

HISTORY OF TUBERCULOSIS CONTACT AND TUBERCULIN TEST RESULT

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ABSTRACT

Introduction: Tuberculosis (TB) is a chronic disease caused by *Mycobacterium tuberculosis*. History of tuberculosis contact has consequences for TB infection. Density of occupancy may also accelerate TB transmission. Tuberculin test is a screening method that can detect TB infection. However, BCG immunization can reduce the specificity of tuberculin test results because it causes false positive results.

Aim: The aim of this study is to see the relationship between history of TB contact and tuberculin test results. Other variables related to tuberculin test results were also examined i.e. occupancy density and incidence of BCG immunization.

Methods: This research was conducted with cross-sectional analytic design using contingency coefficient test with a value of $\alpha = 0.1$. TB contacts subjects were taken from Surabaya Pulmonary Hospital and non-TB contacts subjects were volunteers from Medical Faculty of Widya Mandala Catholic University volunteers and Medical Faculty of Wijaya Kusuma. Each group consisted of 25 people taken using consecutive sampling technique. There is a significant correlation between history of tuberculosis contact and tuberculin test ($p = 0,000$); There is no significant correlation between BCG immunization history and tuberculin test results ($p = 0.221$)

Result: There is a significant correlation between occupancy density and tuberculin test results ($p = 0.066$).

Conclusion: It can be concluded that history of tuberculosis contact and occupancy density are associated with positive tuberculin test results.

Keywords : Tuberculosis, tuberculin, tuberculosis contact

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INTRODUCTION

Tuberculosis (TB) is a chronic infectious disease caused by *Mycobacterium* bacterium group, *Mycobacterium tuberculosis*, *Mycobacterium bovis*, *Mycobacterium africanum*.⁽¹⁾

Pulmonary Tuberculosis bacteria was observed by Robert Koch on March 24th 1882 for the first time.⁽²⁾ In 2014, 6 million incidents were identified and caused 1.5 million deaths. 95% of TB cases occur in developing countries such as India, Ghana, and Indonesia.⁽³⁾ According to some researches, it was known that low-income countries and densely populated countries are correlated with TB infection.⁽²⁾

Diagnosing TB is a difficult task, it needs a long time and high cost. *Tuberculin skin test* (TST) is a cheap and easy method to identify *M. Tuberculosis* infection. This technique was first developed by Robert Koch in 1890, however it was improved using the intradermal injection method by Charles Mantoux in 1912.⁽²⁾

Tuberculin test is used to identify whether a person has cellular reaction against TB basil, indicating that the person has ever been infected by *Mycobacterium*.⁽⁵⁾ However, tuberculin test could not be used to distinguish latent TB infection with active TB infection.^(4,5)

Patient with positive tuberculin test does not always exhibit clinical manifestation, radiological abnormality, and abnormality in laboratory test results.^(1,5) Diagnosis can be confirmed after microbiological examination of *M. tuberculosis* and thorax radiology.⁽⁵⁾

Research in Chennai, India, regarding the role of Mantoux test and positive TB contact in various pediatric tuberculosis forms, conducted on 605 children younger than 12 year old showed positive Tuberculin test in 30.3% subjects with history of positive contact.⁽⁶⁾ In a case-control study conducted in Semarang involving 60 children with positive and negative Tuberculin test result, it was found that history of positive contact is responsible for 90.7% of the cases.⁽¹⁾

Close contact to TB is defined by contact with TB infected patient who lives in the same house or works at the same office. This research is expected to identify the relation between tuberculin test results and history of TB contact, also with another factors related to tuberculin test results.⁽¹⁾ The aim of this research is to analyze the correlation between the history of TB contact with tuberculin test results. Data analysis utilizing SSPS and a correlation of contingency coefficient test for two nominal variables, which are history of TB contact and tuberculin test results, is used. Data from other variables

such as BCG immunization and occupancy density will also be analyzed using the contingency coefficient correlation test to identify its correlation with tuberculin test results. The correlation is considered significant if $p > \alpha$ ($\alpha = 0,1$).

METHODS

The research was conducted using the observational analytic model with *cross-sectional* approach.

Research population was taken from the TB contact population and non TB contact population. Non TB contact population was taken from volunteers from Faculty of Medicine Widya Mandala and Wijaya Kusuma who have not had history of TB contact with the total members of 25 per group.

The Contact with TB population was taken from workers near the RS Paru Surabaya. Workers are defined as the people who are working in the respiratory department, such as midwife, laboratory officer, and radiology officer.

The sample was taken from the Contact with TB and non TB contact population that were eligible based on the inclusion criteria. The method used was *consecutive sampling*, meaning all eligible participants are taken until it fulfills the desired quota.

