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ORIGINAL ARTICLE

MULTIPHASIC SCREENING: CLINICAL SYMPTOMS AND MENTAL HEALTH PATIENT TUBERCULOSIS IN JAMBI CITY, INDONESIA

Multiphasic Screening: Gejala Klinis dan Kesehatan Mental Pasien Tuberkulosis di Kota Jambi, Indonesia

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ABSTRACT

Background: Multiphasic screening with GeneXpert MTB/RIF and PHQ-9 is a solution for achieving successful conversion of intensive phase sputum examination. **Purpose:** To determine the effectiveness and feasibility of multiphasic screening for clinical symptoms and mental health in patients using the Tuberculosis Directly Observed Therapy (TB-DOTS) strategy. **Methods:** This study used a survey approach with a one-sample multiple testing screening method on the case finding and mental health of patients with TB. This screening was carried out in two stages: Stage I, suspected TB screening, and Stage II, mental health screening of TB patients undergoing intensive treatment (two months). Samples were taken from 160 TB suspects who came to health centers in Jambi City from August 1 to October 1, 2022, using proportionate stratified random sampling. Data were analyzed using statistical software to determine the accuracy and feasibility of screening. **Results:** Sputum conversion (Smear [-]) was 97.78% and the prevalence of mental health problems in patients was 22.22%. Stage I screening (suspected TB [GeneXpert MTB/RIF]): cough >2 weeks sensitivity, 94.84%; PPV, 97.35%; and accuracy, 92.50%. Stage II screening (patient mental health [PHQ-9]) with a validity of 9 items in the range of 0.17-0.66; ICC (interclass correlation coefficient [ICC], 0.60-0.83; Cronbach's α coefficient, 0.88). Multiphasic yield screening is recommended to achieve a better treatment success rate. **Conclusion:** Early detection of cases and mental health problems of TB patients in the early phase of treatment is a solution for developing a TB-DOTS strategy at first-level health facilities.

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ABSTRAK

Latar Belakang: *Multiphasic screening dengan GeneXpert MTB/RIF dan PHQ-9 adalah salah satu solusi pencapaian keberhasilan konversi pemeriksaan sputum fase intensif.* ***Tujuan:*** *Mengetahui efektivitas dan kelayakan multiphasic screening gejala klinis dan kesehatan mental pasien dalam strategi Tuberculosis Directly Observed Treatment Shortcourse (TB-DOTS).* ***Metode:*** *Studi ini menggunakan pendekatan survey dengan metode skrining secara one-sample multiple testing pada penemuan kasus dan kesehatan mental pasien TB. Skrining ini dilakukan sebanyak 2 tahap: Tahap I, skrining suspek TB; dan Tahap II, skrining kesehatan mental pasien TB yang menjalani pengobatan intensif (dua bulan). Sampel diambil sebanyak 160 suspek TB secara proportionate stratified random sampling yang datang ke puskesmas se Kota Jambi dari tanggal 1 Agustus-1 Oktober 2022. Data dianalisis menggunakan software statistic untuk mengetahui akurasi dan kelayakan skrining.* ***Hasil:*** *Konversi sputum (Smear [-]) sebesar 97.78%, dan prevalensi masalah kesehatan mental pasien sebesar 22.22%. Skrining Tahap I (suspek TB [GeneXpert MTB/RIF]): batuk > 2 minggu dengan sensitivitas, 94.84%; PPV, 97.35%; akurasi, 92.50%. Skrining Tahap II (kesehatan mental pasien [PHQ-9]) dengan validitas 9 item pada range: 0.17-0.66; ICC (interclass correlation coefficient [ICC], 0.60-0.83; Cronbach's α coefficient, 0.88). Yield multiphasic screening dapat direkomendasikan sebagai upaya pencapaian keberhasilan pengobatan (success rate) yang lebih baik.* ***Kesimpulan:*** *Deteksi dini kasus dan permasalahan kesehatan mental pasien TB pada fase awal pengobatan sebagai solusi pengembangan strategi TB-DOTS di fasilitas kesehatan tingkat pertama.*

INTRODUCTION

The early detection of mental health diseases and disorders in patients with tuberculosis (TB) is an integrated and continuous series of activities. Screening is one of the actions that can be recommended to strengthen the Tuberculosis Directly Observed Treatment Shortcourse (TB-DOTS) strategy in achieving more satisfactory treatment success and achieving "end the global TB epidemic" by 2030 (1).

