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DEVELOPMENT OF A HOME CONTACT TUBERCULOSIS CASE-FINDING MODEL BASED ON SCREENING WITH RAPID MOLECULAR TESTS (TCM) AT THE OESAPA COMMUNITY HEALTH CENTRE IN KUPANG CITY

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ABSTRACT

Background: Data from the East Nusa Tenggara (NTT) Central Bureau of Statistics in 2023 recorded 9,535 confirmed cases of pulmonary tuberculosis (TB), showing a significant increase compared to 4,798 cases in the previous year. Kupang City contributed the highest number of TB cases in NTT, with 1,253 cases.

Objectives: To develop a screening model based on Molecular Rapid Tests for early detection and treatment of TB and to identify factors influencing its distribution in the working area of Puskesmas Oesapa in 2024.

Materials and Methods:A cross-sectional study was conducted with 150 randomly selected samples, using inclusion and exclusion criteria. Data analysis included the Spearman rank test for bivariate analysis and Logistic Regression for multivariate analysis.

Results: Bivariate analysis showed no significant association between TB and gender, age, education, occupation, knowledge, residential density, information availability, pregnancy risk factors, treatment dropout, or elderly risk factors. Significant associations were found with sputum disposal behaviour (p=0.026; r=0.182), smoking behaviour (p=0.000; r=0.331), exercise habits (p=0.034; r=-0.173), cough (p=0.000; r=0.585), shortness of breath (p=0.000; r=0.630), weight loss (p=0.000; r=0.655), appetite loss (p=0.000; r=0.674), fever (p=0.000; r=0.693), night sweats without physical activity (p=0.000; r=0.624), and history of diabetes mellitus (p=0.007; r=0.219). Multivariate analysis indicated that smoking (p=0.017; Exp(B)=4.469; 95% CI=1.311–15.236) and fever (p=0.028; Exp(B)=8.259; 95% CI=1.263–54.033) were significant predictors of positive TCM TB results.

Conclusion: Smoking behaviour and fever were identified as significant predictors of positive TB cases. There is a need for community socialisation programs to promote healthy lifestyles and preventive measures to reduce TB transmission.

Keywords: Molecular Rapid Test, Tuberculosis (TB), Puskesmas Oesapa

INTRODUCTION

Almost a quarter of the world's population is infected with Mycobacterium tuberculosis. Tuberculosis is an infectious disease caused by the bacteria *Mycobacterium tuberculosis* that attacks the lungs. To date, TB remains the leading cause of death after HIV/AIDS, and is one of the top 20 leading causes of death worldwide. Most of the estimated deaths caused by TB are recorded in four countries, namely India, Indonesia, Myanmar and the Philippines. The number of deaths due to TB (among HIV-negative patients) globally in 2022 was 1.1 million, which is a decrease compared to 2021, which was 1.2 million [20.] Indonesia is also the second highest TB sufferer in the world after India with a proportion of new cases of 10% of all cases in the world. Globally, it is estimated that 10.6 million people will suffer from TB in 2022[45]. TB case finding in Indonesia has continued to increase every year for the last 3 years. In 2021, 443,235 TB cases were found in Indonesia, in 2022 the TB case finding increased to 724,309 cases and in 2023 it increased to 821,200

cases. The last TB case report on 16 March 2024 found 172,233 cases. [19]

The primary goal of TB case finding is to treat people with TB as early as possible to reduce the risk of death. Another goal is to reduce or minimise the scale of spread of TB disease to healthy people. The national TB case notification target for 2023 is 90% and 11 provinces have reached the 90% target. There are 4 provinces that have a notification achievement of <50%, namely Riau Islands, East Nusa Tenggara, Bangka Belitung Islands, and Bengkulu. East Nusa Tenggara Province is the only priority province out of 8 provinces that have notification achievements below 50% in Indonesia. (Ministry of Health, 2023).

Data from the East Nusa Tenggara Central Bureau of Statistics in 2023 recorded 9,535 confirmed cases of pulmonary TB in East Nusa Tenggara Province. Compared to the 4,798 TB cases in the previous year, there was a significant increase in cases. The increase in TB case finding in East Nusa Tenggara Province has not yet reached the national target despite the increase. Meanwhile, Kupang City is one of the cities that contributed the most TB cases in East Nusa Tenggara Province, with 1,253 cases in 2023. The increase in TB case finding is supported by the efforts of health workers and cadres in searching for, finding and treating TB patients within the scope of the work area of each Puskesmas. Puskesmas Oesapa is one of the Puskesmas in Kupang City that is active in seeking, finding and treating TB patients. This is also supported by the readiness of the Molecular Rapid Test equipment owned by the Puskesmas. The prevalence of TB cases at Puskesmas Oesapa is 48 cases spread across 5 urban villages. There were 20 TB cases in Kelurahan Oesapa, 13 TB cases in Kelurahan Lasiana, 7 TB cases in Kelurahan Oesapa Selatan, 6 TB cases in Kelurahan Oesapa Barat, and 2 TB cases in Kelurahan Kelapa Lima. Contact investigations were conducted on household contacts through screening activities conducted by cadres.

According to the *Centers for Disease Control and Prevention*, there are two groups of people who are at high risk of developing TB: people who have been recently infected with TB bacteria and people with medical conditions that weaken the immune system. The *airborne* transmission of TB *disease* increases the likelihood of infection to people who are physically close to TB patients, including those who live in the same house. Infection rates may increase with the length of contact/exposure to TB patients. The possibility of TB bacteria to infect will increase when the body's immune system decreases, making people vulnerable to TB bacterial infection (Ministry of Health RI, 2018).

