RATIONAL USE OF CATEGORY I ANTI-TUBERCULOSIS DRUGS IN ADULT PULMONARY TUBERCULOSIS PATIENTS AT BALKESMAS PATI

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Abstract

Tuberculosis can be prevented and cured, yet it remains one of the largest causes of death worldwide. Anti-tuberculosis drugs (ATDs) must be administered in a combination of several types of drugs, sufficient quantities and precise dosages according to the treatment category, and the use of a single ATD should be avoided. Nevertheless, irrationalities in the administration of ATDs are still encountered. The purpose of this study is to determine the rational use of category I anti-tuberculosis drugs in adult pulmonary tuberculosis patients, with the aim of increasing the effectiveness of treatment. There are a total of 58 medical records that meet the inclusion criteria with the total sampling method. Data were retrospectively collected from the medical records of adult pulmonary tuberculosis patients at Balkesmas Pati for the period of January–December 2023. Based on the analysis of patient characteristic data, it was found that there are 37 individuals (63.8%) of male gender and 21 individuals (36.2%) of female gender, with the most common age groups being 26–35 years and 46–55 years, each comprising 15 individuals (25.9%), and the weight range dominated by 38–54 kg with 33 individuals (56.9%). The prescribed category I ATDs consists of a combination of rifampin, isoniazid, pyrazinamide, and ethambutol. The rational use of category I anti-tuberculosis drugs based on the appropriate patient, indication, diagnosis, medication, dose, and duration of treatment is already 100% rational.

Keyword: Rational, Anti-Tuberculosis Drugs, Category I, Pulmonary Tuberculosis

INTRODUCTION

Tuberculosis (TB) is one of the diseases that is transmitted through the air. The disease is caused by the bacterium Mycobacterium tuberculosis (Kemenkes RI, 2019). This bacterium has a rod-like shape and is acid-resistant, hence it is also known as Acid-Fast Bacillus (AFB). TB can attack various organs of the body but most commonly affects the lungs. TB causes tissue destruction and death if not treated or treated improperly (Dipiro *et al*., 2020).

Tuberculosis can be prevented and cured, yet it remains one of the largest causes of death globally. About 10 million people suffered from TB worldwide in 2020, and 1.5 million died due to the disease (WHO, 2020). The prevalence of TB in Indonesia is among the highest in the world. In 2018, Indonesia ranked third in the list of 30 countries with the highest tuberculosis burden. Approximately 845,000 people, or 316 out of every 100,000 individuals, were infected with tuberculosis (WHO, 2019).

According to the Central Java Provincial Health Office, the Case Notification Rate (CNR) for all tuberculosis cases in 2018 was 143.9 cases per 100,000 population, an increase from 132.9 cases in 2017 (Dinkes Jateng, 2018). The age group most affected by tuberculosis was 25-34 years, which is the productive age in society. The prevalence rate of tuberculosis in this age group reached 753 cases per 100,000 population (Kemenkes RI, 2015).

The treatment of tuberculosis (TB) aims to cure patients, prevent death, prevent recurrence, interrupt the chain of transmission, and prevent drug resistance (Kemenkes RI, 2019). Tuberculosis patients require a considerable amount of time for treatment, which is about 6 months. Anti-Tuberculosis Drugs (ATDs) are medications used in the management of tuberculosis and are divided into several lines. TB treatment can also be categorized into several groups, namely category I, II, and children (Kemenkes RI, 2016).

Category I is assigned to new pulmonary/extra-pulmonary TB patients who are bacteriologically confirmed and clinically diagnosed. Category II is intended for TB patients who have relapsed, failed treatment with Category I ATDs, or are lost to follow-up. The child category

is given to TB patients under the age of 15 years (Kemenkes RI, 2016). Anti-Tuberculosis Drugs (ATDs) are provided in the form of Fixed-Dose Combinations (FDC) and also separately. Tuberculosis treatment is further divided into two stages: the intensive phase (R/H/Z/E) and the continuation phase (R/H) (Kemenkes RI, 2014).

The intensive phase of the Anti-Tuberculosis Drugs (ATDs) combination includes rifampin (R), isoniazid (H), pyrazinamide (Z), and ethambutol (E), which are used for 2 months, followed by rifampin (R) and isoniazid (H) for 4 months in the continuation phase (Kemenkes RI, 2019). ATDs must be given in a combination of several types of drugs, in sufficient quantities and precise doses according to the treatment category, and the use of single ATD (monotherapy) should be avoided (Depkes RI, 2011).

According to a study by Yulianti (2019), the appropriateness of the dosage for category I anti-tuberculosis drugs at Keluarga Sehat Pati Hospital was 98.78%. A study conducted by Anwar & Ayuni (2016) indicated that the use of anti-tuberculosis drugs for outpatient treatment at Atma Jaya Hospital achieved 93.64% accuracy in medication, 97.5% accuracy in dosage, and 100% accuracy in duration of therapy. This suggests that there are still irrationalities in the administration of anti-tuberculosis drugs (ATDs).

