Analysis of The Adverse Effects of Anti-Tuberculosis Drugs (ATDs) on Patients with Tuberculosis, 2024

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Abstract

Introduction: *Tuberculosis (TB) remains a major global health concern, with an estimated 10 million cases worldwide. In 2023, the Ministry of Health reported 5,650 TB cases in Timor-Leste, with 53% being new pulmonary cases with positive coughs.* ***Objective:*** *This study aims to analyse the adverse effects of anti-tuberculosis drugs in patients at the Guido Valadares National Hospital in 2024.* ***Method:*** *Using a cross-sectional analytical quantitative approach, the study involved 100 TB patients aged 15 and older, selected through snowball sampling. Data analysis employed SPSS, using cross-tabulation and chi-square tests.* ***Result and Discussion:*** *Results indicated a significant correlation between anti-tuberculosis drug use and mild adverse effects ($p = 0.000$, $r = 0.690$). Additionally, compliance levels were significantly associated with mild adverse effects ($p = 0.019$, $r = 0.530$).* ***Conclusion:*** *These findings highlight the importance of monitoring adverse effects to prevent resistance and ensuring patient adherence through clear treatment guidelines.*

Keywords: Tuberculosis; Anti-Tuberculosis Drugs; Adverse Effects;

Olandino Evaristo Obeno, Elanora Estrela Araujo do Amaral, Antonia Soares, Jelina Martins de Jesus, Maria Francisca Eflin, Saturnina Julieta Geri De Sena Amaral/**KESANS**

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Introduction

According to the WHO, tuberculosis is a significant problem in Timor-Leste. In our country, it was the leading cause of death in 2019 in the Southeast Asian region, compared to other countries (Oqui et al., 2024). Tuberculosis is a highly contagious disease caused by the bacterial infection Mycobacterium tuberculosis. It can spread through the air when a person with tuberculosis coughs, sneezes, or speaks, releasing bacteria into the air (Bansal, 2022). When others breathe in the bacteria, especially those with weakened immune systems, they can easily contract the infection (Moyo et al., 2023), (Rajeshwar, 2024)

According to WHO estimates, the global prevalence of tuberculosis was expected to reach 10 million in 2020, including 5.6 million men, 3.3 million women, and 1.1 million children. Based on available data, eight countries reported the total number of cases: India with 351 million (27%), Indonesia with 27 million (10%), China with 99.4 million (7.1%), the Philippines with 7.7 million (7%), Pakistan with 12.8 million (5.7%), Nigeria with 9 million (4.5%), Bangladesh with 5.94 million (3.6%), and South Africa with 1.8 million (3%). India had the highest number of cases, followed by Indonesia, China, the Philippines, Pakistan, Nigeria, Bangladesh, and South Africa. According to the global tuberculosis report on November 7, 2023, tuberculosis cases continue to rise, from 10 million in 2020 to 10.3 million in 2021, and 10.6 million in 2022 (Organization, 2022)

Based on research from the "Illustration of Human Lung Anatomy Showcasing Tuberculosis Infection" released by the Ministry of Health of the Republic of Indonesia in 2023, the total prevalence of tuberculosis cases in Indonesia reached 724,000 (7.24%) in 2022. This number increased to 809,000 (8.09%) in 2023. The Ministry of Health of the Republic of Indonesia, through Mr. Budi Gunadi Sadikin, stated during the Indonesia tuberculosis virtual ceremony that tuberculosis cases are expected to decrease in 2024 (Junedi, Mastur, & Zuhdi, 2023)

According to general data from the Ministry of Health's National Directorate of Pharmacy and Medicines (DNFM), in 2022, the total number of tuberculosis cases from January to December was 4,823. Of these, 2,578 (57%) were new pulmonary cases with positive coughs, and 2,245 (43%) had negative coughs. Additionally, there were 521 new extra-pulmonary cases. In 2023, the total number of tuberculosis cases is projected to reach 5,650, with 2,843 (53%) being new pulmonary cases, 2,807 (53%) having positive coughs, and 547 being new extra-pulmonary cases (DNFM, 2024).

