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# Anti-Tuberculosis Drug Use Patterns in Outpatient Pulmonary Tuberculosis Patients at Kediri District Hospital in 2025

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ABSTRACT

Transmission of "mycobacterium tuberculosis" occurs via airborne droplet nuclei originating from an individual with active tuberculosis. This study aims to describe the pattern of anti-tuberculosis drug use among outpatients with pulmonary tuberculosis at the Kediri Regency Regional General Hospital (RSUD) in 2025. A descriptive observational study design with a retrospective approach was employed. Consecutive sampling was used to select subjects meeting the inclusion and exclusion criteria. The study population consisted of all patients diagnosed with pulmonary tuberculosis at the hospital, with a sample size of 62 patients; data collection took place between February and March 2026. Data were collected retrospectively using secondary data from patient medical records. A validated observation sheet (checklist) served as the data collection instrument. The collected data were analyzed using descriptive statistics, with all variables presented as frequencies (n) and percentages (%). The results of the study based on the characteristics of the majority were male (33 patients) (53.2%), age 26-35 years (20 patients) (32.3%), high school education (24 patients) (38.7%), and occupation as farmers (13 patients) (21.0%)

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## INTRODUCTION

Tuberculosis, also known as "becillary tubercles", is a directly infectious disease caused by the Mycobacterium tuberculosis bacterium. Transmission of the Mycobacterium tuberculosis bacteria occurs through the air, containing droplet nuclei (fluid bubbles) obtained from someone with active TB. Some symptoms that can appear in tuberculosis patients include a cough with phlegm that lasts for more than 2-3 weeks, cold sweats at night, weight loss, and loss of appetite (Kemenkes, 2020).

The incidence of pulmonary tuberculosis in Indonesia is approximately 0.42% (1,017,290 individuals); the highest prevalence is found in Banten at 0.76%, while the lowest is in Bali at 0.13%. In East Java Province, the prevalence of pulmonary tuberculosis is 0.29%, or approximately 151,878 cases (RISKESDAS, 2018). According to the 2023 Indonesian Health Survey (SKI), the incidence of pulmonary tuberculosis in Indonesia stands at 0.30%, or approximately 877,531 individuals. East Java Province ranks second after West Java, with a prevalence rate of 0.24% and a total of approximately 130,683 cases. Pulmonary tuberculosis cases are more frequently found in males (0.38%), with the highest number of sufferers being adults (0.26%) (SKI, 2023).

Pulmonary tuberculosis can be treated over a six-month period using a regimen of anti-tuberculosis drugs administered at regular doses. The initial phase of treatment lasts two months, with daily medication to effectively reduce the bacterial load and lower the risk of transmission a risk that typically decreases after two weeks of therapy (Kemenkes, 2021). This is followed by a four-month continuation phase aimed at eradicating any remaining persistent bacteria, ensuring the patient's complete recovery and preventing relapse (PDPI, 2021). The administration of antibiotics aims to suppress and halt the proliferation of Mycobacterium tuberculosis bacteria and minimize the likelihood of resistance developing (Kemenkes, 2019).

In tuberculosis treatment, medication control refers to the routine monitoring process carried out by healthcare workers to evaluate the patient's clinical condition, ensure medication adherence, detect drug side effects, and assess treatment response through laboratory tests such as sputum examinations (Kemenkes, 2020). These control activities are carried out periodically according to a predetermined schedule, usually monthly during the intensive and continuation periods (WHO, 2022). Regular control is crucial because irregularity can result in ineffective treatment, increase the risk of drug resistance, and prolong the period of tuberculosis transmission in the community. This suggests that health control behavior significantly determines patient decisions regarding health conditions and treatment compliance (Nopiayanti et al., 2022).

Non-adherence to treatment will lead to a high rate of treatment failure in tuberculosis patients, which can lead to the risk of morbidity and mortality, and result in more tuberculosis patients being detected with acid-fast bacilli (AFB), which are more likely to experience increased resistance to acid-fast bacilli (AFB) to standard treatment and experience failure, resulting in substandard treatment outcomes or unattainable therapeutic outcomes (Laili et al., 2023).

