemia is important to consider because it has significant clinical implications. Uric acid levels exceeding the threshold (> 7 mg/dL in men or > 6 mg/dL in women) can trigger crystallization of monosodium urate in the joints and peri-articular tissues, which subsequently leads to conditions such as gouty arthritis, joint pain, swelling, and chronic joint damage Auliya (2023). For TB or DR-TB patients, the occurrence of side effects such as arthralgia, gout, or hyperuricemia can interfere with the treatment process by reducing patient comfort, increasing the likelihood of non-adherence to treatment, and ultimately increasing the risk of treatment failure or the emergence of more extensive drug resistance (Soebroto, 2023).

A study from the Ambarawa Community Health Center showed that among 30 pulmonary TB patients, 11 experienced increased uric acid levels, with an average of 7.08 mg/dL for men and 6.41 mg/dL for women, although the analysis showed no significant relationship between uric acid levels and adherence to medication Auliya (2023). Hyperuricemia in DR-TB patients can cause clinical complaints, reduce quality of life, and potentially interfere with treatment adherence, which affects the success of therapy.

RESEARCH METHODS

This study was conducted at the Medical Records Installation of Respira Yogyakarta Lung Hospital using a quantitative descriptive research design with a cross-sectional approach based on secondary data from January 2020–December 2025. The population in this study consisted of all drug-resistant tuberculosis (DR-TB) patients who underwent treatment at Respira Yogyakarta Lung Hospital during the period of January 2020–December 2025. The sampling technique used was purposive sampling. The inclusion criteria in this study included DR-TB patients who had complete data consisting of age, sex, uric acid levels, type of treatment regimen, and treatment duration based on medical records during the study period. The exclusion criteria included incomplete patient data or patients without uric acid level examination results, resulting in a total of 30 samples that met the inclusion and exclusion criteria.

RESULTS AND DISCUSSION

The characteristics of DR-TB patients in this study included sex. The distribution of patients based on sex is presented to provide an overview of the characteristics of respondents who became the research sample. The results of the distribution of DR-TB patients based on sex can be seen in Table 1.

Table 1. Distribution of DR-TB Patients Based on Sex

Sex	Number	Percentage (%)
Male	18	60%
Female	12	40%
Total	30	100%

Based on Table 1, it is known that the majority of DR-TB patients were male, with 18 patients (60%), while there were 12 female patients (40%). These results indicate that DR-TB patients in this

study were more commonly found in males than females. The patient with the highest uric acid level was a male patient who had comorbid diabetes mellitus (DM). This condition can theoretically contribute to increased uric acid levels. In patients with DM, especially those experiencing insulin resistance, decreased uric acid excretion through the kidneys may occur, potentially increasing uric acid levels in the blood. In addition, males physiologically tend to have higher uric acid levels than females. Therefore, the high uric acid level in the male patient with DM in this study is suspected to be related to a combination of sex characteristics and metabolic conditions associated with DM. However, this finding cannot be interpreted as a causal relationship because this study used a descriptive cross-sectional design and did not analyze the relationship between sex, DM, and uric acid levels. Epidemiologically, this condition can be explained by differences in risk factors between males and females, such as smoking habits, alcohol consumption, and occupational environmental exposure (WHO 2025).

Research conducted by Albério et al. (2025) explained that males have higher baseline uric acid levels because they do not have the protective effect of the hormone estrogen as in females. Estrogen plays a role in increasing uric acid excretion through the kidneys, thereby helping maintain uric acid levels within the normal range. Research by Zada et al. (2024) and Sundas et al. (2025) also explained that males have a higher risk of experiencing increased uric acid levels compared with females. This difference is physiologically related to the hormone estrogen in females, which has a uricosuric effect, namely helping increase uric acid excretion through the kidneys. In contrast, males do not have the same protective effect of estrogen, so uric acid levels tend to be higher. In addition to hormonal factors, differences in purine metabolism and renal excretory function may also contribute to differences in uric acid levels between males and females. In DR-TB patients, this condition may be further exacerbated by the use of anti-tuberculosis drugs, particularly pyrazinamide and ethambutol, which can inhibit uric acid excretion. Therefore, regular monitoring of uric acid levels is necessary during DR-TB therapy, especially in male patients who have a greater risk of increased uric acid levels.