This study was conducted with the aim of evaluating the rational use of category I anti-tuberculosis drugs (ATDs) in adult pulmonary tuberculosis (TB) patients at Balkesmas Pati. This study is an observational study that utilizes secondary data from the medical records of pulmonary TB patients. This study is essential to measure the accuracy criteria of drug use in pulmonary TB therapy with category I anti-tuberculosis drugs.

METHODS

Study Design

The type of this study is non-experimental descriptive with a quantitative approach, which is study based on existing data without conducting treatments on the test subjects.

Place and Time of Study

This study was conducted at Balkesmas Pati. The study took place from February to March 2024.

Population and Sample

The population in this study encompasses all the pulmonary tuberculosis patient medical record data at Balkesmas Pati during January to December 2023.

The sample used in this study consists of the medical record data of pulmonary tuberculosis patients who underwent treatment at Balkesmas Pati from January to December 2023 and meet the inclusion and exclusion criteria.

Data Collection

a. Application for research permit.
b. Submission of ethical clearance.
c. Collecting data from the medical records of adult pulmonary tuberculosis patients from January to December 2023.
d. Identifying sample criteria, data recording, and data processing with Statistical Product and Service Solutions (SPSS) version 27 using frequencies test.
e. Analyzing the rational use of anti-tuberculosis drugs based on the appropriate patient, indication, diagnosis, medication, dose, and duration of treatment.

Data Analysis

The data analysis in this study was conducted using SPSS version 27 with frequencies test, the data is presented in the form of percentage tables.

RESULTS AND DISCUSSION

Based on the data collection results regarding the rational use of anti-tuberculosis drugs (ATDs) in adult pulmonary tuberculosis patients at Balkesmas Pati for the period of January to December 2023, 175 medical records of pulmonary tuberculosis patients were obtained, and those that met the inclusion criteria amounted to 58 medical records.

Table 1. Patient Characteristics

Variables	Frequency (n=58)	Percentage (%)
Gender		
Male	37	63,8
Female	21	36,2
Age Range (years)		
12-16	2	3,4
17-25	5	8,6
26-35	15	25,9
36-45	9	15,5
46-55	15	25,9
56-65	12	20,7
Weight Range (kg)		
30-37	4	6,9
38-54	33	56,9
55-70	21	36,2

The patient identity characteristics based on the medical record data collected include three aspects: the patient's gender, age, and weight. According to **Table 1**, out of a total of 58 patients diagnosed with pulmonary tuberculosis, 37 individuals (63.8%) were male and 21 individuals (36.2%) were female. The Data and Information Center of the Indonesian Ministry of Health in 2018 stated that tuberculosis cases in males occur more frequently, with a ratio 1.4 times higher than in females (Kemenkes RI, 2018).

This is in line with the research conducted by Anwar & Ayuni (2016), where male patients (60.90%) were more numerous than female patients (39.10%). According to Dotulong et al. (2015), the higher percentage of pulmonary tuberculosis occurrences in males could possibly be attributed to habits such as smoking and alcohol consumption among men. These habits may lead to a decrease in the body's immune system, thus making the body more susceptible to tuberculosis bacteria infection.

Patient grouping by age was conducted to obtain an overview of which age range has the highest frequency distribution. According to **Table 1**, it is known that the age range of 26-35 years and 46-55 years occupy the highest rank with 15 individuals (25.9%) each affected by pulmonary tuberculosis. Followed by the age range of 56-65 years with 12 individuals (20.7%), the age range of 36-45 years with 9 individuals (15.5%), the age range of 17-25 years with 5 individuals (8.6%), and the age range of 12-16 years with 2 individuals (3.4%).

Based on the Indonesian Ministry of Health in 2015, the incidence of pulmonary tuberculosis is mostly experienced by patients of productive age (15-55 years). The productive age is highly susceptible to tuberculosis exposure because at this age, patients have a high level of mobility and often interact with their surroundings, thus increasing the risk of contracting and transmitting tuberculosis to others (Nurkumalasari et al., 2016).

Table 1 results indicate that the frequency of patients diagnosed with pulmonary tuberculosis is predominantly in the weight range of 38-54 kg with 33 individuals (56.9%), followed by the weight range of 55-70 kg with 21 individuals (36.2%) and 30-37 kg with 4 individuals (6.9%). The weight difference among these patients will affect the amount of medication or dosage given based on the treatment category received by the patients.