Another factor causing treatment failure that increases the risk of resistance is treatment side effects. All OATs used in the treatment of tuberculosis patients have the potential to cause side effects, whether mild, moderate, or severe (Nugrahaeni & Malik, 2015). In addition, delayed diagnosis will further prolong the spread of drug-resistant strains. Unsupportive environmental factors, such as inadequate housing conditions and high levels of residential density, can also increase the risk of the spread of drug-resistant bacteria (WHO, 2022).

Based on the results of research conducted by Rochjana & Laeman (2024), the characteristics of pulmonary tuberculosis sufferers in the most productive age are adults aged 26-45 years totaling 48 sufferers (47%) and male gender totaling 62 sufferers (60%). The type of OAT used in pulmonary tuberculosis sufferers is OAT KDT category I as many as 77 sufferers (75%) and OAT KDT replacement to OAT Lepas (Kombipak) as many as 26 sufferers (25%). The pattern of OAT KDT use used is the intensive phase of 4KDT and the continuation phase of 2KDT, while the pattern of OAT Release (Kombipak) use is R/H, R/H/E, and R/H/Z/E. The duration of OAT use in pulmonary tuberculosis sufferers is the treatment period of > 6 months, namely as many as 50 sufferers (48%) due to complications (Rochjana & Laeman, 2024).

The results of another study conducted by Siswidiasari et al., (2026), showed that the majority of the gender was male, 39 people (62.90%), 20 people aged 46-55 years (32.26%), 24 people with junior high school education (38.71%), 20 people with self-employment (32.26%), 36 people with comorbid diabetes mellitus (58.06%), and 53 people in the initial/intensive treatment category (85.48%). Patients weighing 53 kg and 51 kg received Category 1 treatment, consisting of an intensive phase in which they were administered three FDC tablets (4-drug FDC) of RHZE daily for 56 days, followed by a continuation phase in which they were administered three FDC tablets (2-drug FDC) of RHZE three times a week for 16 weeks (Siswidiasari et al., 2026).

Based on this description, the researcher is interested in examining the pattern of anti-tuberculosis drug use in outpatient pulmonary tuberculosis patients at Kediri District Hospital in 2025.

## LITERATURE REVIEW

The Category 1 OAT guidelines provided by this program are KDT and Combipak. The guidelines currently offered are a combination with intermittent doses. The daily dose of 2(HRZE)/4(HR) is currently being procured by the national TB program. The Category 2 OAT combination used in Indonesia is 2(HRZE)S / (HRZE) / 5(HR)3E3 or 2(HRZE)S / (HRZE) / 5(HR)E. The OAT combination is used for patients with a history of previous tuberculosis treatment (retreatment patients), namely: relapse patients, patients who failed in category I healing, and patients who received treatment after stopping treatment (lost to follow-up). The combination of Anti-Tuberculosis Drugs (OAT) 2 is given for 8 months, divided into 2 stages: 3 months in the initial stage and 5 months in the final stage. The Category 2 Anti-Tuberculosis Drug Combination provided by the program is a combination of fixed dose (KDT) and release drugs (combipak). The current regimen is an intermittent dose

regimen. The daily regimen, 2(HRZE)S/(HRZE)/5(HR)E, is currently under procurement by the National Tuberculosis Program. Evaluation of tuberculosis therapy through bacteriological monitoring is necessary for tuberculosis patients. The purpose of this monitoring is to determine the presence or absence of sputum conversion and to determine follow-up. This monitoring is performed before treatment begins (when the diagnosis is confirmed), at the end of the intensive treatment phase, one month before the end of treatment, and at the end of treatment (Kemenkes, 2020).

Based on the results of another study conducted by Wibowo et al., (2021), it was found that the dominant gender of the subjects was male at 50.7%, the most common age group was 18-40 years at 80%, and the body mass index (BMI) of most study subjects was within the normal range, namely 32 subjects (49.2%). The study subjects with a history of previous drug-sensitive TB treatment were 47 subjects (73.8%). The number of subjects with comorbidities was 8 subjects (12.3%). The most common bacterial resistance pattern was the MDR group at 93.8%. The most commonly administered treatment regimen was the individual injection regimen in 22 subjects (33.8%). The most common bacterial cultures of TB-RO patients were classified as MDR and the most commonly administered treatment was the individual injection regimen (Wibowo et al., 2021).

