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Risk Factor Analysis Of Tuberculosis (TB) Transmission A Study To Determine The Sources Of Transmission And The Increasing Number Of Patients In Urban Communities

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Abstract

What causes tuberculosis to increase in the community despite the availability of affordable health facilities and free TB drugs. This study aims to determine the dominant risk factors associated with the incidence of TB transmission. This study was conducted in the working area of Pampang Health Centre, Makassar City with a cross sectional study. The number of samples was 91 samples taken by purposive sampling technique. Data results were analysed univariately, bivariately and multivariately on Stata. The results showed that the factors associated with TB transmission were: level of knowledge (p=0.001), close contact (p=0.000), mask use (p=0.004), occupancy density (p=0.000), nutritional status (p=0.001), exposure to CO_2 gas (p=0.000) and exposure to $PM_{2.5}$ dust particles (p=0.022). The unrelated factor was personal hygiene (p=0.630). Further analysis with logistic regression showed that knowledge level (OR=10.3, p=0.017, CI.1.50-70.34), close contact (OR=64.5, p=0.000, CI.6.43-647.40), CO_2 gas exposure (OR=15.4, p=0.007, CI.2.09-113.73) and occupancy density (OR=28.8, p=0.007, CI.3.91-212.73) were more significant risk factors for TB transmission with a probability value of

99.6%. The most dominant risk factor is close contact, so it is necessary to increase education about TB, fulfil adequate nutrition, improve physical housing, and conduct case-contact tracing to avoid case loss and transmission risk.

Keywords: Risk Factors TB Transmission Public Health Pampang Health Centre.

1. INTRODUCTION

Tuberculosis (TB) is a leading infectious disease causing poor health in the world [1]. Global data states that the COVID-19 pandemic resulted in a decline in the number of people newly diagnosed with TB from 7.1 million in 2019 to 5.8 million in 2020, an 18% drop back to 2012. 16 countries accounted for 93% of these cases, with India, Indonesia and the Philippines being the worst affected [2].

Indonesia's TB data in the last 3 years has decreased, namely, in 2018 there were 570,289 cases, in 2020 there were 393,323 cases and in 2021 there were 385,295 cases. The achievements of the TB programme in 2021 include; Treatment Coverage (TC) 85% achieved 47%, Treatment Success Rate (TSR) target 90% achieved 84%, RO TB Enrollment target 86% achieved 60% and RO TB treatment success target 75% achieved 45% [2].

The biggest challenge facing Indonesia is that there are still many "missing cases", meaning TB cases that are undiagnosed or diagnosed but not recorded in the national TB recording system. Missing cases have an impact on TB control efforts because the existence and condition of the index case is unknown despite case-finding efforts where the Case Detection Rate (CDR) is one of the indicators of successful achievement of the national TB programme [3].

South Sulawesi is one of the provinces contributing to TB cases in Indonesia, where in 2019 there were 19,071 TB cases with details of 11.226 men and 7.845 women. The number of BTA^+ was 11.476 people (60.17%) registered and treated, with a cure in 2019 of 5.366 people (46.75%). Data for 2020 recorded 31.022 estimated TB cases, of which only 14.808 cases were identified or an increase of 22.5% of TB cases from 2019 [4].

The distribution of TB cases in South Sulawesi Province comes from Makassar City as the largest contributor of TB cases compared to other districts/cities. According to TB data from the Makassar City Health Office, in 2019 there were 5.412 TB patients with a cure rate of 83%, then in 2020 the case had decreased to 3.250 patients with a cure rate of 85% and in 2021 it jumped again to 3.911 with a cure rate of 85%. So far, the death rate from TB has been 231 patients in 2019, 156 patients in 2020 and 126 patients in 2021 [5].

The preliminary study revealed several problems in the implementation of the TB programme in Makassar City, despite having innovated by implementing various kinds of intervention programmes to solve the TB problem in the community, namely the lack of multisectoral coordination and collaboration of all parties to support the TB programme, although currently the TB case finding efforts are actively promoted by the Makassar City TB Elimination Team with the use of the “Sobat TB” application has been implemented, SITB (TB Information System) reporting at several health facilities that are not optimal needs to be improved, officers double as PMO (companion taking medicine) and there are several family members who volunteer to become PMO and this is closely related to the success of TB treatment.

Another obstacle experienced is that the community is not open with their health conditions, where at the initial symptoms remain at home and when entering the severity phase, they seek treatment at health facilities and this has the opportunity to increase the risk of TB transmission, especially with the current Covid-19 pandemic status, making people reluctant to seek treatment at health facilities due to Covid-19 stigma which affects the coverage of basic health services [6].