Some of the risk factors for TB incidence found in previous studies are variables of occupancy density, knowledge, and behaviour that are significantly associated with the incidence of TB transmission; knowledge is the most dominant variable [47]. Meanwhile, research by Budi et al (2018) stated that family history of TB, access to information, and housing density were significantly associated with the occurrence of TB disease; the variable of housing density being the most influential in the occurrence of the disease. Furthermore, research by Sari (2018) showed that the level of knowledge, attitudes, and actions about TB were associated with the incidence of TB. Another study found a significant relationship between the variables of knowledge, attitude, and action with the incidence of TB; action being the most dominant variable in influencing the incidence of TB.

MATERIALS AND METHODS

This study used a cross sectional study design. This study was conducted in the working area of Puskesmas Oesapa from June to July 2024. The population in this study were all TB patients registered in the working area of Puskesmas Oesapa and household contacts with TB patients. The total population was 384 which was obtained by multiplying the number of TB sufferers recorded, namely 48 people with 8 people who had contact with sufferers. The sampling technique selected was random sampling with the results of the calculation of the sample size of 150 samples. This study also involved inclusion and exclusion criteria in the selection of respondents to be used as research samples.

The independent variables in this study were gender, age, education level, occupation, knowledge level, attitude, sputum disposal behaviour, smoking, occupancy density, information availability, cough, shortness of breath, weight loss, decreased appetite, fever, unexplained night sweats, history of diabetes mellitus (DM), elderly, pregnant and treatment dropout. The dependent variable in this study was the result of a positive TB Rapid Molecular Test (TCM) examination conducted on the sample. The data collection tool used was a questionnaire. Data processing techniques were carried out through *editing, coding, data entry, cleaning* and analysed.

Data analysis involved univariate analysis to describe the characteristics of respondents. Bivariate analysis was used to analyse the correlation between independent variables and dependent variables using the *Spearman rank test*, followed by multivariate analysis to analyse the effect of independent variables on dependent variables in the model.

This research has passed and received ethical approval from the Health Research Ethics Commission of the Faculty of Public Health, Nusa Cendana University with number 001890/KEPK FKM UNDANA/2024.

RESULTS

Characteristics of respondents

Table 1. Characteristics of Respondents

Characteristics	Total Sample = 150	%
Gender		
Male	78	52,0%
Female	72	48,0%
Age		
≤ 25 Years	41	27,3%
26 - 35 years	49	32,7%
36 - 45 years	24	16,0%
46 - 55 years	24	16,0%
56 - 65 years	9	6,0%
≥ 66 Years	3	2,0%
Education		
Not in school/not completed primary school	4	2,7%
Graduated from elementary school/equivalent	24	16,0%
Graduated from junior high school/equivalent	33	22,0%
Graduated from high school/equivalent	70	46,7%
Academy/PT Graduation	19	12,6%
Jobs		
Student	38	25,3%
Private	25	16,7%
Self-employed	36	24,0%
PNS	7	4,7%
IRT	43	28,7%
Retired	1	0,7%

Source: Data processed, 2024

Table 1 above shows the percentage of male respondents by 52.0% and female by 48.0%. The age distribution of respondents was highest in the age range of 26-35 years, namely 49 people with a percentage of 32.7%, while the lowest was in the age range above 65 years, namely 3 people with a percentage of 2.0%. The distribution of education levels shows that most of the respondents are high school graduates/equivalent, namely 46.7% or 70 people. While the lowest distribution of respondents was not graduated from elementary school, which was 2.7% or 4 people. Most of the respondents interviewed were students and housewives, each of which had a percentage of 28.7% or 43 people. Meanwhile, the lowest is retirees, totalling 1 person and the percentage is 0.7%.

Bivariate Analysis

Data from Table 2 found that 26 male respondents were TB positive and 24 female respondents were also TB positive. Meanwhile, there were 52 TB negative male respondents and 48 TB negative female respondents. So it can be concluded that TB-positive respondents are more prevalent among male respondents. Statistical testing results obtained p value = 1.000 > 0.05. Thus, there is no relationship between gender and positive TCM examination for TB in the Oesapa Health Centre Working Area in 202

Table 2. **Analysis of the relationship between independent variables and dependent variables**

Variables	TCM Check Result		Total	Spearman rank test	
	Positive	Negative		P value	rho
Gender					
Male	26	52	78	1,000	0,000
Women	24	48	72		
Age					
Age ≤ 45 years	36	78	114	0,421	-0,066
Age ≥ 46 years	14	22	36		
Education Level					
Low	24	37	61	0,199	0,106
High	26	63	89		

Jobs

Not working	32	50	82	0,106	0,133
Work	18	50	68		

Knowledge

Bad	3	1	4	0,074	0,146
Good	47	99	146		

Attitude

Not in favour	0	0	0	-	-
Support	50	100	150		

Phlegm removal behaviour

Bad	22	26	48	*0,026*	*0,182*
Good	28	74	102		

Smokers

Yes	35	35	70	*0,000*	*0,331*
No	15	65	80		

Exercise Habits

Once a week	8	28	36	*0,034*	*-0,173*
2 - 3 times a week	9	24	33		
Never	33	48	81		

Residential density

Solid	16	23	39	0,239	0,097
Not solid	34	77	111		

Availability of information

There is	49	97	146	0,722	0,029
None	1	3	4		

Cough

Yes	50	39	89	*0,000*	*0,585*
No	0	61	61		

Shortness of breath

Yes	43	20	63	*0,000*	*0,630*
No	7	80	87		

Weight loss

Yes	45	21	66	*0,000*	*0,655*
No	5	79	84		

Decreased appetite

Yes	45	21	66	*0,000*	*0,655*
No	5	79	84		

Fever

Yes	44	16	60	*0,000*	*0,693*
No	6	84	90		

Night sweats without physical activity

Yes	42	19	61	*0,000*	*0,624*
No	8	81	89		

History of Diabetes Mellitus (DM)