Data from the National Hospital Guido Valadares between 2021 and 2023 shows a total of 153 patients, both female and male, aged 15-45. Of these, 54 were females (35%) and 99 were males (65%). Of the 100 respondents in this survey, the majority, 77 (77.0%), reported experiencing adverse effects in 2024. Globally, tuberculosis is the leading cause of death. Various factors influence patient compliance with treatment, including the adverse effects of anti-tuberculosis drugs (Seniantara, Ivana, & Adang, 2018),

(Abdulkadir, Djuwarno, Rasdianah, & Hiola, 2022). The occurrence of drug side effects in tuberculosis patients can lead to treatment failure, as it impacts those suffering from tuberculosis who do not adhere to prescribed medications (Maulitha, Fitriani, & Rusli, 2022), (Dasopang, Hasanah, & Nisak, 2019), (Cahyati & Maelani, 2019). The resulting adverse effects can also contribute to drug resistance, increasing the risk of treatment complications. Therefore, knowledge about the incidence of adverse effects due to anti-tuberculosis drugs and their management is essential for successful treatment (Maulitha et al., 2022), (Fraga, Oktavia, & Mulia, 2021),

To combat tuberculosis in Timor-Leste, the Ministry of Health needs to focus on prevention by reducing the risk factors associated with tuberculosis transmission. The Ministry must also conduct extensive educational programs to emphasize the importance of appropriate and regular tuberculosis treatment and how to prevent adverse effects within the community. To eradicate and control tuberculosis, the Ministry of Health should implement a monitoring and assistance program to ensure that patients understand and are aware of the potential effects of their medication. Healthcare staff can provide essential support and guidance throughout the treatment process.

Furthermore, to reduce tuberculosis in Timor-Leste, the Ministry of Health must pay particular attention to health professionals, especially those at the Guido Valadares National Hospital pharmacy, to ensure they provide maximum assistance to patients. This will help prevent patients from discontinuing medications based on their own beliefs or misunderstandings and promote community health education to raise awareness about the adverse effects of anti-tuberculosis drugs.

Methods

This research employs an analytical quantitative approach with a cross-sectional study design. The study was conducted at the Guido Valadares National Hospital in September 2024, with the population consisting of patients seeking treatment for tuberculosis aged 15 and above. The sample for this research included 100 tuberculosis patients. The sampling technique used was snowball sampling. The independent variable in this study is the use of anti-tuberculosis medication, while the dependent variable is the occurrence of adverse effects. Data collection instruments included questionnaires and primary data. Bivariate data analysis was performed using the SPSS program to analyze cross-tabulation and conduct a chi-square test.

Olandino Evaristo Obeno, Elanora Estrela Araujo do Amaral, Antonia Soares, Jelina Martins de Jesus, Maria Francisca Eflin, Saturnina Julieta Geri De Sena Amaral/**KESANS**

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Results and Discussion

Result

1.   Respondent Characteristics

Table 1

Frequency distribution of respondent characteristics based on gender, age, education level, and profession

Distribution	Frequency	Percent
Gender		
Female	11	11.0
Male	89	89.0
Total	**100**	**100**
Age		
15-25	26	26.0
26-45	31	31.0
46-55	17	17.0
56-65	12	12.0
66-85	14	14.0
Total	**100**	**100**
Level of Education		
Illiterate	42	42.0
Primary	7	7.0
Pre-Secondary	9	9.0
Secondary	30	30.0
University	12	12.0
Total	**100**	**100**
Occupation		
Farmer	40	40.0
Housewife	6	6.0
Student	16	16.0
Employed	8	8.0
Trader	30	30.0
Total	**100**	**100**

Based on Table 1 above, the distribution of respondent characteristics shows that the sample consists of 100 patients, with the majority being male (89 males, 89.0%). The most common age group is 26–45 years, with 31 patients (31.0%). The majority have no formal education, with 42 individuals (42.0%). The most common occupation is farming, with 40 patients (40.0%)."

2. Univariate Analysis

Table 2

Frequency distribution of variables related to anti-tuberculosis drug use, level of compliance, and adverse effects

Variable	Frequency	Percentage
Anti-Tuberculosis Drug Use		
Good	74	74.0
Average	16	16.0
Not good	10	10.0
Total	**100**	**100**
Compliance Level		
Compliant	32	32.0
Non- Compliant	68	68.0
Total	**100**	**100**
Adverse Effects		
Experienced Effects	77	77.0
No Effects	23	23.0
Total	**100**	**100**

Based on Table 2 above, the results showed that out of a total of 100 samples, regarding the use of anti-tuberculosis drugs, the majority fell into the "good use" category, with a frequency of 74 (74.0%). The level of patient compliance was predominantly in the "non-compliance" category, with a frequency of 68 (68.0%). Adverse effects occurred in most patients, with the "effects" category showing a frequency of 77 (77.0%).