This is in line with the performance accountability report of the Indonesian Ministry of Health in 2020 that obstacles to achieving TB service targets are caused by; reduced TB programme resources due to the transfer of Covid-19 countermeasures, the use of TCM (molecular rapid tests) for TB diagnosis and resistant TB is also used for Covid-19 diagnosis, not all TB cases have been successfully found and reached, contact investigation has not been maximised due to cadres' concerns about tracking and tracing TB cases in the community, provision of TB preventive therapy is not optimal, patients do not routinely take drugs, some labs have stopped conducting TB examinations due to the transfer of Covid-19 examinations, PMO is disrupted and other determinant factors [3].

In this situation, possible risk factors for TB transmission include HIV patients, patients taking immunosuppressant drugs for a long time, smokers, high alcohol consumption, children under five years of age and the elderly who interact closely with infectious TB patients [3]. Other risk factors include poor nutrition, BCG vaccine status, age, history of contact with TB patients and poor environmental conditions including personal hygiene that interact with TB transmission. Novrika's research (2021) found that 70% of TB patients have unqualified personal hygiene such as spitting in any place, not covering their mouths when coughing, smoking habits are one of the causes of TB exposure [7].

TB data in 2022 recorded at the Makassar City Health Office were 5,724 cases or 89% of the target achievement of the 6,677 TB burden target set which decreased compared to 2021 when 4,109 TB cases were reached out of 6,685 targets. Pampang health centre is one of the health centres with the most TB cases in the last 2 years. Data up to the 4th quarter recorded 1,058 TB suspects. 130 patients were followed up with TCM and 99 patients were found to be TB positive and 31 patients were TB negative out of a case finding target of 214 in 2022 [5].

Based on the description of TB cases that have been described, it is necessary to conduct research on "Analysis of Risk Factors Associated with Tuberculosis Transmission in the Pampang Health Centre Working Area, Makassar City Health Office, South Sulawesi Province in 2022".

2. METHODS

The type of research used is descriptive analytic with cross sectional study design [8], which is a study of disease prevalence at the same time as the prevalence of causes or risk factors aimed at observing the relationship between risk factors and consequences that occur in the form of certain diseases or health conditions at the same time [9].

This study was conducted in the working area of Pampang Health Centre, Panakukang Subdistrict, Makassar City Health Office, South Sulawesi Province from January to February 2023 with a total sample of 91 respondents taken by purposive sampling technique. Primary data were collected using questionnaires and observation measurements specifically for nutritional status parameters, exposure to CO_2 gas and exposure to $PM_{2.5}$ dust particles in the house. Secondary data were obtained from the TB 01 and TB 02 registers in the Pampang Health Centre.

Statistical analysis consists of, univariate analysis was conducted to produce frequency distribution data and percentages of each variable, followed by bivariate analysis to determine the relationship between two variables, using the Chi Square test and multivariate analysis to determine which independent variable has the greatest influence on the dependent variable using multivariate logistic regression.

The procedure begins with the selection of candidate variables based on bivariate analysis of independent variables. The results of bivariate analysis that show a p-value <0.25 can be continued with multivariate analysis modelling.

The results of the analysis of significant variables with a p-value <0.05 are the selected model. Variables that were not significant with a p-value > 0.05 were excluded from the model in order of the highest p-value so that the best model was obtained in all significant variables with a p-value <0.05.

3. RESULTS AND DISCUSSION

3.1 Results

Table 1 shows that the characteristics of the respondents studied based on gender were mostly men with a proportion of 54.9% (50 respondents) compared to women. For the age group, most were in 2 age intervals, namely 15-30 years and 47-62 years with a total of 29 people (31.9%) and the least was in the age group >63 years (12.1%).

Respondents in terms of education level were mostly at the high school level, totalling 33 people (36.3%) and the fewest respondents who did not go to school were 4 people (4.4%). When viewed from the employment status, the majority were private workers, namely 35 people (38.4%) and the least were mechanics, namely 2 people (2.2%). 62.6% of respondents had low knowledge of TB, 69.2% had a history of close contact with the index TB case, 56.0% did not use masks, 71.4% lived in houses that did not meet the occupancy density requirements, 69.2% had good personal hygiene, 54.9% had abnormal nutritional status, 61.5% were exposed to CO_2 gas in the house with high concentrations, and 78.0% were exposed to $PM_{2.5}$ dust particles in the house with high intensity.

