Research Article

Exploring the Determinants of Multidrug-Resistant Tuberculosis in Pulmonary TB Patients at Jatisari Karawang: A Cross-Sectional Analysis

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Abstract

Aims: The aim of this study is to find out what factors contribute to the spread of Multidrug-Resistant Tuberculosis (MDR-TB) at Jatisari Karawang Hospital. It focuses on things like nutrition, patient adherence to treatment, motivation, family support, and how treatment is supervised.

Methods: This study uses a quantitative method with a cross-sectional approach, which looks at the relationship between risk factors and their effects at one time. It involves 249 patients who visited the MDR-TB clinic at Jatisari Regional Hospital in January 2024, with a sample size of 106 patients. The goal is to identify the factors that are linked to MDR-TB at the hospital in 2024.

Result: Most people in the study were under 60, and more males had MDR-TB. Many had poor nutrition (77.4%) and didn't follow their medication (55.7%). Over half had low motivation (57.5%) and lacked family support (72.6%). About half had poor medication supervision (50.9%). These issues all played a role in the spread of MDR-TB.

Conclusion: In conclusion, most people in the study were under 60, male, had a junior high school education, and were unemployed. The study also found that factors like nutrition, taking medication correctly, motivation, family support, and medication supervision are linked to the spread of MDR-TB.
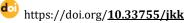
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Cross-Sectional Analysis, Multidrug-Resistant Tuberculosis, Patients, Pulmonary Tuberculosis

INTRODUCTION

Multidrug Resistant Tuberculosis (MDR-TB) is a condition of relapse of TB disease that has experienced drug withdrawal. Indonesia is the fifth country in the world with the largest number of cases of multi-drug-resistant tuberculosis. In 2019, the number of cases of multidrug-resistant tuberculosis in Indonesia reached 8.8 cases per 100,000 people (1). In 2021, the number of cases of multidrug-resistant tuberculosis (MDR-TB) that were discovered worldwide reached 450,000, representing a 3.1% rise from the previous year, 2020. MDR-TB reached a prevalence of 3.3% in newly diagnosed cases and 17% in cases of tuberculosis that had been treated in the past (2).

According to the Karawang Health Office (2023), the number of people in Karawang who have multidrug-resistant tuberculosis (MDR-TB) is also growing at an annual rate. In 2021, there were 89 people who were diagnosed with MDR-TB. This figure grew

to 190 in 2022, and then it increased once again to 213 in 2023. As of the year 2023, the Jatisari Karawang Regional Hospital has a population that is highly concentrated, with a total of 2,493 patients that are visiting the hospital. There is also a separation between infectious and non-infectious rooms, which helps to reduce the spread of infection from one patient to another. The number of patients who were suffering from multidrug-resistant tuberculosis was found to be 249 patients, according to the findings of a preliminary study that was carried out at the MDR TB clinic of Jatisari Regional Hospital in January of 2024.

Mycobacterium tuberculosis bacteria that are resistant to first-line anti-tuberculosis drugs (OAT), specifically rifampicin and isoniazid, are referred to as multidrug-resistant tuberculosis (MDR TB) (3). According to (4), the recurrence of tuberculosis (TB) caused by Multidug resistance can be influenced by a number of different factors. These factors include nutritional status, compliance, motivation, motivation, and support from family members. It is vital to note that malnutrition is a risk factor that might lead to the development of pulmonary tuberculosis. The process of cellular immunity, also known as cellular mediated immunity (CMI), is significantly impacted by malnutrition. Both the decrease in drug concentration in blood plasma and the rise in renal function to perform excretion are influenced by the low nutritional status of those who are affected by the condition. This modification leads to a reduction in enzyme activity, which is beneficial to the process of absorption. It is because of this that the effectiveness of treatment for pulmonary tuberculosis is not at its highest level, which can lead to a rise in the rate of treatment failure for patients suffering from pulmonary tuberculosis and even an increase in the likelihood of recurrence (5,6).

Non-compliance in undergoing treatment related to MDR TB can be influenced by lack of motivation to undergo treatment (7). Compliance in taking medication is a behavior to comply with the advice or procedures from a doctor regarding the use of drugs, which previously went through a consultation process between the patient or the patient's family and the doctor as a medical service provider (8). Lack of motivation for treatment in tuberculosis patients can cause TB patients to experience MDR-TB because they have no enthusiasm to continue treatment (9,10).