According to the results of other studies, the age group <50 years dominated (52.27%) and men outnumbered women (63.64%); the majority received long-term regimens (72.73%), followed by BPAL/M (20.45%) and 9-month regimens (6.82%). A total of 86.36% of patients achieved recovery. The chi-square test showed no significant association between regimen type and recovery (p=0.272); all patients on BPAL/M and 9 months recovered, while in the long-term group, 26 recovered and 6 did not recover. Complaints that appeared were gastrointestinal (84.09%), followed by nervous (59.09%), integumentary (54.55%), musculoskeletal (47.73%), mental (36.36%), hematologic (29.55%), sensory/visual (27.27%), cardiovascular (4.5%), and liver disorders (2.27%). There was no significant relationship between the recovery rate and the treatment combination. The highest side effects occur in the gastrointestinal system (Tahitoe et al., 2025).

The results of another study showed that patients diagnosed with pulmonary tuberculosis were 18 male patients (51.4%), 8 patients aged 26-35 years (22.9%), 8 patients aged 36-45 years (22.9%), and 8 patients aged 56-65 years (22.9%), with a body weight range of 38-54 kg (19 patients) (54.3%). The accuracy of the use of anti-tuberculosis drugs in pulmonary tuberculosis patients, in the variables of drug swallowing supervisors and drug use rules, was present (100%), correct dosage, correct patient, correct time of administration, and correct method of administration were correct (100%) (Verencia et al., 2022).

## METHODOLOGY

This study employed a descriptive observational design with a retrospective approach. The study aimed to describe the patterns of anti-tuberculosis drug use among outpatients with pulmonary tuberculosis at the Kediri Regency Regional General Hospital (RSUD) during the period of February–March 2026. The study population consisted of all patients diagnosed with pulmonary tuberculosis at the hospital, with a sample size of 62 patients. Consecutive sampling was used to select participants who met the inclusion and exclusion criteria. Inclusion criteria comprised patients diagnosed with pulmonary tuberculosis recorded in the hospital's medical records in 2025, aged 17–65 years, with clear, complete, and legible medical records. Exclusion criteria included patients transferred to other hospitals and those who had died. Data were collected retrospectively using secondary data from patient medical records. Extracted data included demographic variables (gender, age, education, occupation), clinical characteristics (treatment regimen, body weight, treatment duration, and frequency of follow-up visits), and laboratory results (Acid-Fast Bacilli/AFB values). A validated observation sheet (checklist) served as the data collection instrument. The collected data were analyzed using descriptive statistics, with all variables presented as frequencies (n) and percentages (%).

## RESEARCH RESULT

### Characteristics of Pulmonary Tuberculosis Patients

Based on research results at Kediri Regency Hospital, the majority were male (33 patients) (53.2%), aged 20 (32.3%) between 26-35 years, high school education (24 patients) (38.7%), and farming (13 patients) (21.0%).

Table 1. Characteristics Data of Pulmonary Tuberculosis Patients

| Demographic Data | f | % |
|---|---|---|
| **Gender** | | |
| **Man** | 33 | 53.2 |
| **Woman** | 29 | 46.8 |
| **Age (year)** | | |
| **17-25** | 8 | 12.9 |
| **26-35** | 20 | 32.3 |
| **36-45** | 17 | 27.4 |
| **46-55** | 12 | 19.4 |
| **56-65** | 5 | 8.1 |
| **Education** | | |
| **Elementary School** | 14 | 22.6 |
| **Middle School** | 18 | 29.0 |
| **High School** | 24 | 38.7 |
| **Diploma 3** | 2 | 3.2 |
| **Bachelor's Degree** | 4 | 6.5 |
| **Work** | | |
| **Housewives** | 15 | 24.2 |
| **Self-Employed** | 10 | 16.1 |
| **Laborers** | 10 | 16.1 |
| **Farmers** | 13 | 21.0 |
| **Honorary Employees** | 3 | 4.8 |
| **Civil Servants** | 7 | 11.3 |
| **Students** | 2 | 3.2 |
| **Pupils** | 2 | 3.2 |