The COVID-19 pandemic in early 2020 reversed several years of progress in providing essential TB services and reducing the burden of TB. The most obvious impact has been the global decline in the number of people newly diagnosed and reported with TB, from 7,1 million in 2019 to 5,8 million in 2020, down 18% back to 2012 levels and well below the estimated 10 million people with TB that were targeted (2). In 2021, a global increase of 10.6 million people will be infected with TB. Therefore, appropriate actions are needed to improve the quality of diagnosis, treatment, and physical and mental health of people with TB or DR-TB (3).

Indonesia is one of 30 countries with a high TB burden. In 2020, there were 351,936 TB cases with a Treatment Coverage (TC) of 41.70%, which is below the global achievement of 59% and a Success Rate (SR) of 82.74% (4). In 2021, there will be 397,377 TB cases with a TC of 47.08% and SR of 86.05%. Until 2020, the TB incidence rate was 301 per 100,000 people, and the mortality rate during treatment was 2.35% (3).

In 2020, Jambi Province was ranked 33 out of 34 provinces in achieving a TC of 21.94%, Cure Rate (CR) of 90.67%, SR of 88.56%, and mortality during treatment of 1.67% (5). In 2021, TC, CR, SR, and mortality during treatment were 26.30%, 35.75%, 89.92%, and 5.15%, respectively. These data indicate a decrease in the recovery rate and an increase in the death rate (4). Based on Jambi City data for 2020, treatment coverage (22.30%), success rate (93.34%), and death during treatment (3.23%) (5). In 2021, treatment coverage (69.59%) and success rate (87.23%) are expected (6).

Confirming an early diagnosis of TB and other problems during the treatment phase is essential. Following the national strategy for tackling tuberculosis in Indonesia (2020-2024), five interventions were carried out, including screening for high-risk groups, expanding the range of services, and increasing investment in resources to successfully treat drug-susceptible and drug-resistant tuberculosis (7).

This study is based on the discovery and psychological aspects of tuberculosis patients undergoing medication therapy (Directly Observed Treatment Shortcourse/DOTS) by multiphasic screening (8). This study was conducted based on several research results that stated that most patients diagnosed with tuberculosis (Smear (+)) experienced physical, psychological, and social weaknesses (9).

Tuberculosis (TB) and mental illnesses are shared globally and often coexist. Poor mental health is known to be a comorbid occurrence of treatment failure; therefore, it is necessary to anticipate concrete health services in the early symptoms of mental disorders experienced by TB patients while undergoing treatment therapy (10). reatment failure in patients with TB is due to late diagnosis of the disease and comorbid mental health disorders during the treatment phase (11). Using the TB-DOTS strategy, this study aimed to determine the effectiveness and feasibility of multiphasic screening of clinical symptoms and patients' mental health.

METHODS

Design

This multiphasic screening study was carried out using a survey approach with the screening method: one-sample multiple testing in two stages: Stage I, screening for suspected TB clinical symptoms, and Stage II, mental health screening of patients diagnosed with TB in Stage I.

The screening was conducted at the first-level health facilities at the Jambi City Health Office, namely, as many as 20 Public Health Centers that had carried out DOTS TB service activities. The population includes all TB suspects and new TB patients who undergo health checks, are diagnosed with TB, and receive OAT between August 1st - October 1st 2022.

Subjects

In this multiphasic screening, minimum sample size was calculated based on low probability event considerations: the prevalence of TB with poor quality of life (physical and mental) was 8.93%, 95%CI, design effect = 1, so a minimum sample of 125 was obtained in this screening, which was taken by proportionate stratified random sampling and met the following criteria:1) age ³ 15 years; 2) complaints of cough > for two weeks, and other accompanying complaints such as chills > one month, sputum mixed with blood, hard to breathe, chest pain, weakness, weight loss, and night sweats; 3) do not have a history of TB disease; and 4) willing to participate as a respondent by signing informed consent.

Instruments

GeneXpert MTB/RIF

The procedure for applying GeneXpert MTB/RIF to samples was based on the testing process recommended by the GeneXpert MTB/RIF manufacturer. Briefly, the processed sputum was diluted with a sample reagent at a ratio of 1:2. The reagent and sample mixtures were then shaken for at least 10 s and incubated at room temperature for 10 min. The recommended blend volume was then transferred to the Xpert MTB/RIF cartridge, and the steps and assessment procedure were automated immediately after adding the sample to the cartridge (12).

Patient Health Questionnaire-9

The PHQ-9 is a psychometric instrument used in Multiphasic Screening Stage II to assess mental health/depression problems in patients with TB, which includes nine items that focus on the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV) for MDD. This questionnaire measures how often the respondent has been disturbed by one of the nine items over the past two weeks: lack of interest, feeling gloomy, having trouble sleeping, lack of appetite, lack of confidence, difficulty concentrating, restlessness, and feeling better off dead (13).