Purines are compounds derived from two main sources, namely endogenous and exogenous. Endogenous purines are produced through the processes of synthesis and breakdown of nucleic acids that naturally occur in the body, while exogenous purines are obtained from foods that contain high levels of purines, such as red meat, organ meats, seafood, and several types of legumes. In the body, purines undergo metabolic processes through degradation into hypoxanthine, which is then converted into xanthine and subsequently oxidized by the enzyme xanthine oxidase into uric acid as the final product of purine metabolism in humans. Unlike most mammals, humans do not have the enzyme uricase, which functions to convert uric acid into allantoin, which is more soluble and easier to excrete. Therefore, uric acid must be excreted primarily through the kidneys. An imbalance between increased uric acid production and decreased excretion can cause uric acid accumulation in the bloodstream, leading to hyperuricemia (Abdelrahman 2025).

Table 2. Distribution of DR-TB Patients Based on Age

Age	Number	Percentage (%)
Adolescents/early adults (21–23 years)	9	30%
Adults (26–45 years)	7	23.3%
Pre-elderly (46–65 years)	13	43.3%
Elderly (>65 years)	1	3.3%
Total	30	100%

Based on Table 2, it is known that the largest age group was the pre-elderly group (46–65 years), consisting of 13 patients (43.3%). The adolescent/early adult group consisted of 9 patients (30%), the adult group consisted of 7 patients (23.3%), and the elderly group consisted of 1 patient (3.3%).

This indicates that DR-TB frequently occurs in the productive to pre-elderly age groups. This condition is associated with a decline in the immune system and the possibility of a history of inaccurate previous TB treatment. Research conducted by Ayesha Sundas et al. (2025) concluded that middle-aged to elderly patients more frequently experienced increased uric acid levels during pyrazinamide therapy compared with younger age groups. Age needs to be considered in monitoring

treatment side effects because older patients tend to have decreased kidney function, making them more susceptible to uric acid metabolism disorders during treatment (Shin et al., 2023).

Research by Azhar et al. (2025) concerning the frequency of hyperuricemia in patients using anti-tuberculosis drugs showed that age is one of the variables that needs to be considered in monitoring treatment side effects. The study emphasized that increasing age is associated with an increased incidence of hyperuricemia during tuberculosis treatment.

The dominance of the 46–65-year age group among DR-TB patients at Respira Yogyakarta Lung Hospital indicates that most respondents were in an age group that physiologically begins to experience a decline in kidney function. This condition can affect the body's ability to excrete uric acid, especially when patients undergo DR-TB therapy containing drugs such as pyrazinamide and ethambutol, which are known to increase uric acid levels. Therefore, age may be one of the factors contributing to variations in uric acid levels found in this study.

Theoretically, increased uric acid levels in older age groups occur because the glomerular filtration rate decreases with increasing age. Consequently, the process of eliminating uric acid through the kidneys becomes less efficient. In DR-TB patients, this condition is exacerbated by the long-term use of anti-tuberculosis drugs, which can inhibit uric acid excretion. Therefore, pre-elderly and elderly patients require regular monitoring of uric acid levels during therapy to prevent hyperuricemia and its associated complications (Purwanti et al., 2025).

Table 3. Descriptive Analysis of Uric Acid Levels in DR-TB Patients

Variable	Mean ± SD	Median	Minimum	Maximum
Uric Acid Level (mg/dL)	5.97 ± 2.53	5.60	2.4	13.0

Based on Table 3, there were variations in uric acid levels among DR-TB patients. Some patients had uric acid levels exceeding the normal values, namely 2.6–6.0 mg/dL in females and 3.5–7.0 mg/dL in males, which may have been influenced by the long-term use of anti-tuberculosis drugs for drug-resistant tuberculosis.

The standard deviation (SD) value is used to describe the level of variation in uric acid levels from the mean value among DR-TB patients. The SD value obtained indicates how widely the uric acid level data are distributed from the mean value. The smaller the SD value, the smaller the data variation and the closer the patients' uric acid levels are to the mean value, whereas a larger SD value indicates greater variation in uric acid levels. Thus, the SD value in Table 3 provides an overview of the diversity of uric acid levels among the 30 DR-TB patients studied, but it is not used to determine whether uric acid levels are normal, low, or high.

