

APPLICATION OF THE MOLECULAR RAPID TEST FOR DETERMINING TUBERCULOSIS (TB) POSITIVITY IN VULNERABLE GROUPS AT OESAPA HEALTH CENTER

Muntasir^{1*}, Pius Weraman², Lewi Jutomo², Deviarbi Sake Tira², Anastasia Sofia Lete Kerat³

¹ Pharmacy study program, Faculty of Medicine and Veterinary Medicine, Universitas Nusa Cendana, Kupang, East Nusa Tenggara, Indonesia

² Public Health study program, Faculty of Health, Universitas Nusa Cendana, Kupang, East Nusa Tenggara, Indonesia

³ Student of the Public Health study program, Faculty of Health, Universitas Nusa Cendana, Kupang, East Nusa Tenggara, Indonesia

*Corresponding author : muntasir@staf.undana.ac.id

ABSTRACT

Kupang City is one of the cities in NTT with the highest TB cases, totaling 1,253 (BPS, 2023). This research aims to identify TB cases and examine the factors influencing the spread of TB. The study was conducted in the Oesapa Community Health Center area in 2024, using a cross-sectional design. 150 samples were collected using simple random sampling, and the Spearman rank test was employed for analysis. The bivariate test results indicated no significant relationship between TB positivity and risk factors such as pregnancy ($p = 0.431$; $r = 0.065$), treatment dropout ($p = 0.173$; $r = 0.112$), and elderly age ($p = 0.096$; $r = 0.137$). However, a significant relationship was found between a history of diabetes mellitus and positive TB results ($p = 0.007$; $r = 0.219$). In conclusion, a history of diabetes mellitus is identified as the most significant factor associated with TB positivity in the Oesapa Community Health Center area in 2024.

Keywords: Molecular Rapid Test; Tuberculosis (TB); Vulnerable Groups; Oesapa Community Health Center

INTRODUCTION

The number of TB cases in Indonesia has been increasing annually over the past three years. In 2021, 443,235 TB cases were reported; in 2022, this number rose to 724,309; and in 2023, it reached 821,200 cases. The most recent TB case report, dated March 16, 2024, recorded 172,233 cases (Kemenkes, 2024). The primary goal of identifying TB cases is to provide early treatment to reduce the risk of death and to minimize the spread of TB to healthy individuals. The national target for TB case notification in 2023 was 90%, with 11 provinces achieving this target. However, four provinces—Riau Islands, East Nusa Tenggara, Bangka Belitung Islands, and Bengkulu—had notification rates below 50%. Among these, East Nusa Tenggara is the only priority province with a notification achievement below 50% in Indonesia (Kemenkes RI, 2023).

According to the East Nusa Tenggara Central Statistics Agency, 9,535 confirmed cases of pulmonary TB were reported in the province in 2023, a significant increase from 4,798 cases in the previous year. Despite this increase, the detection rate in East Nusa Tenggara has not yet met the national target.

Kupang City, a major contributor to TB cases in East Nusa Tenggara Province, reported 1,253 cases in 2023. This increase in detected cases is attributed to the efforts of health workers and cadres in identifying and treating TB patients within the scope of each Community Health Center. The Oesapa Community Health Center, located in Kupang City, plays an active role in searching for, finding, and treating TB sufferers. The center is supported by the availability of Molecular Rapid Test equipment.

At the Oesapa Community Health Center, there are 48 TB cases distributed across five sub-districts: 20 cases in Oesapa Subdistrict, 13 cases in Lasiana Subdistrict, 7 cases in South Oesapa Subdistrict, 6 cases in West Oesapa Subdistrict, and 2 cases in Kelapa Lima Subdistrict. Contact investigations are conducted through household screening activities carried out by cadres.

According to the Centers for Disease Control and Prevention (CDC), two groups are at high risk for contracting TB: individuals recently infected with TB bacteria and those with medical conditions that weaken the immune system. TB is an airborne disease, meaning that transmission through the air increases the risk of infection for people in close proximity to TB patients, including those living in the same household (Centers for disease prevention

and control (CDC), 2024). The risk of infection rises with the duration of exposure to TB patients. Additionally, a weakened immune system increases susceptibility to TB infection (Kementerian Kesehatan RI, 2018).