Lack of family support can also be one of the factors that influence the increase in MDR TB due to treatment failure because the patient does not have support from his family. Family support is an approach strategy to work with children and families can mean helping voluntarily for oneself or for family members to meet needs that will benefit the individual (11). PMO affects the patient's ability to take medication, which makes TB patients more receptive and motivated to take it. A good PMO is one that is known, trustworthy, and obedient, both to patients and health care providers. PMO is an individual who lives close to or in the same house as a TB patient so that they can monitor and ensure that the medication is prescribed accurately by the TB patient (8,12).

Based on the results of the study (13) showed that as many as 82 respondents (66.1%) had poor nutritional status, then 42 respondents (33.9%) had normal nutritional status. This is also in line with the study (14) showing that as many as 26 respondents (61.9%) had thin nutritional status, and 16 respondents (38.1%) had normal nutritional status. Based on the results of the study (15) showed that as many as 11 respondents (78.6%) were not compliant in taking medication, then 3 respondents (21.4%) were compliant in taking their medication.

Based on the findings of a preliminary study conducted with patients with multidrug-resistant tuberculosis, seven out of ten patients (70%) said that they got MDR TB as a result of their failure to take OAT.

Additionally, three patients (30%) reported that they felt weary and lacked the motivation to undergo treatment. On the basis of this phenomena, the researcher is interested in doing research on the topic of " Exploring the Determinants of Multidrug-Resistant Tuberculosis in Pulmonary TB Patients at Jatisari Karawang: A Cross-Sectional Analysis"

METHODS

Sample
The population for this study consisted of all patients who visited the MDR-TB clinic at Jatisari Regional Hospital in January 2024, totaling 249 patients. To determine the sample size, the Isaac and Michael formula was used, with an error margin of 10%, resulting in a final sample of 106 patients. The patients were selected to ensure a representative sample of the population, allowing for generalizable findings that reflect the broader patient population at the clinic.

Instruments
The study used a structured questionnaire as the main data collection instrument. The questionnaire was designed to capture information about risk factors (e.g., demographic data, medical history, lifestyle factors) and outcomes (e.g., diagnosis of MDR-TB, clinical symptoms). The instrument was developed based on established guidelines for tuberculosis research, ensuring that the questions accurately addressed the factors relevant to MDR-TB incidence. The questionnaire was pre-tested on a small sample before being administered to ensure reliability and clarity.

Data Collection
Data were collected through direct interviews with the patients at the MDR-TB clinic. The interviews were conducted by trained research assistants who followed standardized procedures to ensure consistency and accuracy. Each patient was informed about the purpose of the study and provided informed consent before participation. The data collection process took place during regular clinic hours to ensure that patients who met the inclusion criteria were included. The data collection period lasted from January 2024, ensuring that the sample reflected the most recent patient visits.

Data Analysis
Data analysis was performed using statistical software, and the process was carried out in several stages. Univariate analysis involved using descriptive statistics to summarize the demographic characteristics and health status of the participants, including frequency distributions and measures of central tendency such as the mean and median. This step provided a clear overview of the sample population. In the bivariate analysis, Chi-square tests or Fisher's exact tests were applied to examine the associations between independent variables, such as risk factors, and the dependent variable, the incidence of MDR-TB. This analysis helped identify significant factors that were associated with the occurrence of MDR-TB. Finally, in the multivariate analysis, logistic regression was conducted to assess the combined effects of multiple risk factors on the likelihood of contracting MDR-TB. This analysis was crucial in determining which factors, when considered together, had the most significant impact on the incidence of MDR-TB.

Ethical Considerations
The study adhered to strict ethical guidelines to ensure the protection and confidentiality of participants. Ethical approval was obtained from the relevant institutional review board or ethics committee prior to the start of data collection. Informed consent was obtained from each participant, who were fully briefed about the study's purpose, procedures, potential risks, and benefits. Participants were assured that their participation was voluntary and that they could withdraw at any time without

consequence. To maintain confidentiality, all patient information was anonymized, and data were securely stored in compliance with privacy regulations. Additionally, the findings from the study were used solely for academic and public health purposes and would not be shared in a way that could identify individual patients.

RESULTS

The Frequency Distribution numbers from table 1 show that out of 106 respondents, 84 people (79.2%) are younger than 60 years old, while 22 people (20.8%) are older than 60. The Frequency Distribution numbers from table 1 reveal that out of 106 respondents, 68 (64.2%) are male and 38 (35.8%) are female. The Frequency Distribution results from table 1 show the education levels of 106 respondents. Among them, 32 people (30.2%) completed elementary school, 40 people (37.7%) finished junior high school, 30 people (28.3%) graduated from high school, and 4 people (3.8%) attended college. The Frequency Distribution numbers from table 1 show that out of 106 respondents, 39 (36.8%) are employed, while 67 (63.2%) are not working.