Table 4. Distribution of Uric Acid Levels Based on Category

Uric Acid Level Category	Reference Value (mg/dL)	Male	Female	Percentage (%)
Low	M: <3.5; F: <2.6	0	1	3.3%
Normal	M: 3.5–7.0; F: 2.6–6.0	12	9	70%
High	M: >7.0; F: >6.0	6	2	26.7%
Total	-	18	12	100%

Based on Table 4, out of 30 DR-TB patients, there were 18 male patients and 12 female patients. In the male group, the majority had uric acid levels in the normal category, consisting of 12 patients, while 6 patients had high uric acid levels with the types of drugs consumed being Bedaquiline, Clofazimine, Ethambutol, Ethionamide, Isoniazid, Levofloxacin, Pyrazinamide, Kanamycin, Moxifloxacin, and no low uric acid levels were found. In the female group, the majority also had normal uric acid levels, consisting of 9 patients, while 2 patients had high uric acid levels with the types of drugs consumed being Bedaquiline, Clofazimine, Ethambutol, Ethionamide, Isoniazid, Levofloxacin, Pyrazinamide, and 1 patient had a low uric acid level. Overall, 21 patients (70%) had normal uric acid levels, 8 patients (26.7%) experienced hyperuricemia, and 1 patient (3.3%) had a low uric acid level.

The results of uric acid level examinations in Table 3 showed a mean value of 5.97 mg/dL with a maximum value reaching 13.0 mg/dL. This value indicates that there were variations in uric acid levels among DR-TB patients. Although the mean remained within the normal range, the high

maximum value indicates that some patients experienced hyperuricemia; this condition indicates differences in individual responses to therapy.

Clinically, normal uric acid levels are within the range of 3.5–7.0 mg/dL in males and 2.6–6.0 mg/dL in females. Values exceeding these limits are categorized as hyperuricemia, which can cause complications such as gout arthritis and kidney disorders. Thus, the results of this study indicate that although most patients remained within the normal category, there was still a risk of metabolic side effects in some patients who experienced increased uric acid levels.

A recent study specifically examining MDR-TB patients was conducted by Mayada et al. (2025), concluding that MDR-TB patients receiving regimens containing pyrazinamide had a high risk of experiencing hyperuricemia, requiring regular monitoring of uric acid levels.

Another study conducted by Sundas et al. (2025) also showed that the use of pyrazinamide was closely associated with increased uric acid levels. The researchers explained that hyperuricemia is one of the most frequently encountered metabolic side effects during tuberculosis therapy and may affect treatment success if not properly monitored.

Table 5. Distribution of DR-TB Patients Based on the Types of Drugs Used

Type of Drug	Number	Percentage (%)
Clofazimine (Cfz)	29	96.7
Bedaquiline (Bdq)	26	86.7
Ethambutol (E)	24	80.0
Levofloxacin (Lfx)	22	73.3
Pyrazinamide (Z)	21	70.0
Ethionamide (Eto)	21	70.0
Isoniazid (H)	20	66.7
Vitamin B6	13	43.3
Linezolid (Lzd)	10	33.3
Cycloserine (Cs)	6	20.0
Moxifloxacin (Mfx)	5	16.7
Kanamycin (Km)	3	10.0
Delamanid (Dlm)	1	3.3
Para-aminosalicylic acid (PAS)	1	3.3
Rifampicin (R)	1	3.3

Based on Table 5, it shows that most patients received treatment regimen combinations containing Clofazimine, Bedaquiline, and Ethambutol as the main components of DR-TB therapy.

DR-TB treatment does not use a single type of drug, but rather a combination of several anti-tuberculosis drugs. This is because *Mycobacterium tuberculosis* in DR-TB patients has developed resistance to one or more drugs, so several drugs that remain effective are required to kill the bacteria and prevent the development of further resistance. Therefore, treatment regimens are developed based on the results of drug susceptibility testing (Drug Susceptibility Testing/DST), the patient's treatment history, the level of resistance, clinical condition, and possible side effects that may occur.

The high use of Clofazimine and Bedaquiline indicates that these two drugs are major components of modern DR-TB treatment regimens, where Clofazimine works by disrupting bacterial cell membrane function, while Bedaquiline inhibits the ATP synthase enzyme involved in energy production in *Mycobacterium tuberculosis*. Nevertheless, increased uric acid levels in DR-TB patients are more frequently associated with the use of Pyrazinamide and Ethambutol, where Pyrazinamide through its metabolite, namely *pyrazinoic acid*, can inhibit uric acid excretion in the renal tubules, while Ethambutol also decreases uric acid excretion although its effect is milder. This condition explains why patients with high uric acid levels are still found even though most patients consume Clofazimine and Bedaquiline. Thus, it is known that the most widely used drug is not necessarily the drug that has the greatest influence on uric acid levels. Clofazimine and Bedaquiline were the most widely used drugs in this study, but they were not the main focus in explaining increased uric acid levels. Conversely, Ethambutol and especially Pyrazinamide are more relevant to be associated with uric acid levels because they can inhibit uric acid excretion through the kidneys. Thus, uric acid levels

in DR-TB patients are likely influenced by a combination of drugs used, rather than by only one type of drug. Other factors such as age, sex, treatment duration, kidney function, and comorbidities may also affect patients' uric acid levels (WHO 2022).

