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Evaluation of the Sensitivity and Specificity of the Tuberculosis Sign and Symptom (TBSS) Score in Comparison with Chest Radiography and Rapid Molecular Test for Diagnosing Tuberculosis Among Brick Kiln Workers

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Abstract

Purpose: The aim of this study is to evaluate the sensitivity and specificity of the Tuberculosis Sign and Symptom Score in comparison to chest radiography and rapid molecular testing among brick kiln workers in Pringsewu Regency.
Patients and methods: This study uses a cross-sectional design. This study used a total sampling method, with total samples are 92. The study was conducted from February to March 2024 in a brick kiln located in Saribumi Village, Gading Rejo District, Pringsewu Regency, Lampung Province.
Results: The sample in this study consists of 92 subjects. The majority of the sample is female, accounting for 77.3%, while males make up 22.8%. The most common age range is 41-60 years, representing 48.9% of the total. In terms of job categories, most workers are employed in the molding section. The screening with TBSS score and chest radiography yielded a sensitivity of 0.25, specificity of 0.93, positive predictive value of 0.14, and negative predictive value of 0.96. The sensitivity and specificity between the RTM test and TB ss score cannot be assessed because the results of the RTM examination showed that all respondents were negative for TB.
Conclusion: All sputum examinations using rapid molecular testing (RMT) showed negative results. Its preventing the assessment of sensitivity and specificity for this method. This discrepancy may be due to suboptimal sample quality.

Keywords: Tuberculosis, Tuberculosis Sign And Symptom Score, Chest Radiography, Rapid Molecular Test

Introduction

Tuberculosis (TB) is one of the leading causes of death worldwide. The bacterium Mycobacterium tuberculosis is the causative agent of this disease, which typically affects the lungs (pulmonary TB) but can also infect other organs (extrapulmonary TB).[1] Indonesia is one of eight countries contributing to more than two-thirds of the global tuberculosis cases. The other countries are India, China, the Philippines, Pakistan, Nigeria, Bangladesh, and the Democratic Republic of Congo.[2]

Early diagnosis and successful treatment of TB are crucial to prevent the further spread of bacteria and the development of drug-resistant strains. However, because the cause is a slow-growing organism, it takes at least two weeks (sometimes 6-8 weeks) for colonies to appear and produce symptoms. In individuals infected with TB, several signs and symptoms can assist in establishing a clinical diagnosis. The clinical manifestations of active pulmonary TB may include pleuritic chest pain, mild fever, prolonged productive cough, hemoptysis, fatigue, loss of appetite, night sweats, and weight loss.[3] The Tuberculosis Sign and Symptoms (TBSS) screening test serves as an initial step in efforts to detect TB cases. If the screening is positive, chest radiography and sputum tests for sputum examination are recommended.[4]

Brick kiln workers are among the groups at high risk for developing respiratory illnesses. One of the main causes of respiratory diseases and symptoms in this group is exposure to smoke, heat, and dust from the brick kilns.[5] Continuous dust exposure, poor nutrition, and long working hours make this group particularly susceptible to chronic respiratory conditions and TB, especially when combined with extremely poor environmental condition.[6]

Lampung Province has many brick kilns, one of which is located in Pringsewu Regency. Several studies indicate that these brick kiln sites often lack proper hygiene. The smoking habits among workers also increase the risk of TB.[7,8] Therefore, research is necessary to determine the incidence of TB among brick kiln workers in Pringsewu Regency using screening methods.

The aim of this study is to evaluate the sensitivity and specificity of the Tuberculosis Sign and Symptom Score in comparison to chest radiography and rapid molecular testing among brick kiln workers in Pringsewu Regency.

Material and methods

This study uses a cross-sectional design to assess the sensitivity and specificity of the TB screening tool, namely the TB sign and symptom score, compared to chest radiography and sputum Rapid moleculer test. Cross-sectional studies are a type of research that observes the relationship between risk factors and outcomes by collecting data at a single point in time (Point in Time Approach). This study employs a total sampling method, meaning all

individuals in the population are included as research samples. The study was conducted from February to March 2024 in a brick kiln located in Saribumi Village, Gading Rejo District, Pringsewu Regency, Lampung Province. The workers in this area constitute the population of the study.