The inclusion criteria were 20-60 year old adults who were willing to

participate in the research and were not ill. The exclusion criteria were adults who were consuming corticosteroid for a long period, have chronic illness (leprosy, HIV, *chronic renal failure*), were administered TB medications or exhibiting TB clinical manifestation, have malnutrition (BMI<16), have ever been diagnosed with TB.

Among the two groups, the samples were taken based on the inclusion and exclusion criteria, then tuberculin test was performed. The primary data were then taken through the interview who are having positive or negative tuberculin test using the modified questionnaire from Badan Penelitian dan Pengembangan Kesehatan to assess the status of the suspected respondents with TB older than 15 year old of age. The secondary data are taken from the tuberculin test results.

RESULT

Among the 50 samples of the research subjects, 25 samples were subjects with history of close contact with TB, the other 25 samples were subjects without the history of close contact with TB.

Table 1. Sample Distribution based on Age

Age	Research Subject		Total
	TB contact	No TB contact	
20-29	5	16	21
30-39	10	3	13
40-49	8	5	13
50-59	2	1	3
Total	25	25	50

On table 1, the frequency distribution of the TB contact group and non TB contact group based on age was identified. Most of the research subjects were 20-29 years old with the total number of 21.

Tabel 2. Sample Distribution based on Gender

Gender	Research Subject		Total
	TB contact	No TB contact	
Male	12	9	21
Female	13	16	29
Total	25	25	50

On table 2, research subject distribution based on gender was identified. The number of the subjects were 21 for the male subjects and 29 for the female subjects.

Table 3. Sample Distribution Based on Tuberculin Test Results

Tuberculin Test Result	Frequency	Percentage
Positive (≥ 10 mm)	25	50%
Negative (< 10 mm)	25	50%
Total	50	100%

On table 3, it is shown that 25 participants have positive tuberculin test and the other

25 participants have negative tuberculin test.

Table 4. Sample Distribution Based on BCG Vaccination History

BCG Vaccination History	Frequency	Percentage
Yes	43	86%
No	7	14%
Total	50	100%

On table 4, it is shown that 43 (86%) participants had been vaccinated and the other 7 (14%) participants had not been vaccinated.

Table 5. Sample Distribution Based on Occupancy Density

Occupancy Density	Frequency	Percentage
Yes	9	18%
No	41	82%
Total	50	100%

On table 5, it is shown that 9 (18%) participants live in a densely populated residence. On the other hand, 41 (82%) participants do not live in a densely populated residence.

Table 6. Cross Data Summation of Contact History and Tuberculin Test Results

Tuberculin Test Result	TB Contact History		Total
	Yes	No	
Positive	20	5	25
Negative	5	20	25
Total	25	25	50

Based on the cross data summation, data was analyzed using the contingency coefficient test for nominal-nominal data type.

Table 7. Analysis of the Correlation of Contact History and Tuberculin Test Results

	Value	Significance
Contingency Coefficient	,514	,000

The analysis results show significance value of 0,000 ($p=0,000$), meaning $p < \alpha$ ($\alpha = 0,1$), therefore it was concluded that there is a significant correlation between the tuberculin test results and the history of contact with TB. Correlation coefficient between the two variables is 0,514.

Table 8. Cross Data Summation of History of BCG Vaccination and Tuberculin Test Results

Tuberculin Test Result	History of BCG Vaccination		Total
	Yes	No	
Positive	23	2	25
Negative	20	5	25
Total	43	7	50

Cross data summation, was analyzed using the contingency coefficient test.

Table 9. Analysis of the Correlation of BCG Vaccination History and Tuberculin Test Results

	Value	Significance
Contingency Coefficient	,170	,221

The analysis results show significance value of 0,221 ($p = 0,221$), meaning $p > \alpha$ ($\alpha = 0,1$), therefore it was concluded that there is no significant correlation between BCG vaccination history and tuberculin test results.

Table 10. Cross Data Summation of Occupancy Density and Tuberculin Test Results

Tuberculin Test Result	Occupancy Density		Total
	Yes	No	
Positive	2	23	25
Negative	7	18	25
Total	9	41	50

The data listed above was analyzed using the contingency coefficient test for nominal-nominal data type.

Table 11. Analysis of Occupancy Density and Tuberculin Test Results

	Value	Significance
Contingency Coefficient	,252	,066

The analysis shows significance value of 0,066 ($p = 0,066$), meaning $p < \alpha$ ($\alpha = 0,1$), therefore it was concluded that there is significant correlation between occupancy density and tuberculin test results. Correlation coefficient of the two variables is 0,252.

DISCUSSION

In this research, it was found that the correlation of history of contact with TB and tuberculin test results is significant. We identified significant correlation with the significance value of 0,000 with the correlation coefficient value of 0,514. This result correspond to the research conducted by Dwi Purnomo in 2010 in which the role of contact with

TB was as high as 90.7% as the risk factor for positive tuberculin test result.⁽¹⁾

Research conducted by Badan Penelitian dan Pengembangan Kesehatan Indonesia also exhibits same results, the number of people infected with TB was doubled among the participants who live with or near patients infected with TB as a result of the exposure with the TB bacteria.