Previous research has identified several risk factors for TB incidence, including diabetes mellitus (Batubara, 2024), aging, which decreases immune function (Andayani & Astuti, 2017), and close contact with TB patients during pregnancy, with an odds ratio of 4.259 (Anita Syafriyanti et al., 2023). According to the Ministry of Health (2020), incomplete TB treatment can lead to TB reinfection or drug resistance (Kemenkes, 2020).

METHOD

This study employs a cross-sectional design and was conducted in the Oesapa Community Health Center area from June to July 2024. The study population included all TB patients recorded in the Oesapa Community Health Center area and their household contacts. The total population was 384, calculated by multiplying the 48 recorded TB patients by the 8 contacts per patient. Random sampling was used to select a sample size of 150 participants. Inclusion and exclusion criteria were applied to select respondents for the research sample.

The independent variables in this study were a history of diabetes mellitus (DM), old age (elderly), pregnancy, and treatment dropout. The dependent variable was the result of a positive TB Rapid Molecular Test (MRT) conducted on the sample. Data collection was carried out using a questionnaire, and data processing involved editing, coding, data entry, cleaning, and analysis.

Bivariate analysis was performed using the Spearman rank test to examine the correlation between independent and dependent variables. The study received ethical approval from the Health Research Ethics Commission, Faculty of Public Health, Nusa Cendana University, under the number 001890/KEPK FKM UNDANA/2024.

RESULTS

Data from Table 1 show that 37 respondents had a history of diabetes mellitus (DM), with 19 testing positive for TB and 18 testing negative. Among the 113 respondents without

a history of DM, 31 were positive for TB and 82 were negative. Statistical testing revealed a p-value of 0.007 ($p = 0.007 < 0.05$).

Table 1: Analysis of the Relationship Between Independent and Dependent Variables

Variable		Result of MRT		Total	Test spearman rank	
		Positive	Negative		P value	rho
History of Diabetes Mellitus (DM)						
Yes		19	18	37	0,007	0,219
No		31	82	113		
Elderly						
Yes		15	18	33	0,096	0,137
No		35	82	117		
Pregnant						
Yes		6	8	14	0,431	0,065
No		44	92	136		
Dropout Treatment						
Yes		4	3	7	0,173	0,112
No		46	97	143		

The analysis found a significant relationship between a history of DM and positive MRT results for TB, with a weak positive correlation ($\rho = 0.219$). The coefficient of determination is 4.79%, indicating that the history of DM explains 4.79% of the variation in the model.

Among the elderly respondents (33 in total), 15 tested positive for TB, and 18 tested negative. In contrast, 117 respondents were non-elderly, with 35 testing positive and 82 testing negative for TB. Most respondents were non-elderly, regardless of whether their MRT results were positive or negative. Statistical analysis showed a p-value of 0.096 ($p = 0.096 > 0.05$), indicating no significant relationship between elderly risk factors and positive MRT results. Of the 14 pregnant respondents, 6 tested positive for TB, and 8 tested negative. Among 136 non-pregnant respondents, 44 tested positive and 92 tested negative. The statistical test showed a p-value of 0.065 ($p = 0.065 > 0.05$), concluding that there is no significant relationship between pregnancy and positive MRT results for TB.

Seven respondents had previously received TB treatment but did not complete it; among them, 4 were positive and 3 were negative for TB. Meanwhile, 143 respondents had never received TB treatment, with 46 testing positive and 97 testing negative for TB.

Statistical testing showed a p-value of 0.173 ($p = 0.173 > 0.05$), suggesting no significant relationship between incomplete TB treatment and positive MRT results for TB.