Table 1. Frequency Distribution of Characteristics Respondents

Variabel	category	numbers	%
Age	a. < 60 years	84	79,2%
	> 60 years	22	20,8%
	Total	**106**	**100 %**
Gender	Male	68	64,2%
	Female	38	35,8%
	Total	**106**	**100 %**
Education	SD	32	30,2%
	SMP	40	37,7%
	SMA	30	28,3%
	University	4	3,8 %
	Total	**106**	**100 %**
Job	Work	39	36,8%
	Dos'n work	67	63,3%
	Total	**106**	**100%**

The results of the frequency distribution of determinants of MDR TB factors at Jatisari Regional Hospital in 2024 can be seen in Table 2.

Table 2. Frequency Distribution of Determinant Factors of MDR TB

Variabel	category	Numbers	%
Nutritional status	less	82	77,4%
	Normal	18	17,0%
	Excessive	6	5,6%
	TOTAL	**106**	**100%**
medication compliance	obedient	47	44,3%
	not obey	59	55,7%
	Total	**106**	**100%**

Motivation	good	45	42,5%
	less	61	57,5%
	Total	**106**	**100%**
Family support	good	29	27,4%
	less	77	72,6%
	Total	**106**	**100%**
The role of medication supervisors	good	52	49,1%
	less	54	50,9%
	TOTAL	**106**	**100%**

According to the results from table 2, out of 106 people surveyed, 82 (77.4%) have bad nutrition, 18 (17.0%) have normal nutrition, and 6 (5.6%) have excessive nutrition. According to the results from table 2 on medication compliance, out of 106 responders, 47 people (44.3%) followed their medication guidelines, while 59 people (55.7%) did not. From the results in Table 2 about motivation, out of 106 respondents, 45 people (42.5%) have good motivation, and 61 people (57.5%) have bad motivation. According to the results from table 2 on family support, out of 106 respondents, 29 people (27.4%) reported having good family support, while 77 people (72.6%) reported having poor family support. According to the results from table 2, of the 106 people surveyed about the role of medication managers, 52 (49.1%) have a strong role, while 54 (50.9%) have a weak role.

Table 3. Relationship between Nutritional Status and MDR TB

	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Nutritional Status - MDR	.283	.565	.055	5.158	105	.000

Table 4 shows the results of a bivariate analysis using SPSS with a paired t-test. The significant value was P = 0.000, which is less than 0.05. This means that we reject the null hypothesis (HO) and conclude that there is a significant relationship between lack of motivation and the occurrence of Multidrug Resistant (MDR) TB in the treatment of Pulmonary TB at Jatisari Karawang Regional Hospital in 2024.

Table 4. Relationship between motivation and MDR TB

	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Motivation - MDR	.425	.497	.044	8.801	105	.000

Tabel 5. Based on the bivariate analysis table using SPSS with a paired t-test, a significant value of P = 0.000 <0.05 was obtained so that HO was rejected, which means that there is a significant relationship between lack of family support and the incidence of Multidrug Resistant (MDR TB) in the treatment of Pulmonary TB at Jatisari Karawang Hospital in 2024.

Table 5. Relationship between family support and MDR TB

	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Family support - MDR	.274	.448	.048	6.289	105	.000

Tabel 6. based on the bivariate analysis table using SPSS with a paired t-test, a significant value of P = 0.000 <0.05 was obtained so that HO was rejected, which means that there is a significant relationship between the role of inadequate drug-taking supervisors and the incidence of Multidrug Resistant (MDR TB) in the treatment of Pulmonary TB at Jatisari Karawang Hospital in 2024.

Table 6. Relationship between the role of medication supervisors and MDR TB

c	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
the role of medication supervisors - MDR	.491	.502	.049	10.055	105	.000

DISCUSSION

Respondent Characteristics

The data revealed that 84 out of 106 respondents (79.2%) were under 60 years old, indicating that most of the people surveyed were in their working years. Out of the responders, 22 people (20.8%) were over 60 years old, which is considered the elderly age group. This study agrees with research by Baya (16), which found a link between being under 40 years old (62.6%) and MDR TB. People in the active age group move around a lot, making them more likely to get infected with drug-resistant TB.