Yes	19	18	37	*0,007*	*0,219*
No	31	82	113		

Elderly (Elderly)

Yes	15	18	33	0,096	0,137
No	35	82	117		

Pregnant Mums

Yes	6	8	14	0,431	0,065
No	44	92	136		

Discontinued Treatment

Yes	4	3	7	0,173	0,112
No	46	97	143		

Source: Data processed, 2024

A total of 36 TB positive respondents aged ≤ 45 years   and 14 respondents aged ≥ 46 years. A total of 100

respondents with TB negative TCM results with 78 respondents aged ≤ 45 years and 22 respondents aged ≥ 46 years. In conclusion, most respondents were ≤ 45 years old in both TB positive and negative respondents. The p value in statistical testing was 0.421. The p value = 0.421> 0.05. So it is concluded that there is no significant relationship between the age variable and the positive TCM results for TB in the Oesapa Health Centre working area in 2024.

A total of 24 respondents in the low education category were TB positive and 26 TB positive respondents were from the high education level category. A total of 61 TB negative respondents had a low level of education and 89 respondents in the high education level category. The results of statistical testing showed a p value = 0.199. The p value = 0.199>0.05. Thus it is concluded that there is no relationship between education level and positive TCM examination for TB in the Oesapa Health Centre working area in 2024.

A total of 32 TB positive respondents did not have a job and 18 TB positive respondents had a job. There were 50 TB-positive respondents who did not work and 50 other respondents had jobs. So, it was concluded that most TB positive respondents did not have a job. The statistical test results showed a p value of 0.106. The p value = 0.106>0.05. Therefore, there is no relationship between employment and TCM positive TB among respondents at Puskesmas Oesapa in 2024.

A total of 3 respondents with positive TCM TB test results had poor knowledge, while 47 other respondents had good knowledge. In the negative TB TCM examination results, 1 respondent was found to have poor knowledge and 99 other respondents had good knowledge about TB. It can be concluded that almost all respondents already have good knowledge about TB in both positive and negative TB respondents. The results of statistical testing found a p value of 0.074. The p value = 0.074>0.05, so there is no relationship between the level of knowledge of respondents and the results of positive TCM examination for TB in the working area of Puskesmas Oesapa in 2024.

Respondents with both TB-positive and TB-negative TCM test results had favourable attitudes. This is found from the data above, which shows that no respondents had an attitude that was not supportive of TB in both TB positive and TB negative respondents. Therefore, the p value or significance value cannot be measured.

There were 22 TB positive respondents who had poor sputum removal behaviour and 28 TB positive respondents who had good sputum removal behaviour. Meanwhile, 26 respondents with negative TCM examination results had poor behaviour and 74 others had good behaviour. Respondents with TB positive TCM examination results had more good behaviour, as did TB negative respondents. The statistical test showed a p value of 0.026. The p value = 0.026 <0.05. So it is concluded that there is a unidirectional relationship between the variable of sputum disposal behaviour and positive TCM results in the Oesapa Puskesmas work area in 2024. The rho value of 0.182 indicates a very weak correlation between the independent and dependent variables with a large effect of 3.31%. The direction of the correlation is positive so that any increase in poor sputum removal behaviour goes hand in hand with an increase in positive TCM.

Respondents with positive TCM results had smoking behaviour as many as 35 respondents and 15 positive respondents did not have smoking behaviour. Respondents with negative TCM results had 35 smokers and 65 non-smokers. It was concluded that most TB positive respondents had smoking habits and most TB negative respondents were respondents who did not have smoking behaviour. Statistical testing results showed a p value = 0.000. The p value = 0.000 <0.05. So it is concluded that there is a relationship between smoking behaviour and positive TB TCM examination among respondents in the Oesapa Puskesmas work area in 2024. The rho value on the smoking variable is 0.331. Thus the strength of the relationship between the independent and dependent variables is categorised as weak and the direction of the relationship between the two variables is positive, so it is concluded that any increase in the smoking variable will increase the results of positive TCM examination for TB. The value of R = 10.95%, then the smoking variable has an influence on the variable of positive TCM TB examination by 10.95%.

A total of 8 TB positive respondents had the habit of exercising once a week, 9 respondents had the habit of exercising 2-3 times a week and 33 TB positive respondents never / did not have the habit of exercising during their lifetime. TB negative respondents were found to have 28 respondents who exercised once a week, 24 respondents had the habit of exercising 2-3 times a week and 48 respondents never exercised. TB positive respondents were more likely to have no exercise habits, as was the case with TCM negative TB respondents. In the statistical test, the p value = 0.034 <0.05. The rho value = -0.173. It can be concluded that there is a very weak relationship between the variable of exercise habits and positive TCM TB, which has a negative value, which means that increasing exercise habits will reduce positive TCM TB in the Oesapa Puskesmas work area. The coefficient of determination R value is 2.99%, it is concluded that the effect of the independent variable on the dependent variable is 2.99%.

A total of 16 TB-positive respondents lived in densely packed houses and 34 TB-positive respondents lived in non-densely packed houses. Meanwhile, 23 TB-negative respondents lived in densely populated houses and 77 TB-negative respondents lived in houses that were not densely populated. It was concluded that both TB-positive and TB-negative respondents mostly lived

in houses in the non-dense category. Statistical testing results showed a p value = 0.239. The p value=0.239>0.05. So it is concluded that there is no relationship between residential density variables and positive TCM results among respondents in the Oesapa Health Centre working area in 2024.