Table 1. Distribution Based on Respondent Characteristics and Research Variables

Characteristics / Research Variables	Frequency (n)	Percentage (%)
Gender		
Male	50	54.9
Female	41	45.1
Age group		
15-30 Years	29	31.9
31-46 Years	22	24.1
47-62 Years	29	31.9
≥ 63 Years	11	12.1
Education		
Not in School	4	4.4
Elementary School	14	15.4
Secondary School	14	15.4
High School	33	36.3
Diploma	5	5.4

Undergraduate	21	23.1
Jobs		
Not Working	22	24.2
Civil Servant	8	8.8
Private Workers	35	38.4
Mechanics	2	2.2
Daily Labourer	6	6.6
Merchant	5	5.5
Student	13	14.3
Knowledge		
Good	34	37.4
Less	57	62.6
Close Contact		
No Close Contact	28	30.8
Close Contact	63	69.2
Use of Masks		
Using Masks	40	43.9
Not Using Masks	51	56.1
Occupancy Density		
Eligible	26	28.6
Not Eligible	65	71.4
Personal Hygiene		
Good	63	69.2
Bad	28	30.8
Nutritional Status		
Normal	41	45.1
Not Normal	50	54.9
CO_2 Gas Exposure		
Low	35	38.5
High	56	61.5
$PM_{2.5}$ Exposure		
Low	20	21.9
High	71	78.1
Total	91	100.0

Table 2. Results of Chi Square Bivariate Analysis of Research Variables

Risk Factors	TB Transmission				Total		Chi Square/ p-value	RP	CI 95% (LL - UL)
	Not Sick with TB		Sick with TB						
	n	%	n	%	n	%			
Knowledge									1.121-2.111

Good	15	44.1	19	55.9	34	100	0.001	1.538	
Less	8	14.0	49	86.0	57	100			
Close Contact									
No Close Contact	17	60.7	11	39.3	28	100	0.000	2.303	1.443-3.675
Close Contact	6	9.5	57	90.5	63	100			
Use of Mask									
Using Masks	16	40.0	24	60.0	40	100	0.004	1.438	1.091-1.894
No Using Masks	7	13.7	44	86.3	51	100			
Occupancy Density									
Eligible	16	61.5	10	38.5	26	100	0.000	2.32	1.416-3.800
Not Eligible	7	10.8	58	89.2	65	100			
Personal Hygiene									
Good	15	23.8	48	76.2	63	100	0.630	0.937	0.714-1.230
Bad	8	28.6	20	71.4	28	100			
Nutritional Status									
Normal	17	41.5	24	58.5	41	100	0.001	1.503	1.134-1.984
Not Normal	6	12.0	44	88.0	50	100			
CO_2 Gas Exposure									
Low	17	48.6	18	51.4	35	100	0.000	1.736	1.243-2.426
High	6	10.7	50	89.3	56	100			
$PM_{2.5}$ Exposure									
Low	9	45.0	11	55.0	20	100	0.022	1.459	0.966-2.206
High	14	19.7	57	80.3	71	100			

Data in table 2 above from the results of bivariate analysis show that variables significantly associated with the incidence of TB transmission include the level of knowledge (p=0.001), close contact (p=0.000), mask use (p=0.004), occupancy density (p=0.000), nutritional status (p=0.001), exposure to CO_2 gas (p=0.000) and exposure to $PM_{2.5}$ dust particles (p=0.022). The unrelated factor was personal hygiene (p=0.630).

Table 3. Results of Logistic Regression Selection Analysis Variable

Risk Factors	$p > \lvert z \rvert$
Knowledge	0.057
Close Contact	0.003
Use of Masks	0.177
Occupancy Density	0.002
Nutritional Status	0.130
CO_2 Gas Exposure	0.016
$PM_{2.5}$ Exposure	0.134

At this stage, all variables with a p-value <0.25 in the bivariate analysis results are used as multivariate test candidates using the Step Wise method where the Stata application will automatically exclude variables with a p-value > Pr (0.05), with the results in the table 3 above shows that of the previous 8 independent variables that became candidates for further testing to the multivariate analysis stage, 7 variables remained because 1 variable, namely personal hygiene, had a p-value >0.25. After using the step wise method to select candidates to be analysed with the logistic regression test, 4 variables passed with a p-value <0.05, namely; the knowledge variable (p-value = 0.057), the close contact variable (p-value = 0.003), the occupancy density variable (p-value = 0.002) and the CO_2 gas exposure variable (p-value = 0.016). While the other 3 variables that did not pass because the value (p-value > 0.05) were; variable use of masks (p-value = 0.177), variable nutritional status (p-value = 0.130) and variable $PM_{2.5}$ exposure (p-value = 0.134).