Table 6. Distribution of DR-TB Patients Based on Drug Combinations

Type of Drug	Number	Percentage (%)
Bdq Cfz E Eto H Lfx Z	10	33.3%
Bdq Cfz E Eto H Lfx Vit B6 Z	4	13.3%
Bdq Cfz Cs Lfx Lzd Vit B6	3	10.0%
Bdq Cfz E Eto H Mfx Z	2	6.7%
Cfz E Eto H Km Mfx Z	2	6.7%
Bdq Cfz Cs E Lfx Lzd Vit B6	2	6.7%
Bdq Cfz Dlm E Eto Lzd Z	1	3.3%
Bdq Cfz Cs E Lzd Vit B6	1	3.3%
Bdq Lzd Mfx Pa Vit B6	1	3.3%
Bdq Cfz E Eto H Lfx Lzd Vit B6 Z	1	3.3%
Bdq Cfz Eto Lzd Mfx	1	3.3%
H Lfx R Z	1	3.3%
Cfz E Eto H Km Mfx Vit B6 Z	1	3.3%
Total	**30**	**100%**

Description: Bdq = Bedaquiline; Cfz = Clofazimine; E = Ethambutol; Eto = Ethionamide; H = Isoniazid; Lfx = Levofloxacin; Z = Pyrazinamide; Cs = Cycloserine; Lzd = Linezolid; Mfx = Moxifloxacin; Km = Kanamycin; Dlm = Delamanid; Pa = Pretomanid; R = Rifampicin; Vit B6 = Vitamin B6.

Based on Table 6, there were 13 combinations of types of treatment used in DR-TB patients. The most widely used drug combination was Bedaquiline, Clofazimine, Ethambutol, Ethionamide, high-dose Isoniazid, Levofloxacin, and Pyrazinamide in 10 patients (33.3%). The second most widely used treatment combination was Bedaquiline, Clofazimine, Ethambutol, Ethionamide, high-dose Isoniazid, Levofloxacin, Vitamin B6, and Pyrazinamide in 4 patients (13.3%). Meanwhile, other treatment combinations were used by 1–3 patients according to the results of drug susceptibility testing and the clinical conditions of each patient.

The use of drug combinations in DR-TB is carried out because *Mycobacterium tuberculosis* in patients has developed resistance to one or more anti-tuberculosis drugs. Therefore, treatment is not sufficient with only one type of drug, but requires several drugs that remain effective against the bacteria based on resistance patterns and the results of drug susceptibility testing (*Drug Susceptibility Testing/DST*). Treatment of drug-resistant tuberculosis indeed depends on the use of several drugs in combination for an appropriate duration to achieve treatment effectiveness and prevent the emergence of further resistance. The use of several drugs in combination also aims to increase treatment success and prevent the development of resistance to other drugs. If only one drug is used, bacteria that already have or subsequently acquire resistance to that drug may survive and develop. By using several drugs with different mechanisms of action, the possibility of bacteria surviving against all drugs in the combination becomes smaller. Therefore, WHO recommends various regimen combinations for MDR/RR-TB patients according to resistance patterns and patient conditions (WHO 2022).

Differences in regimen combinations are influenced by several factors, including the results of drug susceptibility testing (Drug Susceptibility Testing/DST), previous use of anti-tuberculosis drugs, resistance patterns of *Mycobacterium tuberculosis*, the presence of comorbidities, possible drug interactions, and side effects that occur during treatment. Based on WHO guidelines, the preparation of a DR-TB regimen should use at least four drugs that remain effective and be selected based on the results of drug susceptibility testing to increase the likelihood of treatment success and prevent the development of additional resistance. Therefore, each patient's regimen may differ according to clinical conditions and resistance patterns. In addition, regimen changes may also be made during treatment if patients experience severe side effects or contraindications to certain drugs are identified. For example, some patients in this study received additional Vitamin B6 to help prevent peripheral neuropathy due to the use of Cycloserine or Linezolid, while other patients received Delamanid,

Kanamycin, or Para-aminosalicylic acid (PAS) as replacements or additions to drugs according to clinical evaluation and drug susceptibility testing. This condition resulted in the identification of 13 variations of drug combinations in this study (WHO 2023).