There were 49 TB-positive respondents who received TB-related information at the health care facilities visited. There was 1 TB positive respondent who did not receive information about TB. Meanwhile, 97 TB negative respondents received information about TB and 3 other respondents did not receive TB information. Thus it was concluded that almost all respondents already had access to the availability of information obtained at the health facilities they visited. Statistical testing on the availability of information variable found p value = 0.722. P value = 0.722 >0.05. Thus, there is no relationship between the variable of information availability and the variable of positive TB TCM results in the Oesapa Health Centre working area in 2024.

A total of 89 respondents had cough symptoms with 50 respondents positive and 39 respondents negative. There were 61 respondents who did not have cough symptoms with negative TCM examination results. The statistical test results found p value = 0.000. P value = 0.000 <0.05. It is concluded that there is a variable relationship between cough symptoms and positive TB TCM results in the Oesapa Puskesmas work area. The rho value is positive 0.585 which indicates a unidirectional correlation, meaning that an increase in respondents with cough symptoms goes hand in hand with an increase in positive TCM results in respondents. The strength of the association of the independent and dependent variables is in the moderate category. The coefficient of determination is 34.22%. Thus the influence of the cough variable on the model is 34.22%.

TB positive respondents had 43 respondents with symptoms of breathlessness and 7 respondents had no symptoms of breathlessness. TCM negative respondents had symptoms of shortness of breath as many as 20 respondents and 80 respondents did not have symptoms of shortness of breath. The p value is 0.000. P value = 0.000 <0.05. The positive rho value is 0.630. Thus it is concluded that there is a moderate relationship between the variable symptoms of shortness of breath and positive TCM TB results with a unidirectional relationship. That is, an increase in symptoms of shortness of breath in respondents along with an increase in positive TCM results in respondents. The coefficient of determination is 39.69%. Then the influence of the shortness of breath symptom variable is 39.69% in the model.

A total of 66 respondents had symptoms of weight loss with 45 respondents positive for TB and 21 respondents negative for TB. There were 84 respondents who did not have symptoms of weight loss with 5 respondents positive for TB and 79 respondents negative for TB.

Statistical testing showed p value = 0.000. P value = 0.000 <0.05. Therefore, there is a relationship between the independent variable and the dependent variable. The rho value = 0.655 and is positive. Then the strength of the association between the two variables is categorised as moderate/moderate with a unidirectional relationship. This means that the increase in symptoms of weight loss is in line with the increase in positive TCM results for TB in the community in the Oesapa Puskesmas working area in 2024. The coefficient of determination is 42.90%. So the influence of the weight loss symptom variable on the model is 42.90%.

A total of 66 respondents had symptoms of decreased appetite, 45 of whom were TB positive and the remaining 21 respondents were TB negative. There were 84 respondents who did not have symptoms of decreased appetite, 5 respondents were positive for TB and 79 respondents were negative for TCM. The p value was 0.000. P value = 0.000 <0.05. It is concluded that there is a relationship between the variable of decreased appetite symptoms and the variable of positive TCM results for TB. The rho value = 0.655 which is positive. This means that the strength of the association between the two variables is categorised as moderate/medium and is unidirectional. This means that every increase in appetite symptoms decreases along with an increase in positive TCM TB results in the community in the Oesapa Puskesmas working area in 2024. The calculation of the coefficient of determination is 42.90%. Thus the influence of the variable appetite symptoms decreased by 42.90% in the model.

A total of 60 respondents had symptoms of fever with 44 respondents positive for TB and 16 respondents negative for TB. There were 90 respondents who did not have symptoms of fever with the results of TCM examination positive for TB as many as 6 respondents and 84 other respondents negative for TCM TB. The statistical test results obtained p value = 0.000. P value = 0.000 <0.05. Thus, there is a relationship between the variable of fever symptoms and the variable of positive TB TCM results in the community at Puskesmas Oesapa in 2024. The rho value = 0.693 and is positive. The strength of the association between the two variables is moderate or moderate with a unidirectional relationship. This means that any increase in fever symptoms goes hand in hand with an increase in TB positive TCM results. The calculation of the coefficient of determination is 48.02%. Then the influence of the fever symptom variable on the model is 48.02%.

There were 61 respondents who had symptoms of night sweats without physical activity, of which 42 respondents were TB positive and 19 were TB negative. There were 89 respondents who did not have symptoms of night sweats without physical activity, with 8 respondents positive for TB and 81 respondents negative for TB. Statistical testing obtained a p value = 0.000. P value = 0.000 <0.05. So there is a relationship

between night sweats without physical activity with positive TCM results in the Oesapa Puskesmas work area in 2024. The rho value = 0.624 and is positive. So, it means that the strength of the relationship between the two variables is in the medium/moderate category with a unidirectional relationship direction. Therefore, every increase in respondents with symptoms of night sweats without physical activity along with an increase in positive TCM examination results for TB. The coefficient of determination was 38.93%. So the influence of the variable symptoms of sweating at night without physical activity is 38.93% in the model.

There were 37 respondents who had a history of DM with 19 respondents positive for TB and 18 respondents negative for TB. A total of 113 respondents did not have a history of DM and 31 of them were positive for TB and 82 were negative for TB. Statistical testing found a p value of 0.007. P value = 0.007 <0.05. Thus, there was a significant association between the variable history of DM and positive TB TCM results in the Oesapa Health Centre working area in 2024. The rho value on this variable is 0.219 and is positive. Therefore, the strength of the association is very weak and the correlation is unidirectional. This means that the incidence of DM increases along with the positive TB test results. The coefficient of determination is 4.79%, so the influence of the DM history risk factor variable is 4.79% in the model.