The next step was to carry out analysis with logistic regression for the variables that passed the selection with the following results:

Table 4. Result of Logistic Regression Analysis Variable

Risk Factors	OR	z	$p > \lvert z \rvert$	CI (95%)
Knowledge	10,2864	2,38	0,017	1.5041-70.3451
Close Contact	64,5382	3,54	0,000	6,4336-647,405
CO_2 Gas Exposure	15,4429	2,69	0,007	2,0968-113,735
Occupancy Density	2,.8395	3,30	0,001	3,9098-212,726

The results in table 4 show that the most dominant variable significantly associated as a risk factor for TB transmission in respondents is close contact with OR = 64.5, (p = 0.000 CI.6.43-647.40) meaning that the risk of TB transmission in respondents who are in close contact with TB index cases is 64.5 times compared to respondents who are not in close contact with TB index cases.

Then the calculation is carried out the logistic regression value equation is an advanced analysis to calculate the probability value of the previous 4 variables by determining the coefficient value and constant value using the Stata application with the results; knowledge variable (Coef = 2.3308), close contact variable (Coef = 4.1672), CO_2 gas exposure variable (Coef = 2.7372) and residential density variable (Coef = 3.3617) and value (-cons = -5.6968). The following analysis results are in the table below:

Table 5. Result of Logistic Regression Analysis Variable

Risk Factors TB Transmission	Coef.	z	$p > \|z\|$	CI (95%)
Knowledge	2.3308	2,38	0,017	0.4082-4.2534
Close Contact	4.1672	3,54	0,000	1.8615-6.4729
CO_2 Gas Exposure	2.7372	2,69	0,007	0.7404-4.7338
Occupancy Density	3.3617	3,30	0,001	1.3635-5.3600
-cons	-5.6968	-3.63	0.000	-8.7701- -,6235

After obtaining the coefficient value and constant value, the logistic regression equation can be determined, namely:

$Y = -5697+3.362_{(\text{Occupancy Density})} + 2.737_{(\text{CO2 Gas Exposure})} + 4.167_{(\text{Close Contact})} + 2.331_{(\text{Knowledge})}$

Furthermore, the value of Y can be calculated by giving values of (1) and (0) based on the risk characteristics of all variables; for example, by giving a value of (0) to the variables of lack of knowledge, close contact with TB patients, unqualified residential density and high CO2 gas exposure, the results of calculations with Stata are:

Y = -5.697+3.362*0+2.737*0+4.167*0+2.331*0
Y = -5.697

In determining the probability value using the formula: $P = 1/\left(1+\exp^{(-y)}\right)$. Because the value of Y = -5.697, the equation obtained is: $P = 1/\left(1+\exp^{(-5.697)}\right)$. By calculating using the Stata application, the result of the display 1/(1+exp(-5.697) is 0.99665521. Based on this value, it can be said that the probability of TB transmission among respondents in Panakukang Subdistrict, Pampang Health Centre working area, Makassar City Health Office who have insufficient knowledge of TB, close contact with TB patients, exposure to high CO_2 gas in the house and live in a densely populated house that does not meet the requirements of a healthy home, is 99.6%.

3.2 Discussion

The characteristics of respondents with male gender were more sick with TB with a proportion of 51.5% cases compared to female respondents. The results of the study are similar to research conducted by Cheng et al. (2020) [10] who observed the incidence of active TB and risk factors in the elderly population in China as the largest contributor to cases was male patients of non-Han nationality at 26.80%. The results of Indonesia's national health research (2018) showed 3,219 TB cases, of which 1,865 (57.9%) cases were suffered by men (Tobing et al, 2021) [11].

The age group of respondents 15-30 years suffered the most TB, namely 24 cases (35.3%). Tobing et al [11], informed that in the results of research data analysis, it was found that the highest incidence of TB occurred in the age group 19-54 years, amounting to 2,094 cases. The same as that found by Saifullah et al (2021) [12] that age ≤38 years has a risk of 2.5 times being sick with MDR TB This case occurs at a productive age.

The education level of the respondents was mostly at the senior high school level (SLTA), namely 33 people (36.3%) of which 23 people were confirmed positive for TB (BTA^+). Noerfitra (2022) [13] found that 70.4% of TB cases were mostly at the final high school education level. In this situation, it can be said that respondents with a high school education level are categorised as higher education but can infected with TB.