### Anti-Tuberculosis Drug Use Patterns

Research conducted at the Kediri Regency Regional General Hospital (RSUD) regarding anti-tuberculosis drug usage patterns revealed that the majority of patients (43 or 69.4%) were prescribed the Category 1 regimen specifically the 2(HRZE)/4(HR)-FDC (Fixed-Dose Combination) at a dosage of four tablets once daily. Additionally, the study found that 21 patients (33.9%) weighed between 65 and 69 kg, 54 patients (87.1%) underwent a six-month treatment course, 47 patients (75.8%) tested negative for Acid-Fast Bacilli (AFB) at the six-month mark, and 55 patients (88.7%) attended routine follow-up appointments.

Table 2. Data on Anti-Tuberculosis Drug Use Patterns

| Drug Use Patterns | f | % |
|---|---|---|
| Category 1 Anti-TB Drug Regimen | | |
| 2(RHZE)/4(HR)-KDT: 1 x 3 tablets | 13 | 21.0 |
| 2(RHZE)/4(HR)-KDT: 1 x 4 tablets | 43 | 69.4 |
| 2(RHZE)/4(HR)-KDT: 1 x 5 tablets | 6 | 9.7 |
| Body Weight | | |
| 50-54 Kg | 2 | 3.2 |
| 55-59 Kg | 12 | 19.4 |
| 60-64 Kg | 15 | 24.2 |
| 65-69 Kg | 21 | 33.9 |
| 70-74 Kg | 5 | 8.1 |
| 75-79 Kg | 1 | 1.6 |
| 80-84 Kg | 4 | 6.5 |
| 85-89 Kg | 2 | 3.2 |
| Treatment Duration | | |
| 2 Months | 5 | 8.1 |
| 5 Months | 3 | 4.8 |
| 6 Months | 54 | 87.1 |
| AFB Smear Test Value | | |
| Negative (Month 2) | 5 | 8.1 |
| Negative (Month 5) | 3 | 4.8 |
| Negative (Month 6) | 47 | 75.8 |
| Positive (Month 6) | 7 | 11.3 |
| Frequency of Follow-Ups | | |
| Routine Follow-Ups | 55 | 88.7 |
| Non-Routine Follow-Ups | 7 | 11.3 |

## DISCUSSION

### Characteristics of Pulmonary Tuberculosis Patients

Based on table 1. the results of the study, gender was dominated by men, with 33 patients (53.2%) experiencing more pulmonary tuberculosis compared to women, 29 patients (46.8%). The study results show a predominance of males, a trend attributed to factors such as smoking habits, alcohol consumption, and non-adherence to medication—all of which are risk factors for pulmonary tuberculosis (Kemenkes, 2019). Men often pay less attention to their health and engage in more outdoor activities due to work, thereby increasing their likelihood of exposure to pulmonary tuberculosis (Meyrisca et al., 2022). This finding is supported by World Health Organization data, which indicates that the prevalence of tuberculosis is 1.7 times higher in men than in women (WHO, 2022). The study aligns with research conducted by Fauziah et al. (2022) at a hospital in Bengkulu, which also found a higher proportion of men than women among patients with pulmonary tuberculosis (Fauziah et al., 2022).

Based on Table 1, the study results indicate that tuberculosis can occur across all age groups but is most prevalent in the 26–35 age group (20 patients, or 32.3%) and among the elderly. These findings align with the established

understanding that tuberculosis risk increases with age due to a declining immune system and the presence of additional risk factors, such as comorbidities and environments conducive to transmission. Regarding the productive age group—characterized by high levels of activity—individuals often devote significant time and energy to work at the expense of rest, a factor that can compromise the body's immune defenses (Arisandi et al., 2023). Furthermore, individuals of productive age tend to interact frequently with others and exhibit high mobility, thereby increasing the likelihood of transmission to others and the surrounding environment (Bayan et al., 2022).

The study results showed that the highest educational level was high school, with 24 patients (38.7%). Education is linked to the knowledge held by pulmonary tuberculosis patients, suggesting that education levels can influence treatment success (Azizah, 2020). A survey by the Indonesian Ministry of Health indicates that a higher level of education correlates with a lower risk of developing pulmonary tuberculosis, and vice versa (Inayah & Wahyono, 2019). These findings align with a study conducted by Bakhtiar et al. (2021) on pulmonary tuberculosis patients at Community Health Centers (Puskesmas) in Bantul Regency, which found that higher education levels lead to better knowledge of the disease, thereby enabling better control of transmission and encouraging patients to seek treatment if exposed to pulmonary tuberculosis (Bakhtiar et al., 2021).