Each PHQ-9 item was scored on a 0-3 scale (0 = not at all; 1 = several days; 2 = more than a week; 3 = nearly every day). Total PHQ-9 scores range from 0 to 27 (scores < 10 are classified as having no or mild mental health problem symptoms; 10-14 as mild mental health problems; 15-19 as moderate mental health problems; and ≥ 20 as severe mental health problems).

Procedures

In Stage I, 162 suspected TB patients underwent morning and afternoon sputum examinations, two of whom did not agree to be interviewed, and sputum samples were taken. The GeneXpert MTB/RIF examination results confirmed tuberculosis (Smear [+]) in 154 patients, and one patient confirmed the diagnosis by X-ray. In Stage II, screening was carried out only for 155 patients with confirmed Tuberculosis in Stage I, 15 of whom were <15 years old, and five patients were not willing to participate in the screening; in Stage II, 135 respondents were screened for mental health (Figure 1).

Research data collection from TB patients was carried out directly by researchers and enumerators (TB officers) whom the research team had previously given training for three days. Evaluation and monitoring of filling in the questionnaires were carried out by the research team every day.

Data collection on clinical symptoms and characteristics of suspected TB in Stage I was carried out before sputum examination was carried out, and in Stage II, data on characteristics and mental health status of patients was carried out by direct interviews using the PHQ-9 questionnaire, which was carried out two weeks after TB patients underwent the intensive phase of treatment. The study followed the seven WHO 2011 standards, referring to the 2016 CIOMS guidelines. This study was approved by the Health Research Ethics Commission of the Ministry of Health of the Republic of Indonesia on August 3, 2022 (reference number LB.02.06/2/349/2022).

Statistical analysis

The data collection was done with Microsoft "Excel" 2016 spreadsheet, and statistical data analysis was performed with Statistical Products and Service Solution for Windows version 23.0. Data description in Stage I with categorical scale data distributed with contingency tables (2×2) to see the proportion between the two dichotomous variables and analyzed to determine the validity and reliability values of each TB clinical symptom and the accuracy of GeneXpert MTB/RIF measurements. Cronbach's α and Pearson's correlation coefficients were used to analyze the internal concordance and test-retest correlation coefficients for reliability analysis. The correlation between each item score and the correlation of each item score with the total score was evaluated using the Pearson correlation coefficient. The Intraclass Correlation Coefficient (ICC), obtained from the value of the individual variance divided by the total variance, ranges from 0 to 1:0, indicating a very weak correlation; 1 indicates a solid correlation. In general, the value of the reliability coefficient > 0.70 is categorized as vital and has good reliability. For the analysis of the PHQ-9, validity is assessed from construct validity, assessed from the correlation of each question item.

RESULTS

Stage I

Characteristics of Respondents

From the 160 suspected TB patients, it was found that the average age of the patients was 39.69±18.59 years, with the highest proportion of patients being male (63.75%), high school education/equivalent (53.75%), occupation: self-employed (24.38%), income: ≤ Rp. 2,424,000 (70.63%), and nutritional status was normal (48.13%).

Validity and reliability of Clinical Symptoms Screening

In Stage I, validity and reliability tests were performed on the clinical symptoms of 160 TB suspects to confirm a TB diagnosis based on GeneXpert MTB/RIF confirmation. The results of the analysis are presented in Table 1.

Stage II

Characteristics of Respondents

Based on the results of Stage I screening, Stage II screening was carried out regarding the patient's mental health. Of the 155 TB patients with smear confirmation (+), only 135 met the inclusion criteria and were willing to participate in Stage II screening. The distribution of the characteristics of respondents in Stage II, namely with an average age of 42.84±17.13 years, with the highest proportion of patients being male (63.70%), high school education/equivalent (59.26%), occupation: self-employed (28.15%), income: ≤ Rp. 2,424,000 (66.67%), and nutritional status: average (49.63%).