The number of elderly respondents was 33 respondents with 15 TB positive respondents and 18 TB negative respondents. There were 117 non-elderly respondents with 35 TB positive and 82 TB negative respondents. The most respondents were non-elderly respondents in both positive and negative TB TCM examination results. Statistical tests showed a p value of 0.096. P value = 0.096 >0.05. Thus, there is no relationship between the risk factor variables of the elderly with positive TCM results in the Oesapa Puskesmas work area in 2024.

There were 14 pregnant women who were used as respondents with 6 respondents positive for TB and 8 respondents negative for TB based on TCM examination. There were 136 respondents who were not pregnant with the results of TCM examination 44 respondents were positive and 92 other respondents were negative for TB. The statistical test results showed a p value = 0.065. So the p value = 0.065>0.05. Thus it is concluded that there is no relationship between risk factors for pregnant women and positive TCM results for TB in the Oesapa Health Centre working area in 2024.

A total of 7 respondents who had TB treatment but did not complete it, 4 respondents were positive and 3 respondents had negative TCM test results. Meanwhile, there were 143 respondents who had never had TB treatment before, with 46 respondents positive and 97 respondents negative for TB. Statistical testing results showed p value = 0.173. Therefore, the p value = 0.173 >0.05. Thus, it is concluded that there is no relationship between the variable of having ever received TB treatment but not completing it with positive TB TCM results in the Oesapa Puskesmas work area in 2024.

Multivariate Analysis

In this study, the hypothesis is accepted if the p value <0.05. The data above shows that variable X2 has a p value = 0.017 and variable X8 has a p value = 0.028. Both variables are variables of smokers or respondents who have a smoking habit and variables that have symptoms of fever. So it is concluded that there is an influence of the smoker variable and the fever symptom variable with positive TCM TB results. Thus the results of the interpretation of the Odd Ratio of the two significant variables are as follows:

1. If smokers increase by 1, the TCM of TB positivity increases by 4.469 times.
2. If the fever symptom increases by 1, the TB positive TCM increases by 8.259 times.

Table 3. **Variables in the Equation Table**

Variables	B	S.E	Wald	df	Sig.	Exp(B)	95.0% CI for EXP (B)	
							Lower	Upper
X1	-0,968	0,690	1,969	1	0,161	0,380	0,098	1,468
X2	**1,497**	**0,626**	**5,725**	**1**	**0,017**	**4,469**	**1.311**	**15,236**
X3	0,176	0,375	0,221	1	0,638	1,193	0,572	2,486
X4	18,912	4940,017	0,000	1	0,997	163411552,8	0,000	0
X5	0,418	0,825	0,257	1	0,612	1,519	0,302	7,655
X6	0,494	1,017	0,236	1	0,627	1,639	0,223	12,025
X7	1,604	1,079	2,207	1	0,137	4,971	0,599	41,228
X8	**2,111**	**0,958**	**4,854**	**1**	**0,028**	**8,259**	**1,263**	**54,033**
X9	-0,959	1,180	0,661	1	0,416	0,383	0,038	3,871
X10	0,355	0,641	0,307	1	0,579	1,427	0,406	5,013
Consent	-25,470	4940,017	0,000	1	0,996	0,000		

Notes: X1= Behaviour; X2= Smoker; X3= Exercise habit; X4= Cough; X5= Shortness of breath; X6= Weight loss; X7= Loss of appetite; X8= Fever; X9= Night sweats without physical activity; X10= History of DM

DISCUSSION

Influence of Gender on TB Positive TCM Results

The results of this study showed that TB-positive respondents based on TCM examination were more men than women. In line with research by Sunarmi and Kurniawaty (2022) found that pulmonary tuberculosis disease tends to be higher in men than women [38]. Women pay more attention to their health than men, therefore women are less susceptible to pulmonary TB disease.[38]

Other studies have also found the characteristics of the percentage of men more than women, namely 65.22% who are male sufferers.[31] The results of multivariate analysis of gender obtained an OR = 4.772 (CI: 2.260-10.076), meaning that male respondents will be at risk of developing pulmonary TB 3.8 times compared to female respondents.[11] Screening research conducted on homeless populations in Korea found an influence of gender on the incidence of TB with a risk of 0.65 times in women [15]. In contrast to the results of this study which found no effect of gender on the incidence of TB although the percentage was more in the male gender. Men tend to be outside the home more often due to the demands of their work. This makes it possible for TB transmission to occur when meeting with many people from different circles. Men also tend to have risky lifestyles such as smoking, drinking alcohol and staying up late, which can weaken the body's immunity. With a weakened immune system, it is easier to transmit diseases, especially TB.

Influence of Age on TB Positive TCM Results

This study found that most TB-positive respondents based on TCM examination were ≤ 25 years old and 26 - 35 years old. These age intervals are productive ages. Productive age is the age when a person is actively moving out of the house due to work demands. Heavy work demands, not balanced with eating healthy food and regular exercise will cause a decrease in endurance. In line with other studies that found the majority of respondents came from the productive age group, namely 20-30 years old.[24] Pulmonary tuberculosis disease is most often found in the productive age, economically around 15-49 years of age.[44] The results of cohort study research in England found an age relationship with the incidence of TB.[26] Another study also found an association between age (p-value = 0.003) and pulmonary tuberculosis. Meanwhile, in contrast to the results of research conducted by researchers in the working area of Puskesmas Oesapa who found no association between age and positive TCM examination results for TB.