Table 2. Anti-Tuberculosis Drugs Usage

Types of ATDs	Frequency (n)	Percentage (%)
Rifampin	58	100
Isoniazid	58	100
Pyrazinamide	58	100
Ethambutol	58	100

According to **Table 2**, it is known that the anti-tuberculosis drugs given to patients diagnosed with pulmonary tuberculosis are rifampin, isoniazid, pyrazinamide, and ethambutol, each with a frequency of 58, meaning that all four drugs are administered to all patients in the pulmonary tuberculosis treatment therapy. These anti-tuberculosis drugs are provided in the form of a fixed-dose combination (FDC) drug package. Based on the Indonesian Ministry of Health (2014), these FDC ATD tablets consist of a combination of 2 or 4 types of drugs in one tablet with doses adjusted to the patient's body weight.

Table 3. Drug Usage based on the Appropriate Patient

Indicators	Frequency (n)	Percentage (%)
Appropriate	58	100
Inappropriate	0	0
Total	**58**	**100**

The appropriate patient can be assessed from the administration of anti-tuberculosis drugs that are appropriate to the physiological and pathological conditions, and do not cause problems when given to patients with pulmonary tuberculosis. According to **Table 3**, the results show a 100% appropriate patient based on the Drug Information Handbook literature. This indicates that the use of anti-tuberculosis drugs is in accordance with the patient's condition and is not contraindicated.

The patient received therapy with rifampin, isoniazid, pyrazinamide, and ethambutol, which are indeed suitable for the patient's condition and not contraindicated. This is consistent with the research by Naftali et al. (2022) at the West Semarang District Health Center, Semarang City, for the period January 2019–December 2020, which achieved a 100% appropriate patient from a total sample of 35 medical records.

A similar finding was observed in the study by Anuku et al. (2020) at Ibu Public Health Center for the period January–March 2019, which stated that the appropriate patient rate was 100% from a total sample of 29 medical records. In this study, no special conditions were found such as pregnant patients, patients with chronic liver abnormalities, patients with acute hepatitis, or patients with severe renal failure.

The appropriate indication related to whether or not a drug should be administered in a particular case. The accuracy of the indication in this study was reviewed from the diagnosis and symptoms experienced by the patient. The main symptoms of tuberculosis include a cough for more than 2 weeks, cough accompanied by blood, shortness of breath, weakness, decreased appetite, weight loss, fever, and night sweats without activity (Kemenkes RI, 2014).

Table 4. Drug Usage based on the Appropriate Indication

Indicators	Frequency (n)	Percentage (%)
Appropriate	58	100
Inappropriate	0	0
Total	**58**	**100**

Based on **Table 4**, the results showed a 100% accurate indication from a total of 58 medical records that met the inclusion criteria. This means that the medication given to the patients was in accordance with the diagnosis and indications and its therapeutic benefits were proven based on the Drug Information Handbook literature. This is in line with the research by Ismaya et al. (2021) at the General Hospital of South Tangerang City in 2020, which stated that the percentage of appropriate indications was 100% with a total of 124 patients.

In the research by Kusumawardhani (2016) at the Sidawangi Pulmonary Hospital in West Java for the period of January–June 2015, a 100% appropriate indication was also found from a total of 126 patients, with 71 patients receiving category I ATDs treatment and another 55 patients receiving category II ATDs treatment.

Table 5. Drug Usage based on the Appropriate Diagnosis

Indicators	Frequency (n)	Percentage (%)
Appropriate	58	100
Inappropriate	0	0
Total	**58**	**100**

Appropriate diagnosis is one of the indicators of rational drug usage. According to **Table 5**, the accuracy percentage of diagnoses in 58 medical records is 100%, which means that all patients with pulmonary tuberculosis have received an appropriate diagnosis according to their disease. The diagnosis was established based on the results of bacteriological tests or chest X-rays of the patients and the symptoms of pulmonary tuberculosis experienced. Similarly, the study by Ismaya et al. (2021) at the General Hospital of South Tangerang City stated that the percentage of appropriate diagnosis was 100%.

In the study by Surani et al. (2022), it was also stated that there was a 100% percentage of appropriate diagnosis from a total of 65 respondents at the Sriwijaya Health Center for the period 2018–2020, where all the pulmonary tuberculosis respondent samples in the study were deemed to have been correctly diagnosed based on the symptoms experienced by the respondents, laboratory test results, and the diagnosis established by the attending physician.

The diagnosis made by the doctors on the patients was appropriate because the results of the direct microscopic sputum laboratory examination in all tuberculosis patients yielded positive results and were in accordance with the National Tuberculosis Control Guidelines. The accuracy of the diagnosis itself plays an important role in preventing problems such as drugs that are not suitable for the indication, which can harm patients in terms of treatment costs.