This study has inclusion criteria, which include brick kiln workers with a minimum of five years of work experience and those willing to participate in the study. The exclusion criteria consist of workers who refuse to participate as respondents. The research instruments used include a questionnaire, chest radiography equipment, and sputum testing tools for rapid molecular testing. The questionnaire consists of 16 questions related to symptoms and risk factors of TB. These questions cover various symptoms experienced by respondents, such as a cough lasting more than two weeks, contact with TB patients, loss of appetite, difficulty sleeping, impaired physical activity, fever, body weakness, hemoptysis, shortness of breath, chest pain, smoking history, alcohol consumption, history of chronic diseases, history of pulmonary TB treatment, and a feeling of heaviness in the chest. Each question has a score of 1, which will be totaled at the end of the study. If the score is above seven, it is considered a TB case. Variables in this study use nominal measurement scales. Univariable and bivariate analyses were conducted using SPSS.

Results

The sample in this study consists of 92 subjects. The majority of the sample is female, accounting for 77.3%, while males make up 22.8%. The most common age range is 41-60 years, representing 48.9% of the total. In terms of job categories, most workers are employed in the molding section, as shown in Table 1.

Tabel 1. Characteristics of the sample

Characteristics	Categories	n	%
Gender	Male	21	22,8
	Female	71	77,3
Age	21-40	12	13
	41-60	45	48,9
	>60	35	38
Occupation	Administrative	5	5,4
	Drying	8	8,7
	Klin	27	29,3
	Mixing	17	18,5
	Molding	35	38

Table 2 shows the results of chest radiography, RMT and TBSS score examinations on all respondents. In chest radiography examination, the results showed that 4 respondents were positive for TB and 88 respondents were negative for TB, in RMT examination all respondents were negative for TB and in TB SS score examination, 7 respondents were positive for TB and 85 respondents were negative for TB.

Table 2. Instruments examination results

Instruments	Positive TB	Negative TB
Chest Radiography	4	88
RMT	0	92
TB SS score	7	85

Table 3 shows the number of respondents who were positive and negative for TB in chest radiography and TB SS score examinations. The screening with TB-SS score and chest radiography yielded a sensitivity of 0.25, specificity of 0.93, positive predictive value of 0.14, and negative predictive value of 0.96. The sensitivity and specificity between the RTM test and TB ss score cannot be assessed because the results of the RTM examination showed that all respondents were negative for TB.

Table 3 TSS score and chest radiography

TB SS score	Chest Radiography		Total
	+	-	
+	1	6	7
-	3	82	85
Total	4	88	92

Discussion

In this study, the test of TB SS score and chest radiography showed sensitivity of 0.25, specificity of 0.93, positive predictive value of 0.14, and negative predictive value of 0.96. An ideal screening test is expected to have a sensitivity and specificity of 80–90%.[9]
In the RMT examination, all respondents were found to be negative for TB. This may be due to suboptimal sampling. Quality specimens are vital for the laboratory diagnosis of TB. Sputum, a respiratory secretion originating from deep within the lungs, is the specimen collected for TB testing. Specimens should be collected in containers that are sterile, clear, plastic and leak-proof such as a 50-ml screw-cap centrifuge tube. Sputum collection devices and wide-mouth sterile collection containers. It is recommended that specimens be delivered to the public health laboratory within 24 hours of collection. Samples that cannot immediately be transported to the laboratory should be refrigerated to reduce growth of contaminating.

Conventional screening using any TB signs and symptoms generally suffered low sensitivity and specificity. A study states that the present screening tool enhanced the sensitivity and specificity by incorporating not only TB signs and symptoms, but also risk factors including smoking, alcohol drinking, and TB contact.[4]

Conclusion

All sputum examinations using rapid molecular testing (RMT) showed negative results. Its preventing the assessment of sensitivity and specificity for this method. This discrepancy may be due to suboptimal sample quality.

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Disclosure

The author reports no conflicts of interest in this work.

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Notes:

Abbreviations: TB, tuberculosis Tuberculosis Sign And Symptom, Tb-SS, Radiography And Rapid Molecular Test, RMT