Influence of education level on TB-positive TCM results

The results of this study showed that most respondents had a fairly good education, but most of the TB-positive respondents had a high level of education, namely high school to college graduates. In line with other studies that have the most TB respondents at the high school education level of 52.7%.[41] Another study also found that most respondents with TB had a high level of education with a percentage of 82.9%.[22,33] Bivariate and multivariate testing found no effect of education on positive TCM TB results. The difference between theory and conditions in the field is certainly inseparable from various regional characteristics that contribute greatly to the spread of the disease. The inability of the community to lead a clean and healthy lifestyle is supported by the fairly dense settlement conditions in the Oesapa area. This certainly supports the transmission of disease from person to person.

Influence of Occupation on TB Positive TCM Results

The results showed that there was no effect of occupation on the positive results of the Molecular Rapid Test for TB in the working area of Puskesmas Oesapa in 2024. This is in line with the results of a previous study that found no effect of occupational variables on tuberculosis diagnosis in Indramayu Regency in 2022.[40] In this study, the employment variable did not contribute much to the spread of tuberculosis disease because there are still other factors such as a stable immune system that does not allow TB transmission.

Influence of Knowledge with TB Positive TCM Results

Most of the respondents interviewed already had good knowledge of Tuberculosis disease. This is evidenced through the research data found that 94.0% of TB-positive respondents had good knowledge about TB. However, 6.0% had poor knowledge. The results of the search for each question answered by respondents found that there were about 6.0% who answered that TB disease was a disease caused by blood deficiency and as many as 38.0% of respondents answered that TB was caused by cigarette smoke. A previous study revealed erroneous beliefs about the causes of TB in pastoral communities in Ethiopia which showed significant knowledge gaps about the causes, signs and symptoms, modes of transmission, prevention, and treatment of TB among community members.[27] These findings are consistent with studies conducted in rural Uganda where heredity, heavy labour, sharing cutlery, and smoking were documented as causes of TB. [7]

The results of statistical testing found no relationship between knowledge and TCM-positive TB in the working area of Puskesmas Oesapa. In contrast to previous research, there is a significant relationship between knowledge and the incidence of pulmonary TB transmission, where respondents with poor knowledge have a 5.13 times greater risk of contracting pulmonary TB compared to respondents with good knowledge in the Bandarharjo Puskesmas working area in Semarang.[47]

Influence of Attitude with TB Positive TCM Outcome Respondents' attitudes towards Tuberculosis disease prevention were overall quite good. This good attitude is certainly obtained from the experience experienced by the respondents. Most of the respondents in this study were people who had contact with TB patients. In another study on respondents' attitudes towards TB prevention at Puskesmas Sukaraja in 2021 mostly had poor attitudes but good TB prevention behaviour (61.5%).[32]The results of this study indicate that attitudes that support the prevention of tuberculosis are not necessarily aligned with the behaviour of preventing tuberculosis. This is evidenced by the number of respondents who have a favourable attitude but TB cases are still high. Attitudes that support TB prevention are certainly influenced by good knowledge about TB to form positive perceptions.

Influence of Sputum Disposal Behaviour on TB Positive TCM Results

One of the transmissions of pulmonary TB is the inhalation of sputum/phlegm by TB patients who have dried and evaporated into the air by other people who are around them they can contract Pulmonary TB disease as well. 6 Disposing of sputum or spitting in any place can increase the spread of pulmonary TB bacteria because TB can live and has the opportunity to spread if sputum or saliva is disposed of in any place. [46,16,14]. This finding found as many as 48 respondents still dispose of sputum in any place and do not follow the recommendations to dispose of sputum properly. The results showed that 22 respondents were positive for TB out of 48 respondents who still discharged sputum not as recommended. Most of the respondents had not discharged phlegm in any place and followed the recommendation to spit properly. This is consistent with previous research which found a higher percentage of good sputum disposal behaviour, namely 76.0%. [6] In contrast to research conducted in Papua, it was found that most respondents with TB had poor sputum disposal behaviour.[46] Other research findings show that there are still many respondents, with a percentage of 69.8% of respondents with TB having poor TB prevention behaviour.[17] The results of this finding also show a significant relationship between the sputum removal behaviour variable and the positive TB molecular rapid test results with a very weak correlation strength ($r = 0.182$) and its influence in the model of 3.31%. This is in line with other findings that found an association between sputum disposal behaviour and TB incidence in Papua [46].

Influence of Smoking Behaviour with TB Positive TCM Results

Smoking is one of the factors that can increase the risk of pulmonary TB due to impaired mucosal secretion clearance. The nicotine content in cigarettes can reduce the production of TNF-α which functions to activate macrophages and CD4+ lymphocytes and will reduce the immune response. Clearance by attenuated mucosal secretions, reduced phagocytic ability of alveolus macrophages decreased immune response and CD4 + cause colonisation of TB germs to become easier. [36] In this study, 70 respondents were found to be active smokers with 35 of them positive for TB. Previous findings found that the distribution of respondents based on smoking status was highest among respondents in the active smoker category at 51.6%.[39] Meanwhile, another study found that the characteristics of respondents based on smoking habits who suffered from pulmonary tuberculosis 38 respondents (73.1%) with bivariate analysis showing a relationship between smoking and pulmonary tuberculosis status, where respondents who smoked had a 3.701 greater chance of developing pulmonary tuberculosis compared to those who did not smoke.[18] In line with the findings of researchers who found a significant relationship between smoking behaviour and positive TB molecular rapid test results with a weak correlation ($r = 0.331$). However, the direction of the relationship is positive, which means that an increase in smoking behaviour goes hand in hand with an increase in TB diagnosis in the community in the Oesapa Puskesmas working area. Smoking behaviour also increases the risk of developing pulmonary TB by 5.156 times. Respondents who have a smoking habit will aggravate health conditions and can increase relapse and failure in TB treatment, especially in people with tuberculosis.[13] The results of other studies found a significant influence of smoking variables with TB patients and control groups. Multivariate testing also showed a significant effect of family variables with a history of smoking with the TB case group and control group (OR 2.8, 95% CI: 1.1-8.4), and a smoking history of more than 10 years (OR = 1.6, 95% CI: 1.2-9.8).[1]Comparable to research conducted at Puskesmas Oesapa found a risk of TB of 4.469 times in respondents who smoke compared to respondents who do not smoke.