DISCUSSION

Risk Factors for Diabetes Mellitus and Positive MRT Results for TB

Diabetes mellitus (DM) is a significant risk factor for TB, influencing clinical outcomes, treatment response, and increasing the risk of developing multidrug-resistant TB (MDR TB) (Arliny, 2015). DM weakens the immune system, making individuals more susceptible to TB transmission compared to those without DM. In the Oesapa Community Health Center area, the study found that the majority of TB-positive respondents were non-DM sufferers, largely due to the younger demographic, including many students. Conversely, nearly all TB sufferers aged over 45 had comorbid DM. Bivariate statistical testing revealed a significant relationship between a history of DM and TB incidence at the Oesapa Community Health Center. Consistent with previous studies, the majority of TB sufferers had a history of DM, confirming that DM is a predisposing factor for TB (Alavi & Khoshkhoy, 2012). Other studies have shown a significant association between type 2 diabetes mellitus and extensive pulmonary tuberculosis ($p = 0.03$), with type 2 DM increasing the risk of pulmonary TB lesion status by 5.25 times (Utomo et al., 2016).

Risk Factors for Older Adults and Positive MRT Results for TB

Research conducted in the Oesapa Community Health Center area found that out of 150 respondents, 33 were older adults, and 15 of these tested positive for TB. However, statistical analysis showed no significant relationship between older age and TB incidence at the Oesapa Community Health Center. Other studies indicate that TB most frequently affects older adults, with a progressive increase in TB notifications as age increases. Most TB cases in older adults are linked to the reactivation of dormant lesions (Caraux-Paz et al., 2021). Older adults (aged > 60 years) are particularly vulnerable to TB due to the aging process, which leads to decreased organ function and weakened immunity, making them more susceptible to both infectious and non-communicable diseases.

Risk Factors for Pregnant Women and Positive MRT Results for TB

Tuberculosis in pregnant women presents clinical symptoms similar to those in non-pregnant women, making early diagnosis challenging as initial symptoms may be atypical. Symptoms such as cough, fever, and fatigue are often mistaken for normal signs of pregnancy, which can delay treatment. During pregnancy, the immune system undergoes changes to support fetal growth, making pregnant women more vulnerable to infectious diseases, including TB. TB in pregnant women can lead to complications such as premature birth, low birth weight (LBW), and increased maternal health risks. If not diagnosed and treated promptly, TB in pregnancy can significantly increase morbidity for both the mother and fetus (Miele et al., 2020). This study found no significant relationship between TB risk factors in pregnant women and positive MRT results ($p = 0.431 > 0.05$; $r = 0.065$). Nevertheless, TB poses substantial risks to both the mother and fetus, underscoring the importance of vigilance and maintaining good health during pregnancy.

Risk Factors for Dropping Out of Treatment and Positive MRT Results for TB

The development of drug-resistant bacteria and increase the risk of death from TB (Viera Santillán et al., 2021). Incomplete treatment is influenced by various factors. Previous research identified factors contributing to incomplete TB treatment, including low patient motivation (p -value = 0.046 and 0.004), family motivation (p -value = 0.03 and 0.05), as well as severe (p -value = 0.01) and mild (p -value = 0.04) side effects of anti-tuberculosis drugs (Merzistya & Rahayu, 2019). Other contributing factors include boredom with long-term treatment, side effects of anti-tuberculosis drugs, or the perception of improvement after the initial stage of treatment. Economic factors and transportation barriers to health services also play a role. The results of this study found no significant relationship between incomplete treatment and positive MRT examination results for TB.

CONCLUSION

The study concludes that a history of diabetes mellitus significantly influences positive MRT examination results for TB in the Oesapa Community Health Center working area in 2024.

RECOMMENDATIONS

It is recommended to promote Clean and Healthy Lifestyle practices within the community to enhance overall public health. Additionally, routine screening for older adults is necessary to detect TB early.

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CONFLICT OF INTEREST

Please ensure that a ‘Declaration of Conflicting Interests’ statement is included at the end of your manuscript, after any acknowledgements and prior to the references. If no conflict exists, please state that ‘The Author(s) declare(s) that there is no conflict of interest’.
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