3. Bivariate Analysis

Table 3

Analysis of the use of anti-tuberculosis drugs and mild adverse effects of anti-tuberculosis drugs

Use		Adverse Effect		Total	Correlation	
		Give Effect	No Effect		p-value	chi-square
Average	n	0	10	10		
	%	0.0%	10.0%	10.0%		
Moderate	n	16	0	16		
	%	16.0%	0.0%	16.0%	0.000	0.690
Good	n	61	13	74		
	%	61.0%	13.0%	74.0%		
Total	n	**77**	**23**	**100**		
	%	**77.0%**	**23.0%**	**100.0%**		

Based on Table 3 above, the results of the chi-square crosstabulation statistical test showed that the p-value of 0.000 is lower than α = 0.05, which indicates that the use of anti-tuberculosis drugs has a significant influence on the occurrence of mild adverse

effects. The analysis also revealed a correlation coefficient value of 0.690, which, with r = 0.50–0.75, falls into the category of a strong correlation.

Table 4

Analysis of compliance with mild adverse effects of anti-tuberculosis medication

Compliance Level		Effect Total		Total	*Correlation*	
		Give effect	No Effect		*p-value*	*chi-square*
Compliance	n	20	12	32		
	%	62.5%	37.5%	100.0%		
Non-Compliance	n	57	11	68	0.019	0.530
	%	83.8%	16.2%	100.0%		
Total	n	**77**	**23**	**100**		
	%	**77.0%**	**23.0%**	**100.0%**		

Sources: Search results, 2024

Based on Table 4 above, the results of the chi-square crosstabulation statistical test showed that the p-value = 0.019, which is lower than α = 0.05. This indicates that the level of compliance significantly influences the occurrence of mild adverse effects. From the analysis results, the correlation coefficient value is 0.530, which, when r = 0.50–0.75, falls into the category of a strong correlation.

Discussion

1.   Respondent Characteristics

Based on Table 1 above, the distribution of respondent characteristics shows that, out of a total of 100 patients, the majority were male, with a frequency of 89 (89.0%). The most common age group was 26–45 years old, with a frequency of 31 (31.0%). Most respondents had no formal education, with a frequency of 42 (42.0%). The majority were employed in farming, with a frequency of 40 (40.0%).

In comparison, the results of researcher Fridya Maulitha (2022) showed that, out of 70 respondents, most male patients were more likely to develop tuberculosis compared to females, with a frequency of 50 (71.4%). In terms of age, the majority were over 46 years old, with a frequency of 22 (31.42%). Regarding education, the majority had no formal schooling, with a frequency of 35 (50.0%). In terms of occupation, the majority were unemployed, with a frequency of 25 (35.71%).

The researcher concluded that men are at a higher risk of suffering from tuberculosis due to higher rates of alcohol consumption and smoking compared to women. Older age and lower education levels may also influence their use of medication and adherence to tuberculosis drug regimens, potentially leading to adverse effects and antibiotic resistance if treatment protocols are not followed properly.

Olandino Evaristo Obeno, Elanora Estrela Araujo do Amaral, Antonia Soares, Jelina Martins de Jesus, Maria Francisca Eflin, Saturnina Julieta Geri De Sena Amaral/**KESANS**
Analysis of The Adverse Effects of Anti-Tuberculosis Drugs (ATDs) on Patients with Tuberculosis, 2024

2.   Univariate Analysis

Based on Table 2 above, the results show that out of a total of 100 samples, regarding the variable of anti-tuberculosis drug use, the majority had the category of "good use," with a frequency of 74 (74.0%). The high number of respondents categorized as "good" indicates that all patients who participated in the survey are using anti-tuberculosis drugs. However, this also suggests that adverse effects may still occur due to the use of these drugs. Additionally, there is a lack of specific information related to these drugs, particularly antibiotics, which can pose risks if used irrationally.