Variations in uric acid levels found in this study were influenced by the types of treatment regimens used. The results of the study in Table 5 showed 13 variations of DR-TB treatment regimens, with the most common combination being *Bdq (Bedaquiline), Cfz (Clofazimine), E (Ethambutol), Eto (Ethionamide), H (Isoniazid), Lfx (Levofloxacin), and Z (Pyrazinamide)*. Among these combinations, *pyrazinamide (Z)* is the drug most frequently associated with increased uric acid levels. *Pyrazinamide* is metabolized into *pyrazinoic acid*, which can inhibit uric acid excretion in the renal tubules, thereby causing uric acid accumulation in the blood.

The results of this study are consistent with research conducted by Mayada et al. (2025), which found that uric acid levels increased gradually during the use of regimens containing *pyrazinamide*. The mean uric acid level increased from 4.47 mg/dL before therapy to 9.69 mg/dL in the fifth month of treatment. The researchers concluded that pyrazinamide was the main factor causing hyperuricemia in MDR-TB patients.

Although the regimens used in this study contained a substantial amount of *pyrazinamide*, the mean uric acid level of the respondents remained within the normal range. This condition indicates that not all patients receiving *pyrazinamide* experience hyperuricemia. These differences may be influenced by various factors such as good kidney function, hydration status, dietary patterns, age, sex, and the individual ability of each patient to excrete uric acid. In addition to *pyrazinamide*, *ethambutol*, which was also used in the regimens in this study, is known to increase uric acid levels through the mechanism of decreased urate excretion in the kidneys. The combination of *pyrazinamide* and *ethambutol* has a synergistic effect in increasing uric acid levels. Therefore, the presence of these two drugs in the treatment regimens of DR-TB patients may be one of the causes of the high uric acid levels found (Purwanti et al. 2026).

In terms of treatment duration, DR-TB patients generally undergo long-term therapy, namely between 9 and 20 months according to national guidelines. Long-term drug exposure can increase the risk of metabolic side effects, including hyperuricemia. This is supported by research by Abdelrahman et al. (2025), which showed that uric acid levels increased progressively as treatment duration increased. The longer patients received pyrazinamide, the higher the uric acid levels found.

The results of the study by Sundas et al. (2025) showed that treatment duration was not always significantly associated with the occurrence of hyperuricemia. The study found that individual factors such as age, sex, nutritional status, and kidney function also influenced patients' uric acid levels. This finding may explain why this study still found patients with normal uric acid levels despite undergoing long-term treatment.

The maximum uric acid level of 13.0 mg/dL found in this study indicates that there were patients who experienced severe hyperuricemia. This condition requires attention because high uric acid levels can cause arthralgia, gout arthritis, kidney stone formation, and even impaired kidney function if not properly managed. Therefore, regular examination of uric acid levels during DR-TB therapy is very important as part of monitoring treatment side effects.

Overall, the results of this study indicate that the use of DR-TB regimens containing pyrazinamide and ethambutol has the potential to increase uric acid levels in some patients. Although the mean uric acid level of the respondents remained within the normal range, the finding of a high maximum value indicates that hyperuricemia-related side effects may still occur. Therefore, routine laboratory monitoring is necessary to detect increased uric acid levels at an early stage and prevent complications during DR-TB treatment.

CONCLUSION

Based on the results of the study regarding the description of uric acid levels in drug-resistant tuberculosis (DR-TB) patients at Respira Yogyakarta Lung Hospital, it can be concluded that the majority of patients had uric acid levels within the normal range, consisting of 21 patients, 8 patients had high levels, and 1 patient had a low level. The patients' uric acid levels showed variation, with a mean value of 5.97 mg/dL, which was still within the normal range; however, a high maximum value of up to 13.0 mg/dL was found in 1 patient, indicating the presence of hyperuricemia in some patients. Male patients and the pre-elderly age group tended to have a higher risk of increased uric acid levels. In addition, the most commonly consumed drug was Clofazimine, used by 29 patients, followed by Bedaquiline used by 26 patients and Ethambutol used by 24 patients.

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