Table 6. Drug Usage based on the Appropriate Medication

Indicators	Frequency (n)	Percentage (%)
Appropriate	58	100
Inappropriate	0	0
Total	**58**	**100**

The appropriateness of medication relates to the selection of therapeutic classes and types of drugs based on considerations of benefits, safety, price, and quality. According to **Table 6**, it is known that the percentage of medication accuracy in pulmonary tuberculosis patients is 100%. The accuracy of medication in this study is viewed from the drugs given compared to the diagnosis using the literature Pharmacotherapy: A Pathophysiologic Approach 9th edition and the National Tuberculosis Control Guidelines as a reference where the prescribed drugs are indeed in accordance with the accuracy of the therapeutic class and type of drug according to the diagnosis and have proven therapeutic benefits.

The sample used in the study has received anti-tuberculosis drugs (ATDs) in the form of a fixed-dose combination (FDC) package which are suitable for the patient's condition and is the drug of choice because there is no safer alternative to this drug. Pulmonary tuberculosis patients at Balkesmas Pati are treated for 6 months with the anti-tuberculosis drugs category I package

consisting of RHZE to be used daily for the first 2 months during the intensive phase and RH to be used daily for the next 4 months during the continuation phase.

This is in line with the research by Rahwandi et al. (2022) at the Kendari City Hospital for the period January–December 2020, which obtained a 100% medication accuracy result from 65 medical records. Similarly, the research conducted by Fauziah et al. (2022) at the M. Yunus Hospital for the period January–December 2021, which obtained 100% appropriate medication percentage from a total of 67 pulmonary tuberculosis patients.

Table 7. Drug Usage based on the Appropriate Dose

Indicators	Frequency (n)	Percentage (%)
Appropriate	58	100
Inappropriate	0	0
Total	**58**	**100**

The appropriate dose plays a crucial role in achieving the effectiveness of drug therapy, preventing drug toxicity, and resistance to anti-tuberculosis drugs. Based on **Table 7**, it is known that the percentage of appropriate dose obtained is 100% from a total of 58 medical records. This means that all patients have received a dose that is appropriate to their body weight based on the literature Pharmacotherapy: A Pathophysiologic Approach 9th edition and the National Guidelines for Tuberculosis Control 2014.

According to Rabahi et al. (2017), anti-tuberculosis drugs dose for adult pulmonary tuberculosis patients based on body weight is RHZE (150/75/400/275) with a calculation of 10/10/35/25 mg/kg/day and a maximum dose of 4 tablets for body weight above 50 kg in the intensive phase. The continuation phase dose for pulmonary tuberculosis is RH (150/75) with a calculation of 10/10 mg/kg/day and a maximum dose of 4 tablets for body weight above 50 kg.

This is in line with the research conducted by Fraga et al. (2021) at the Oebobo Kupang Community Health Center for the period 2018–2019, where an accuracy of dosing of 100% was obtained from a total sample of 68 patients. Similarly, the research by Surani et al. (2022) at the Sriwijaya Community Health Center for the period 2018-2020 obtained 100% appropriate dose from a total of 65 respondents.

Table 8. Drug Usage based on the Appropriate Duration of Treatment

Indicators	Frequency (n)	Percentage (%)
Appropriate	58	100
Inappropriate	0	0
Total	**58**	**100**

Based on **Table 8**, it can be understood that the percentage of the appropriate duration of treatment is 100% out of a total of 58 medical record data of pulmonary tuberculosis patients. The duration of treatment can be considered appropriate if the patient undergoes tuberculosis treatment in the initial stage for 2 months and the continuation stage for 6 months. For patients who still show the presence of some TB culture organisms in direct sputum laboratory results, the treatment can be extended for 3 months, provided there is an improvement in radiological and clinical patient conditions (Rabahi et al., 2017).

This research is in line with the study by Anwar & Ayuni (2016) at Atma Jaya Hospital for the period December–February 2014, where the percentage of the appropriate duration of therapy was 100%, with all patients completing their treatment until recovery. Similarly, the study conducted by Qiyaam et al. (2020) at the Kediri Health Center, where the accuracy percentage of the duration of treatment reached 100% with a total of 77 medical record data, with 52 patients undergoing proper treatment for 6 months, 20 patients undergoing treatment for less than 6 months, and 5 patients undergoing treatment for more than 6 months.

CONCLUSION

The characteristics of adult pulmonary tuberculosis patients at Balkesmas Pati for the period January–December 2023 based on gender revealed that males ranked highest with a total of 37 patients (63.8%), the most common age groups were 26-35 years and 46-55 years with each group having 15 individuals (25.9%), and the diagnosis of pulmonary tuberculosis was dominated by the weight category of 38-54 kg with 33 people (56.9%). The first category of anti-tuberculosis drugs used in the treatment therapy for all adult pulmonary tuberculosis patients at Balkesmas Pati during the period January– December 2023 was a combination of rifampin, isoniazid, pyrazinamide, and ethambutol. The rational use of category I anti-tuberculosis drugs based on the appropriate patient, indication, diagnosis, medication, dose, and duration of treatment has been 100% rational.

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