Out of 106 responses, most were male, with 68 males (64.2%) and 38 females (35.8%). Gender is an important personal trait that affects how people make decisions because it relates to their natural qualities (17). This study is similar to research by Baya (16), which found that 163 of the participants (76.2%) were male, and 51 participants (23.8%) were female.

In the study with 106 people, the largest group had a junior high school education, with 40 respondents (37.7%). There were 32 respondents (30.2%) with an elementary school education, 30 respondents (28.3%) with a high school education, and 4 respondents (3.8%) with a college education. This study agrees with research by Dedy et al. (2022), which found that 49 out of 79 respondents, or 62%, had a junior high school education.

In the study, 106 people were surveyed. The majority, 67 respondents (63.2%), were not working, while 39 respondents (36.8%) were employed. This matches a study by Reni Ranteallo and others in 2021, which found that 46 out of 56 people surveyed (82.1%) were not working, while 10 responders (17.9%) were employed. This matches study by F. S. Nugroho from 2019, which found that 25 out of 28 respondents (89%) were not employed, while 3 respondents (11%) were working.

Description of nutritional status with Multidrug Resistant (MDR TB)

The study indicated that 82 (77.4%) of 106 respondents had poor nutritional status, 18 (17.0%) had normal, and 6 (5.6%) had surplus nutritional status. According to

Saputra et al. (2022), 82 respondents (66.1%) had low nutritional status and 42 (33.9%) had normal nutritional status. The body's demand for calories and other nutrients from diet with demonstrable physical effects determines nutritional status (Kanah, 2020). This supports studies Aswar & Istyanto (14) that found 26 respondents (61.9%) were slim and 16 (38.1%) were normal. Pratama (18) found that 13 (61.9%) respondents had low nutritional status and 8 (38.1%) had good nutritional status.

Overview of medication adherence with Multidrug Resistant (MDR TB)

The research of 106 respondents indicated that 59 (55.7%) did not take their medication, whereas 47 (44.3%) did. Medication adherence involves following a doctor's instructions or procedures after consulting with the patient or family. This is consistent with (17), which found that 11 respondents (78.6%) did not take their medication, while 3 (21.4%) did. This is consistent with Aswar & Istyanto (14), who found that 24 respondents (57.1%) were not compliant with OAT and 18 (42.9%) were.

Description of motivation with Multidrug Resistant (MDR TB)

The study found that 61 (57.5%) of 106 respondents had poor motivation and 45 (42.5%) had strong motivation. Low patient motivation might hinder therapy and healing owing to a lack of self- or other-motivation. Thus, motivation is crucial. This contradicts Mashidayanti (19), which found 16 (94.1%) motivated respondents.

Description of family support with Multidrug Resistant (MDR TB)

A study of 106 respondents found that 77 (72.6%) had inadequate family support and 29 (27.4%) had good support. Family help in monitoring patient medication compliance will boost patient motivation and indicate patient recovery success. This contradicts Sibua & Watung (20), which found that 68 respondents (52.3%) had good family support and 62 (47.7%) had low.

Description of the role of medication supervisors with Multidrug Resistant (MDR TB)

The survey indicated that 54 (50.9%) of 106 respondents had a bad medicine supervisor job, while 52 (49.1%) had a good one. This supports studies by Puspita (21) that found 21 respondents (70.0%) had bad medication supervisor roles and 9 (30.0%) had good ones. TB patients need medication supervisors. TB patients who take their medicine can inactivate microorganisms and limit TB germ transmission. Medication supervisors are crucial to TB patients' OAT compliance with doctor orders. This is also supported by research Aswar & Istyanto, (14) that found 21 respondents (95%) had bad medication supervisor roles, whereas 1 (5%) have good ones.

Relationship between nutritional status and Multidrug Resistance (MDR TB)

Based on the paired t-test, 0.000 was significant. Significant value = 0.000 < α (0.05), rejecting HO, indicating a link between nutritional status and MDR TB at Jatisari Karawang Regional Hospital in 2024. Poor diet can produce protein energy deficiency, which can lead to immune system abnormalities and raise the risk of tuberculosis. This supports research Aristiana & Wartono , 2019) (22) found a significant relationship between nutritional status and MDR TB (p = 0.005) with an OR of 3.79 at the Kramat Jati District Health Center, Makasar District, Pasar Rebo District, and Ciracas District. Aswar & Istyanto (14) found a significant link between nutritional status and MDR TB incidence in Biak Numfor Regency, with a p value of 0.000 (p <0.05). Research by Puspita (21) found a correlation between nutritional status and MDR TB incidence at Tertiary Referral Hospital in Central Java, with p-values of 0.007 <0.05.