In the research conducted by Rusnoto regarding the factors related to pulmonary TB cases in Semarang, 63.8% of the subjects who were infected with TB had a history of close contact with TB patients.⁽⁸⁾

The results of this research were also in agreement to research regarding the factors that cause pulmonary TB cases in Koeloda primary health center, NTT. The results of that research showed significant correlation between the history of contact with TB and TB cases with the *p* value of 0.001.⁽⁹⁾

Another research in Kabupaten Bandung Barat regarding the factors related to pediatric TB cases also showed significant correlation with the *p* value of 0,000.⁽¹⁰⁾

Close contact with TB patients is the main factor of TB transmission, the closer and longer the contact, the greater the risk. Thus, contact in the same house

or office has a great role as the risk factor of contracting TB infection.⁽¹⁾

Based on the Pedoman Nasional Pengendalian Tuberkulosis, people with history of contact with TB are one of the main targets for pulmonary TB screening, especially the ones who have contact with AFB (+) pulmonary TB and MDR-TB patients.⁽¹¹⁾

In this research, the correlation between BCG vaccination history and tuberculin test results was not significant, with the significance value of 0,224-

There are still many controversies regarding positive tuberculin test results after the BCG vaccination and there is no clear explanation regarding this matter. Based on the recommendation from United States, BCG vaccination does not affect tuberculin test results. In tuberculin test showing over 10 mm induration, the existence of infection is still considered.⁽²⁾

In the case-control study in San Diego, significant correlation between BCG vaccination and positive tuberculin test was observed. The case group in this research was children with positive tuberculin test and the control group was children with negative tuberculin test. In that research, 73% participants from the case group had been vaccinated with BCG, on the other hand, only 7% of the participants from the control group had been vaccinated with BCG.

In the research in Saudi Arabia, among 1945 children who had been vaccinated with BCG and 643 children who had not been vaccinated, approximately 7.8% of the children from both groups had positive tuberculin test results. Another research conducted on a group of 12 years old children, significant difference from both groups was obtained. 20% of the vaccinated participants with BCG showed positive tuberculin results, however only 3.9% of the unvaccinated participants showed positive results.⁽¹²⁾

In another research, tuberculin test was performed in children with BCG vaccination history. 8.5% of the children showed positive results. The research was conducted again on children with BCG vaccination history for more than 10 years, positive tuberculin results were observed in 1% of the participants, meaning it is not clinically important.⁽¹³⁾

In this research, the correlation of occupancy density and tuberculin test was observed with the significance value of 0.066, meaning there is a significant correlation with the correlation coefficient of 0.252.

Occupancy density measured was the ratio of the house area to the number of inhabitants. The decent minimum occupancy density is 8 m² per inhabitant based on the standard.⁽⁷⁾ Other research regarding the factors related to pulmonary

TB in Koeloda primary health center, NTT, similarly showed significant correlation between occupancy density with TB cases.⁽⁹⁾

Similar research conducted in Bandung by Windy implied that there is no significant correlation between occupancy density and pulmonary TB transmission, however it was found that there is significant correlation between TB transmission with the condition of the home natural lighting.⁽¹⁰⁾ Research conducted by Elisa in public hospital in Noongan regarding the correlation between the occupancy density and pulmonary TB cases showed insignificant results.⁽¹⁴⁾

In a case-control study conducted by Mahpudin, it was found that occupancy density is not a risk factor, however, another condition of the residence such as the type of the floor is a risk factor, with *Odds Ratio* value of 2,74.⁽¹⁵⁾

Theoretically, occupancy density is supposed to affect the inhabitants. The more dense the house is, the faster the transmission is, especially airborne transmission such as TB.⁽¹⁾ According to Cissi, occupancy density and the number of inhabitant in one house are included as risk factors of TB infection beside history of contact with TB.⁽³²⁾

In this research, the data was taken primarily, using the tuberculin test results

reading and questionnaire. The interview using the questionnaire may cause *recall bias* in some questions which require respondents to memorize several things such as history of BCG vaccination. In this research, immediate and subsequent observation regarding the other condition of the residence, such as area of the window and lighting system of the residence, that may affect the results of the research was not considered.

CONCLUSION

Based on the research regarding The Correlation of History of Contact with Tuberculosis and Tuberculin Test Results, it is concluded that:

1. 50% of the participants have positive tuberculin test results and vice versa, 41 participants (82%) do not have a densely occupied residence, and 43% of the participants (86%) have been vaccinated with BCG.
2. There is a significant correlation between history of contact with TB and tuberculin test results.
3. There is no significant correlation between BCG vaccination history and tuberculin test results.
4. There is a significant correlation between occupancy density and tuberculin test results.

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