When patients have good knowledge about their medications, the use of anti-tuberculosis drugs can yield better outcomes. According to some research, patients' knowledge about the rational use of antibiotics is often lacking, as many do not fully understand the importance of using antibiotics responsibly (Krisdianto, Natasyah, & Malini, 2023). Regarding the level of compliance, most respondents were classified as non-compliant, with a total of 68 individuals (68%). This low level of compliance suggests that many patients or respondents are not following the correct methods for consuming anti-tuberculosis drugs. Non-compliance is a major concern because it reflects negative behaviors regarding drug use. Improper use of antibiotics can lead to antibiotic resistance, as bacteria adapt to the drugs and become less responsive to them. This can result in a situation where infections are not easily treated. Similar findings were reported by Parse, Rocci Jack et al. (2017), who found that 47.9% of respondents stopped taking antibiotics when they felt better. Compliance refers to the act of adhering to regulations or instructions, and non-compliance can undermine the effectiveness of treatment (Swarjana, K., 2022).

As for the adverse effects experienced by patients from the consumption of anti-tuberculosis drugs, most respondents reported experiencing effects, with a total of 77 individuals (77%). A study by Fridya Maulitha (2022) found that most patients (85.7%) also experienced adverse effects. The most common adverse effects reported by patients include nausea and vomiting, which are often the first symptoms felt when taking tuberculosis medications. Adverse drug reactions are unexpected reactions that can worsen the patient's condition and may even lead to death (Cimahi, 2020).

3.   Bivariate Analysis
Analysis of the Use of Anti-Tuberculosis Drugs and Adverse Effects
Based on Table 3 above, the results of the chi-square crosstabulation statistical test showed that the p-value of 0.000 is lower than α = 0.05, which indicates that the use of anti-tuberculosis drugs significantly influences the occurrence of mild adverse effects. The correlation coefficient value was 0.690, which falls within the range of r = 0.50–0.75, indicating a strong correlation. From the results of this research, the researcher concluded that the use of anti-tuberculosis drugs will still result in adverse effects. Additionally, there is a lack of specific information related to these drugs, particularly antibiotics, which

Olandino Evaristo Obeno, Elanora Estrela Araujo do Amaral, Antonia Soares, Jelina Martins de Jesus, Maria Francisca Eflin, Saturnina Julieta Geri De Sena Amaral/**KESANS**
Analysis of The Adverse Effects of Anti-Tuberculosis Drugs (ATDs) on Patients with Tuberculosis, 2024

can pose a risk if used irrationally. According to some research, patients' knowledge about the use of antibiotics is limited, as many patients do not fully understand the rational use of antibiotics (Krisdianto et al., 2023).

Analysis of Compliance Levels and Adverse Effects

Based on Table 4 above, the results of the chi-square crosstabulation statistical test showed that the p-value of 0.019 is lower than α = 0.05, indicating that the level of compliance significantly influences the occurrence of mild adverse effects. The correlation coefficient value was 0.530, which also falls within the range of r = 0.50–0.75, suggesting a strong correlation.

From the results of this research, the researcher concluded that the alternative hypothesis (Ha) is accepted, and the null hypothesis (Ho) is rejected, as there is a significant relationship between the level of compliance and adverse effects. Compliance is a key factor in influencing individual behavior. When there is good knowledge of how to use anti-tuberculosis drugs, the results tend to be positive. However, non-compliance can lead to negative outcomes, such as improper drug use. Improper antibiotic use, such as not following the prescribed dosage, can result in negative consequences, such as antibiotic resistance. When bacteria become accustomed to antibiotics and adapt to them, the antibiotics no longer show pharmacological effects, allowing the bacteria to recover and leading to recurring infections. This result is consistent with research conducted by Parse, Rocci Jack et al. (2017), which found that most respondents stopped taking antibiotics once they felt better, with 47.9% of participants reporting this behavior.

Conclusion

The results of this research indicate that the analysis of the use of anti-tuberculosis drugs and the level of compliance both have a significant influence on the occurrence of adverse effects in patients with tuberculosis at the National Hospital Guido Valadares.

To reduce the rate of tuberculosis, the researcher suggests that pharmacists should focus on counseling patients about the potential adverse effects of anti-tuberculosis drugs. This will help increase patients' knowledge about the proper use of tuberculosis medications and promote health to prevent these adverse effects and reduce the impact of tuberculosis.

Olandino Evaristo Obeno, Elanora Estrela Araujo do Amaral, Antonia Soares, Jelina Martins de Jesus, Maria Francisca Eflin, Saturnina Julieta Geri De Sena Amaral/**KESANS**
Analysis of The Adverse Effects of Anti-Tuberculosis Drugs (ATDs) on Patients with Tuberculosis, 2024

References

Abdulkadir, Widysusanti, Djuwarno, Endah Nurrohwinta, Rasdianah, Nur, & Hiola, Faramita. (2022). Gambaran efek samping obat antituberkulosis pada pasien tuberkulosis. *Journal Syifa Sciences and Clinical Research (JSSCR)*, *4*(1).