Based on Table 1, the study results indicate that farmers constitute the largest occupational group among the patients, accounting for 13 individuals (21.0%). Pulmonary tuberculosis transmission is closely linked to occupation, particularly regarding factors that increase exposure risk through the work environment and socioeconomic conditions; specifically, enclosed workspaces with minimal natural light and poor ventilation facilitate tuberculosis infection (Arisandi et al., 2023). Meanwhile, a study by Inayah & Wahyono (2019) found that individuals whose work environments involve high-intensity interaction with many people—such as civil servants, private-sector employees, entrepreneurs, and traders—tend to face a higher risk of contracting pulmonary tuberculosis (Inayah & Wahyono, 2019).

**Anti-Tuberculosis Drug Use Patterns**

Based on Table 2, the results of the study on the pattern of use of pulmonary anti-tuberculosis drugs using fixed dose combination drugs category 1 (2(RHZE)/4(HR)-KDT) with a dose of 1x4 tablets in 43 patients (69.4%), with a body weight of 65-69 kg in 21 patients (33.9%). Fixed dose combination drugs category 1 are tablets containing a combination of several types of anti-tuberculosis drugs with a fixed dose. The number of tablets given is adjusted to the patient's body weight, because if the dose of the drug given is too small it will not guarantee the achievement of the expected therapeutic level. The use of OAT KDT has the advantage of having a small number of tablets taken, making it easier for patients to consume them and can increase compliance and prevent the risk of drug resistance. The use of OAT KDT category II is no longer used in accordance with changes in the diagnosis and

treatment process for tuberculosis in Indonesia. The use of OAT KDT according to the Guidelines for Diagnosis and Management in Indonesia states that pulmonary tuberculosis patients must use the intensive phase and the continuation phase. According to the Indonesian Association of Pulmonologists on Tuberculosis Management, the intensive phase of OAT aims to reduce the number of bacteria and minimize the risk of transmission, while the continuation phase aims to kill tuberculosis bacteria and prevent recurrence (Kemenkes, 2021).

The results of the study showed that the longest duration of OAT use in pulmonary tuberculosis patients was 6 months, with a total of 54 patients (87.1%), followed by patients who used OAT for 2 months (5 patients) (8.1%), and patients who used OAT for 5 months (4.8%). According to the guidelines for the diagnosis and management of tuberculosis in Indonesia, the general duration of treatment for pulmonary tuberculosis patients without comorbidities and complications is 6 months, while treatment for extrapulmonary tuberculosis and tuberculosis with complications or comorbidities requires more than 6 months. The use of OAT for more than 6 months can be caused by the patient's chest scan results not showing improvement by the end of the sixth month of treatment. Meanwhile, judging from the clinical records of pulmonary tuberculosis patients, the use of OAT for less than 6 months is due to patients not continuing treatment (loss to follow-up) or transferring to another hospital (Kemenkes, 2021).

The results of follow-up AFB examinations in pulmonary tuberculosis patients showed that in the second month, there were 5 patients (8.1%) with negative AFB results. AFB examinations in the second month were conducted to assess the patient's initial response to intensive phase treatment. In this study, negative results in the second month are an important indicator that most patients have shown a good response to OAT, and play a role in reducing the potential for transmission to those around them. In the fifth month, the number of patients recorded as having negative AFB examinations was only 3 patients (4.8%). In the sixth month, the number of patients recorded as having negative AFB examinations was 47 patients (75.8%) and 7 patients (11.3%). If the sputum is still positive at the end of the intensive phase, microscopic examination is performed again at the end of the third month, and if it remains positive, rapid molecular drug susceptibility testing (line probe assays or TCM TB, MTB/RIF) or culture with drug susceptibility testing should be performed. If the sputum AFB is still positive at the fifth month or the end of treatment, then treatment is considered a failure. Patients should undergo rapid MDR-TB diagnosis and be recorded as "Failed," followed by recommended retreatment according to MDR-TB procedures. For patients with AFB sputum that is negative at the start of treatment and remains negative at the end of the second month of treatment, no further sputum monitoring is necessary. Clinical monitoring and body weight are very useful indicators (Kemenkes, 2019).