Relationship between medication adherence and Multidrug Resistance (MDR TB)

Based on the paired t-test, 0.000 was significant. Significant value = 0.000 < 0.05 (HO rejected), indicating a link between medication adherence and MDR TB at Jatisari Karawang Regional Hospital in 2024. OAT that is not taken frequently in pulmonary TB patients makes Mycobacterium Tuberculosis germs immune or resistant to first-line OAT, making them MDR TB patients. In agreement with Beda Ama & Suhermi's (15) study, medication adherence had a significant impact on MDR TB occurrence (p = 0.001 <0.05, OR 8.947 CI: 2.299-34.816). Research by Eis Kusmita (23) supports this. HA is accepted with a p-value of 0.004 <0.05 using the chi-square test. HO is refused, medication adherence is associated with MDR TB at Embung Fatimah Hospital, Batam City 2019. Using chi square analysis, a study by Janan (24) found a significant correlation between medication adherence and MDR TB incidence in Brebes Regency from 2011-2017 (p < 0.05).

The relationship between motivation and Multidrug Resistance (MDR TB)

Based on the paired t-test, 0.000 was significant. Significant value = 0.000 < α (0.05), rejecting HO, indicating a link between motivation and MDR TB at Jatisari Karawang Regional Hospital in 2024. Low patient motivation might hinder therapy and healing owing to a lack of self- or other-motivation. Thus, motivation is crucial. This study aligns with Gumelar (25) study, which found a significant correlation between motivation and MDR TB incidence at Dr. Goenawan Partowidigdo Cisarua Lung Hospital (p-value < 0.05). Regular treatment failure is often caused by low motivation, which prevents patients from recovering and leads to OAT or MDR TB resistance. This study agrees with Aristiana & Wartono (9), which found a significant relationship between low motivation and MDR TB at the Health Centers of Kramat Jati District, Makasar District, Pasar Rebo District, and Ciracas District in 2017-2018.

Relationship between family support and Multidrug Resistant (MDR TB)

Based on the paired t-test, 0.000 was significant. Significant value = 0.000 < α (0.05), rejecting HO, indicating a link between family support and MDR TB at Jatisari Karawang Regional Hospital in 2024. Family support shields people from stress. Family support includes attitudes, accepting, informational, evaluative, instrumental, and emotional assistance. Family help in monitoring patient medication compliance will boost patient motivation and indicate patient recovery success. This matches Fajar & Silaen (26) study. The Spearman Rank statistical test revealed a significant link between family support and pulmonary TB therapy and MDR TB prevention in outpatients at Aminah Hospital, Tangerang City in 2021 (p-value = 0.000 <0.05). In line with Noviana (27), the chi-square test found a significant p-value of 0.002 <0.005, supporting the HA hypothesis. This suggests a link between family support and adherence to pulmonary TB medication at Padang Bulan Health Center, Medan.

The relationship between the role of medication supervisors with Multidrug Resistant (MDR TB)

Based on the paired t-test, 0.000 was significant. Significant value = 0.000 < α (0.05), rejecting HO, indicating a link between medication supervisors and MDR TB at Jatisari Karawang Regional Hospital in 2024. Lack of medication supervision can be one of the causes of MDR TB in pulmonary TB patients because medication supervisors play a very important role in the continuity of treatment for pulmonary TB patients by supervising them to take their medication regularly. OAT, taken regularly with a dose determined by health workers, can make bacteria inactive and

reduce germ transmission. In agreement with Noviana (27), the chi-square test results indicate a significant relationship between drug swallowing supervisors and MDR TB incidence at the UPTD Makasar District Health Center (p-value = 0.000, α <0.05). Aswar & Istyanto (14) found a significant relationship between PMO and MDR TB incidence in Biak Kota and Ridge Health Center Work Areas, with a p value of 0.000 (p <0.05).

CONCLUSION

After conducting research on the factors related to Multidrug-Resistant (MDR) Tuberculosis in pulmonary TB patients at Jatisari Karawang Hospital in 2024, it can be concluded that, based on the study results and discussion: First, the majority of respondents were under the age of 60, male, had a junior high school education, and were unemployed. Second, the study found a significant relationship between various factors—such as nutritional status, medication adherence, motivation, family support, and the role of medication supervisors—and the incidence of Multidrug-Resistant (MDR) Tuberculosis at Jatisari Karawang Hospital in 2024.

Conflict of Interest
The authors declare no conflict of interest.

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