Influence of Exercise Habits with TB Positive TCM Results

The results of this study found that 81 respondents never exercised, including 33 respondents who were positive for TB. As many as 33 respondents who exercised 2 - 3 times a week, there were 9 positive respondents and there were 36 respondents who exercised once a week, there were 8 positive respondents. Thus, the bivariate test showed a negative relationship where the decreasing frequency of exercising a person will increase the positive TB TCM test results. Another study comparing case and control groups found that more case groups did not engage in healthy behaviours of exercise (physical activity) than control groups (81.48%).[30] Exercise for people with TB can reduce the risk of re-infection by Mycobacterium Tuberculosis. Exercise can also strengthen the immune system, which can help protect

individuals from TB disease or aid recovery for those already infected.[12] Multivariate testing found no effect of exercise on TCM-positive TB results. Previous research found an effect of exercise habits with a reduced risk of TB transmission.[5]

Influence of Residential Density with TB Positive TCM Results

In the provisions of the health requirements of residential houses according to Kepmenkes No. 829/Menkes/SK/VII/1999, the minimum bedroom area is 8 m² and it is recommended that no more than 2 people sleep. If these requirements are not met then the house is categorised as crowded. Occupancy density will facilitate the transmission of disease to fellow family members living in the same house. Tuberculosis will be easily transmitted to other family members when the body condition is declining. The more occupants, the lower the free oxygen level in the room. [35] The results of this study found that most respondents lived in houses that were not densely occupied. The findings in the Oesapab Health Centre working area showed no effect of occupancy density with positive TB TCM test results. In previous studies, there was an effect between occupancy density and TB incidence (P-value = 0.014). [35]

Influence of Information Availability on TB Positive TCM Results

A total of 92.0% of respondents found the availability of information boards/brochures/leaflets on TB on the information board at the health facility visited. A total of 98.0% of health workers explained TB disease and 96.0% of respondents could ask questions about TB information to health workers. A total of 146 respondents had information available at the health facility visited with 49 respondents being TB positive and 4 respondents not, with 1 respondent being TB positive and 3 being TB negative. Posting leaflets/brochures on TB can improve understanding of the causes, symptoms, transmission and management of TB at the individual level. The availability of information will support people with TB in obtaining TB health services.[34] With information about TB, patients will immediately check at the nearest health facility so that they can get immediate treatment.

Influence of cough symptoms on TCM-positive TB results

Bivariate testing in this study found a significant association between cough symptoms and the incidence of TB confirmed by Molecular Rapid Test examination (p-value = 0.000 < 0.000; r = 0.585). The strength of association of the cough variable is categorised as moderate and has a unidirectional relationship. Thus, an increase in cough symptoms will be accompanied by an increase in TB cases. However, multivariate testing found no significant effect of cough symptoms with TB. When people cough, they can produce 3000 sputum splashes that evaporate into the free air which can survive in room temperature for about a few hours and if inhaled, people can be infected. However, sputum droplets can be reduced if there is sufficient ventilation or airflow and direct sunlight. [22] One cough can produce about 3,000 sputum splashes containing 0-3,500 M. tuberculosis bacteria. Meanwhile, sneezing can release as much as 4,500 - 1,000,000 M. tuberculosis. [21] According to Lee et al., (2020) TB patients tend to cough more often when compared to non-TB patients. The severity of a TB patient can also be seen through the severity of his cough. [23]

Influence of Shortness of Breath Symptoms with TB Positive TCM Results

The results of this study found a relationship between shortness of breath and positive TCM examination results for TB (p-value = 0.000 <0.005; r = 0.630). The effect of shortness of breath variable was 39.69% on the dependent variable in this study. Multivariate testing using the logistic regression test found no effect of these variables on TB. Shortness of breath is a condition when a person feels they do not have enough air, cannot breathe freely or feels breathless in any condition whether walking, running or even sitting. One of the symptoms of TB is shortness of breath. This occurs due to damage to the tissue in the lungs.

Influence of weight loss symptoms on TCM-positive TB result

TB bacterial infection can cause a person's body to experience increased metabolism and reduce the appetite of the sufferer. This situation makes the energy reserves in the body even less, triggering significant weight loss. The results of this study found a relationship between symptoms of weight loss and TB patients (p value = 0.000 < 0.05; r = 0.655) with an influence of 42.90% in the model. The strong correlation between tuberculosis reactivation and body mass index (BMI) in patients with pulmonary tuberculosis suggests that low BMI predisposes to TB reactivation in the lungs. (Casha & Scarci, 2017) [9]. Reinforced by research conducted in Riau which found a relationship between body mass index and the incidence of TB. [4]

Effect of Decreased Appetite with TB Positive TCM Result

Several hormonal factors can affect appetite. One hormone that plays a role in appetite suppression and is often implicated in conditions such as TB is **leptin. In** TB patients this hormone will increase. Meanwhile, the hormone ghrelin increases appetite. As the leptin hormone increases, the ghrelin hormone decreases. This is supported by previous research that found lower ghrelin levels in malnourished cases compared to well-nourished cases. In addition, it was also found that leptin concentrations decreased in TB patients as treatment progressed.[10] This finding is in line with the researcher's

findings, which found 1 respondent who discontinued treatment due to loss of appetite. The results of this study found an association between decreased appetite and positive TCM examination results for TB (p-value = 0.000 < 0.05; r = 0.655) with an effect of 45.42% on the model.