Bansal, Reema. (2022). Mycobacterial Tuberculosis: A Highly Contagious. *CONFERENCE PROCEEDING OF INTERNATIONAL MULTIDISCIPLINARY CONFERENCE 2022*, 87.

Cahyati, Widya Hary, & Maelani, Tika. (2019). Karakteristik penderita, efek samping obat dan putus berobat tuberkulosis paru. *HIGEIA (Journal Of Public Health Research And Development)*, *3*(4), 625–634.

Dasopang, Eva Sartika, Hasanah, Fenni, & Nisak, Chairul. (2019). Analisis Deskriptif Efek Samping Penggunaan Obat Anti Tuberculosis Pada Pasien TBC Di RSUD Dr. Pirngadi Medan. *Jurnal Penelitian Farmasi & Herbal*, *2*(1), 44–49.

Fraga, Aurelia Da Silva Sequeira, Oktavia, Nur, & Mulia, Reginardis Ariarce. (2021). Evaluasi penggunaan obat anti tuberkulosis pasien baru tuberkulosis paru di Puskesmas Oebobo Kupang. *Jurnal Farmagazine*, *8*(1), 17–24.

Junedi, Heri, Mastur, Agus Kurniawan, & Zuhdi, Mohd. (2023). Study of Changes in Physical Properties of Burnt Peat: A Case Study in Jati Mulyo Village, Jambi Province, Indonesia. *Proceedings of the 4th Green Development International Conference (GDIC 2022)*, *772*, 290. Springer Nature.

Krisdianto, Boby, Natasyah, Natasyah, & Malini, Hema. (2023). Pengaruh pendidikan kesehatan dengan booklet dan metode demonstrasi terhadap pengetahuan dan kemampuan remaja putri melakukan praktik sadari di daerah pedesaan. *Jurnal Ners*, *7*(2), 849–857.

Maulitha, Fridya, Fitriani, Nurul, & Rusli, Rolan. (2022). Analisis Efek Samping Penggunaan Obat Antituberkulosis (OAT) di Instalasi Rawat Jalan RSD BLUD dr. H. Soemarno Sosroatmodjo Tanjung Selor: Analysis of Side Effects of Using Antituberculosis Drugs in the Outpatient Departments of RSD BLUD dr. H. Soemarno Sostroatmodjo Tanjung Selor. *Proceeding of Mulawarman Pharmaceuticals Conferences*, *16*, 1–8.

Moyo, Nompilo, Tay, Ee Laine, Trauer, James M., Burke, Leona, Jackson, Justin, Commons, Robert J., Boyd, Sarah C., Singh, Kasha P., & Denholm, Justin T. (2023). Tuberculosis notifications in regional Victoria, Australia: implications for public health care in a low incidence setting. *PloS One*, *18*(3), e0282884.

Oqui, Maximiano, Ximenes, Antonio, da Costa, Joaninha, de Almeida Oqui, Serafino, Obeno, Olandino Evaristo, da Costa Guterres, Ana Claudia, & de Jesus Amaral, Isabel. (2024). Factors That Influence The Occurrence of The Disease Tuberculosis in The Clinic of Tubercolosis. *KESANS: International Journal of Health and Science*, *3*(5), 379–389.

Organization, World Health. (2022). *Global tuberculosis report 2021: supplementary material*. World Health Organization.

Rajeshwar, Xx. (2024). Prevalence of undernutrition among children (6 months to 5 years) with tuberculosis and impact of nutritional counselling and tuberculosis treatment on the nutritional status: a cohort study from Pakistan. The University of Bergen.

Olandino Evaristo Obeno, Elanora Estrela Araujo do Amaral, Antonia Soares, Jelina Martins de Jesus, Maria Francisca Eflin, Saturnina Julieta Geri De Sena Amaral/**KESANS**
Analysis of The Adverse Effects of Anti-Tuberculosis Drugs (ATDs) on Patients with Tuberculosis, 2024

Seniantara, I. Kadek, Ivana, Theresia, & Adang, Yohana Gabrilinda. (2018). Pengaruh efek samping OAT (obat anti tuberculosis) terhadap kepatuhan minum obat pada pasien TBC di puskesmas. *Jurnal Keperawatan Suaka Insan (JKSI)*, *3*(2), 1–12.