The employment status in this study was mostly respondents with jobs in the private sector, namely 35 people (38.5%) of which 23 people were sick with TB (BTA^+). In line with this study is (Firdausi 2019) [14] who found that respondents who worked as private employees were at risk of 9.5 times contracting TB when compared to other types of work.

It can be said that the type of work of a person determines how much risk of contracting TB disease if it is associated with the work environment, for example, people who work in a factory area with high dust have the potential to experience respiratory tract disorders which generally experience TB disease and the risk of mutual transmission occurs in factory work groups that are densely employed.

The level of knowledge in this study has a significant relationship with the incidence of TB transmission, which is the same as that conducted by (Maharja et al. 2021) [15] who found that patients with a low level of knowledge had a risk of dropping out 5.28 times and potentially relapsing or relapsing and transmitting to others.

Knowledge and Attitude for TB case finding studied by Madjid et.al 2019 [16][17] in Majene District, West Sulawesi that after intervention with the FGD counselling method there was a significant increase. Madjid [18] also found a significant relationship between the knowledge and attitudes of respondents about efforts to prevent and spread TB in ethnic Mandar in Rangas Village with a value of 2.521. It can be said that the right pattern of TB health promotion can increase a person's knowledge about TB.

Respondents' knowledge about TB determines their behaviour towards protecting themselves from the risk of TB transmission. In this study, it was found that respondents with poor knowledge and good knowledge both had a low response to efforts to protect themselves from the dangers of TB transmission.

Research by (Laghari et al. 2019) [19] who conducted contact screening and TB risk factors in household contacts of children with active TB cases in Pakistan where out of 2,397 respondents who were in household contact with 443 index cases found 223 TB cases came from symptom screening results and 35 other TB cases from contacts diagnosed with TB.

Gebretsadik et al (2020) [20] also found that TB patients in Ataye district hospital of Northeast Ethiopia had a history of contact with known index TB cases and a history of contact with confirmed TB from family members, friends, neighbours and others.

The presence of a history of close contact with previous TB patients, both household contact and contact in the public environment that lasts for a long time and repeats continuously is at risk of contracting TB.

The use of masks in this study showed that 44 TB patients did not use masks. In contrast to research by Sharma et al (2022) [21] on the perception of coronavirus among TB patients in Delhi India found that during the Covid-19 pandemic (98.6%) TB patients were required to wear masks in public places and even followed social distancing (85.9%).

The use of masks is one of the effective prevention methods against bacteria or viruses, such as TB, Influenza and Covid-19. People who are exposed to these diseases should obediently use masks when they are in the treatment room, for example in a hospital, or when they are at home (outpatient) and all family members who interact with these patients are also required to use masks so as not to be infected.

Aditama et al (2019) [22] found that residential density that does not meet the requirements is at risk of TB cases 27 times compared to residential density that meets the requirements in the working area of Puskesmas Lhoong, Aceh Besar district. These results are also similar to research from Amelia et.al (2018) [23] where residential density is significantly associated with the incidence of TB in the working area of Puskesmas Kaluku Bodoa Makassar City.

The results of observations of population settlements in the Panakukang sub-district area, especially the Pampang area, look very dense with the condition of residential housing close together and some are spaced apart but not much. The condition of the respondents' houses studied was on average densely inhabited, the size of the room occupied was <8 M^2 and more than two people occupied the same room. Moreover, the condition of house ventilation is poor and sunlight is not direct because it is blocked by the walls of neighbouring houses. This is what causes the risk of TB transmission in respondents who live in densely populated houses.

The personal hygiene of the respondents studied found insignificant results in contrast to (Fitrianti 2021) [24] who found that there was a significant relationship between the personal hygiene practices of patients with the incidence of pulmonary TB at Talang Ubu Hospital, Penukal Abab Lematang Ilir Regency in 2021 with a p-value = 0.013. Sofiyani and Wijayanti (2022) [25] found that hygiene practices include the habit of drying sleeping equipment, opening house windows and washing hands as risk factors for transmission of TB to household contacts at Puskesmas Klareyan, Pemalang Regency.

This study found that out of 68 BTA^+ cases, 70.6% of respondents practised good personal hygiene and 29.4% practised poor personal hygiene. It can be said that even respondents who apply good personal hygiene can contract TB, let alone respondents who apply poor personal hygiene.