Influence of fever symptoms on TCM-positive TB result
The results showed a significant association of fever variables with TB incidence at Puskesmas Oesapa (p-value = 0.000 <0.05; r=0.693) with an influence on the model of 48.02%. Multivariate testing also showed that fever had an 8.259 times influence on the positive outcome of TB based on TCM examination. TB patients experience fever for several reasons related to the body's response to Mycobacterium tuberculosis infection. When TB bacteria infect the body, the immune system reacts to fight the infection. This process involves the release of chemicals such as cytokines (e.g., interleukins and tumour necrosis factor), which can increase body temperature and cause fever.

Influence of Night Sweats on TCM positive TB results
Night sweats are a significant symptom in people with TB that not only helps in diagnosis but also affects the patient's quality of life and disease management. Although it is largely unclear why fever associated with TB occurs primarily at night (hence the term "night sweats"), its occurrence has been attributed to the body's circadian rhythms.2[5]

Night sweats may indicate that the body is trying to fight an active infection. This can be an indicator that the TB disease is still active and requires proper treatment. Excessive sweating can lead to fluid and electrolyte loss, which may require medical attention to prevent dehydration and electrolyte imbalance. Night sweats in TB patients are often one of the main symptoms indicating active infection and can help in the diagnosis and treatment assessment of the disease. The results of this study found that there was a relationship between night sweats and positive TCM examination results for TB in the Oesapa Puskesmas work area (p-value = 0.000 <0.05; r=0.624). The effect of the night sweats variable on TCM-positive TB was 38.93%.

Influence of Diabetes Mellitus Risk Factors with TB Positive TCM Results
Diabetes mellitus is an important risk factor for TB and can affect clinical and treatment response and is a risk for drug-resistant TB (MDR TB). (Arliny, 2015) [3]. Diabetes mellitus weakens the immune system, increasing the risk of transmission when compared to non-DM patients. The results of research in the Puskesmas Oesapa work area found that most of the respondents who were positive for TB were non-DM respondents. This is because most of the respondents are young people who are mostly students. Meanwhile, almost all patients over 45 years of age have comorbid DM. The results of bivariate statistical testing found an association of DM history with TB incidence at Puskesmas Oesapa. In line with previous research, it was found that most TB patients had a history of DM, so it is certain that DM is a predisposing factor for TB.[2] Another study showed a significant association between type 2 diabetes mellitus and extensive lesion pulmonary tuberculosis (p=0.03). Type 2 diabetes mellitus can increase the risk of extensive lesion pulmonary tuberculosis status by 5.25 times.[42]

Influence of Elderly Risk Factors with TB Positive TCM Results
Research in the working area of Puskesmas Oesapa found that 33 elderly out of 150 respondents interviewed, 15 respondents were positive for TB. However, the results of this study showed no association between the elderly and the incidence of TB at Puskesmas Oesapa. Another study mentioned that the TB epidemic is most prevalent in elderly people and there is a progressive increase in the number of TB notifications with age. Most cases of TB in the elderly are associated with reactivation of dormant lesions.[8] TB is very easily contracted in someone with advanced age (aged >60 years) because the elderly experience an aging process which results in decreased organ function and endurance, making them more susceptible to infection with various infectious and non-communicable diseases.

Influence of Risk Factors for Pregnant Women with TB Positive TCM Results
Tuberculosis in pregnant women has clinical symptoms similar to tuberculosis in non-pregnant women. Diagnosis may be difficult in the early symptoms as they are not typical. Symptoms of tuberculosis such as cough, fever and fatigue are considered as normal signs of pregnancy so treatment may be delayed. During pregnancy, a woman's immune system changes to support the growth and development of the foetus in the womb. These changes can make pregnant women more susceptible to infectious diseases, including TB. Pregnant women infected with TB disease can have complications for both mother and foetus such as premature birth, low birth weight (LBW), and increased maternal risk. Tuberculosis in pregnancy can pose a significant risk of morbidity for both the pregnant woman and the foetus if not diagnosed and treated promptly.[29] This study found no association between pregnant women's risk factors and TB-positive TCM test results (p-value = 0.431>0.05; r=0.065). Even so, TB cases in pregnant women have a huge risk to pregnant women and fetuses, so pregnant women must be vigilant in maintaining a healthy body to support the growth and development of the fetus in the womb.

Influence of Risk Factors for Dropping Out of Treatment with TB-Positive TCM Results
Discontinuing treatment before the prescribed period can cause TB bacteria that do not die to develop

resistance. Incomplete drug use can increase the risk of death from TB.[43] Incomplete treatment is certainly influenced by many factors. The results of previous studies found that incomplete TB treatment was due to low patient motivation (p-value 0.046 and 0.004), family motivation (p-value 0.03 and 0.05), and severe (p-value 0.01) and mild (p-value 0.04) OAT side effects.[28] Another factor is due to boredom with long treatment, side effects of anti-tuberculosis drugs or feeling better after the initial stage (first 2 months) of treatment. Other causes include economic factors and transport barriers to health services. The results of this study found that there was no relationship between the variable of having been treated but not completed with a positive TB TCM examination result.

CONCLUSIONS

The conclusion is that the variables that have a significant effect in the model are smoking behaviour and fever on TB-positive TCM test results in the Oesapa Puskesmas working area in 2024.

Advice

These results found that some respondents were still mistaken about the causes of TB, so there is a need to educate the general public as well as teach proper coughing etiquette and how to dispose of sputum as recommended to avoid transmission. There is a need to socialise a Clean and Healthy Lifestyle in the community in an effort to improve health.

DECLARATIONS

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