The study results indicate that the majority of respondents demonstrated high levels of adherence to follow-up appointments (18 individuals or 60.0%) and high levels of medication adherence (17 individuals or 56.7%). The Chi-

Square test yielded a p-value of 0.036 (<0.05), indicating a significant relationship between adherence to follow-up appointments and medication adherence among patients with pulmonary tuberculosis. Adherence to follow-up appointments among the pulmonary tuberculosis patients in this study was classified as high. This is likely because the majority of patients were of productive age, resulting in strong motivation to complete the treatment process. Being of productive age also enabled patients to more easily understand and accept the instructions provided by healthcare workers. Furthermore, available facilities—regarding both accessibility and other support resources—facilitated adherence to the established follow-up schedule, encouraging patients to attend appointments regularly in accordance with the applicable guidelines (Nasution et al., 2026).

These results align with research conducted by Nastiti & Kurniawan (2020), which showed that among the 18 respondents with insufficient family support, all 18 were non-compliant with treatment follow-ups. In contrast, among 15 respondents with good family support, 11 were compliant with treatment follow-ups. The contingency coefficient test results showed $\rho = 0.022$ (with $\alpha = 0.05$); since $\rho < \alpha$, the null hypothesis (H0) was rejected and the alternative hypothesis (H1) was accepted, indicating a relationship between family support and adherence to pulmonary TB treatment follow-ups at the Kedundung Community Health Center (Puskesmas) (Nastiti & Kurniawan, 2020). Results from another study indicate that, based on multivariate analysis, the variable with the greatest influence on follow-up adherence among patients with drug-resistant pulmonary tuberculosis in Medan is healthcare services (p-value 0.001, OR 204.00). Bivariate analysis results show that knowledge (p=0.044), family support (p=0.007), and healthcare services (p=0.000) influence follow-up adherence (Simanjuntak et al., 2023). This non-compliance with check-ups occurred due to a lack of family support, less open communication between healthcare workers and patients and their families, attitudes and personalities of patients and families who paid less attention to their health, and having weaker egos in dealing with health problems (Bayan et al., 2022).

## CONCLUSIONS AND RECOMMENDATIONS

The pattern of anti-tuberculosis drug use in outpatient pulmonary tuberculosis patients at Kediri District Hospital in 2025, can be concluded that the characteristics of the most pulmonary tuberculosis patients are male gender of 33 patients (53.2%), productive age 26-35 years of 20 patients (32.3%), with high school education of 24 patients (38.7%), and work as farmers of 13 patients (21.0%). The pattern of anti-tuberculosis drug use used in pulmonary tuberculosis patients is the OAT KDT category 1 regimen, namely 2 (HRZE) / 4 (HR) -KDT with a dose of 1 x 4 tablets of 43 patients (69.4%), with a body weight of 65-69 Kg of 21 patients (33.9%), duration of treatment for 6 months of 54 patients (87.1%), negative AFB values in the 6th month of 47 patients (75.8%), and frequency of routine control of 55 patients (88.7%). The pattern of anti-tuberculosis drug use is dominated by fixed-dose combination therapy (FDC) in the intensive and continuation phases. Recommendation: Healthcare workers

are advised to improve counseling regarding the importance of medication adherence, treatment duration, and strategies for remembering medication schedules. Although the prescribing pattern is appropriate, non-compliance among outpatients with the duration of treatment (minimum 6 months) is a major challenge because it can trigger drug resistance. Side effect monitoring (SEM) involves regular monitoring of drug side effects through liver and kidney function tests to ensure the success of therapy, as well as periodic evaluation of medical records to ensure appropriate dosages for changing patient weight during treatment.

## ADVANCED RESEARCH

It is recommended for further researchers to develop research by adding other indicators such as evaluation of potential drug-related problems (DRPs) related to drug interactions, adverse drug reactions (ADRs), as well as analysis of adherence and success of treatment therapy.

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