Research conducted by Musuenge et al (2020) [26] which examined the nutritional status of TB patients in the Burkina Faso health centre area found that the overall prevalence of undernutrition in TB patients was 35.8% (BMI <18.5 kg/m^2). Similar results were found by Pajanivel et al (2022) {27) that almost half of TB patients were underweight and DM was the dominant comorbidity in India.

Nutritional status is a health condition that is influenced by the adequacy of nutrient intake and nutrient utilisation. When a person's nutritional intake meets the daily nutritional needs, it is said that the person is in a good nutritional status phase, but when the nutritional intake is insufficient or excessive, it can lead to the risk of nutritional imbalances that allow the person to be in an abnormal nutritional status phase and the risk of developing diseases.

The results of this study indicate that there is a significant relationship between exposure to CO_2 gas in the house and the incidence of TB transmission. According to research by Zurcher et al (2022) on the risk of TB transmission in clinics in South Africa, a range of 9-29% was obtained during 1 hour of exposure with CO_2 levels of 564 ppm highest in the morning. [Bunyasi et al (2022) [29] found that the average ambient CO_2 concentration was 886 ppm with an airborne concentration of RD9 TB germs of 3.61 copies per 180,000 litres in a school classroom in South Africa with an average risk of a student inhaling RD9 TB germs per 1 hour of 0.71%.

Carbon dioxide (CO_2) is a waste gas produced as a result of cellular metabolism in the body. It is bound to red blood cells and travelled to the lungs, where it is expelled through exhalation. Apart from being produced from metabolic processes, this gas is also found in factory smoke, vehicle fumes, smoke from burning garbage or waste, ice, smoke from cooking activities and in high concentrations can affect the imbalance of the human body.

When viewed from the requirements of a healthy home where CO_2 gas is produced from conditions of occupancy density, houses that have poor ventilation, a dense home environment close together so that healthy air circulation is disrupted resulting in CO_2 gas levels in the air in the house increasing and providing opportunities for faster growth and breeding of Mycobacterium tuberculosis.

Research conducted by (Dimala and Kadia 2022) [30] which examined the analysis between ambient air pollution and Pulmonary TB transmission by reviewing 24 research articles from Asian countries with a total of 437,255 TB cases found that there was a significant association between exposure to PM 2.5 particles (pooled aRR = 1.12, 95% CI: 1.06-1.19 with p-value = 0.001 and N = 6).

The same research was conducted by (Huang et al. 2020) [31] who examined the relationship between short-term air pollution exposure and TB incidence in Hubei, Wuhan China which observed case trends during the 2015-2016 period of 12,648 cases where daily TB incident cases were obtained from the Hubei Provincial Centre for Disease Control and Prevention (Hubei CDC) using single and multiple pollutant models to examine the relationship between air pollution and TB transmission during the warm season (May-October) and winter (November-April). In the single pollutant model, for a 10 µg/m3 increase in PM2.5, the risk of TB incidence increased by 17.03% (95% CI: 1.88-32.42).

Dust is very small solid particles with a diameter of < 500 micrometres, one of which PM2.5 (particulate matter) is very small in size and cannot be seen with the eye so it easily causes irritation to the lungs which allows a person to easily become infected with TB where TB bacteria can adhere to dust particles that enter the lungs because they are 0.3-0.6 microns in size. It should be noted that M.tuberculosis is a small bacillus that is resistant to low levels of disinfectants and can survive in a dry environment for weeks.

When associated with the condition of the respondents' homes studied when measuring PM2.5 dust particles, 71 respondents (78.02%) were exposed to PM2.5 with high concentrations above the threshold value measured using the HT-9600 portable particle counter and 57 respondents (80.3%) of them were diagnosed with TB.

4. CONCLUSIONS

The incidence of TB transmission in the community in the working area of Pampang Health Centre with a probability of case occurrence value of 99.6% is motivated by low knowledge factors, a history of close contact with TB index cases, not using masks, being in densely populated housing conditions, having abnormal nutritional status and being exposed to CO_2 gas and PM2.5 dust particles in the house with high intensity.

Therefore, it is necessary to increase community knowledge by conducting TB promotion education, fulfilling adequate daily nutrition, physical improvement of the house according to the requirements of a healthy home, increasing early detection of TB cases by expanding active case finding activities such as tuberculin testing, rapid molecular testing (TCM), increasing tracking of TB contact cases, monitoring taking TB drugs until complete and cured and final evaluation to declare the patient completely cured by examining the last sputum after completion of treatment in order to reduce the risk of widespread TB transmission in the community and relapse cases.

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