Table 1
Distribution of Clinical Symptoms of Suspected TB in Stage I

Clinical symptoms	Sputum Test		Validity				Reliability
	Smear (+)	Smear (-)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	
Cough > 2 weeks							
Yes	147	4	94.84	20	97.35	11.11	0.71
No	8	1					
Sputum mixed with blood							
Yes	27	0	17.42	100	100	3.76	0.73
No	128	5					
Hard to breathe							
Yes	96	2	61.94	60	97.96	4.84	0.67
No	59	3					
Chest pain							
Yes	90	4	58.06	20	95.74	1.52	0.66
No	65	1					
Weak							
Yes	141	0	90.97	100	100	26.32	0.70
No	14	5					
Weight loss							
Yes	128	4	82.58	20	96.97	3.57	0.68
No	27	1					
Night sweats							
Yes	86	3	55.48	40	96.63	2.82	0.67
No	69	2					
Chills fever > 1 months							
Yes	84	0	54.19	100	100	6.58	0.68
No	71	5					
Total	**155**	**5**	**100**				

PPV, positive predictive value; NPV, negative predictive value
Source: Primary Data (2022)

Table 2
PHQ-9 Validity and Reliability Test for TB Patients

PHQ-9	Reliability	Validity									
	Cronbach's α coefficient N = 135	Scale									
		Item-1	Item-2	Item-3	Item-4	Item-5	Item-6	Item-7	Item-8	Item-9	*ICC*
Item-1	0.863	1									0.771*
Item-2	0.868	0.582*	1								0.718*
Item-3	0.872	0.417*	0.393*	1							0.686*
Item-4	0.855	0.661*	0.534*	0.523*	1						0.834*
Item-5	0.880	0.376*	0.349*	0.327*	0.573*	1					0.634*
Item-6	0.863	0.487*	0.626*	0.432*	0.621*	0.440*	1				0.773*
Item-7	0.859	0.594*	0.430*	0.511*	0.606*	0.456*	0.534*	1			0.801*
Item-8	0.876	0.390*	0.373*	0.419*	0.355*	0.267*	0.378*	0.581*	1		0.628*
Item-9	0.877	0.469*	0.371*	0.385*	0.444*	0.170**	0.415*	0.499*	0.383*	1	0.606*

0.881

*p < 0.01; **p < 0.05; PHQ-9, Patient Health Questionnaire; ICC, Intraclass Correlation Coefficient
Source: Primary Data (2022)

Table 3
Distribution of TB Patient's Mental Health Problems in Stage II

Mental Health Problems	Frequency, N (%)				Total score
	Not at al	Several days	More than half the days	Nearly every day	
Over the last 2 weeks, how often have you been bothered by any of the following problems?					
1. Little interest or pleasure in doing things.	55 (40.74)	61 (45.19)	5 (3.70)	14 (10.37)	113
2. Feeling down, depressed, or hopeless.	82 (60.74)	44 (32.59)	1 (0.74)	8 (5.93)	70
3. Trouble falling or staying a sleep or sleeping too much.	37 (27.41)	77 (57.04)	6 (4.44)	15 (11.11)	134
4. Feeling tired or having little energy.	19 (14.07)	81 (60.00)	10 (7.41)	25 (18.52)	176
5. Poor appetite or overeating.	23 (17.03)	77 (57.04)	10 (7.41)	25 (18.52)	170
6. Feeling bad about yourself - or that you are a failure or have let yourself or your family down.	98 (72.59)	18 (13.34)	5 (3.70)	14 (10.37)	70
7. Trouble concentrating on things, such as reading the newspaper or watching television.	100 (74.07)	24 (17.78)	2 (1.48)	9 (6.67)	55
8. Moving or speaking so slowly that other people could have noticed? Or the opposite - being so fidgety or restless that you have been moving around a lot more than usual.	103 (76.30)	21 (15.56)	3 (2.22)	8 (5.92)	51
9. Thoughts that you would be better off dead or hurting yourself in some way.	123 (91.11)	7 (5.19)	0 (0.00)	5 (3.70)	22

Source: Primary Data (2022)

Validity and Reliability of PHQ-9

In Stage II, validity and reliability tests were carried out on the mental health problems of TB patients taken from patients who had sputum examinations in Stage I; 155 TB patients were found, and only 135 patients were included according to the inclusion criteria.

The data analysis in Table 2, it is known that the validity value of each item at the coefficient interval is 0.17-0.66, and the ICC value is at the interval 0.60-0.83 with a correlation coefficient value (r product moment) of 0.16 ($n = 135$; $\alpha = 0.05$; $df = n-2$), conclusion: the value of each item is stated to be valid, and the ICC value > 0.16 (the r product moment value) thus 9 question items in PHQ-9 are declared reliable, and for Cronbach's α coefficient value is 0.88 > 0.70. The results of interviews with TB patients in Stage II screening revealed that several respondents experienced mental health disorders. The specificity of the problems experienced by respondents can be seen in the total item value score (Table 3).

Mental health problems experienced by TB patients after being diagnosed with TB and taking medication, namely that most respondents experienced fatigue and lack of energy (score:176), lack of appetite (score:170), and difficulty sleeping (score:134), with the statement that the problem occurred almost every day. Table 4 shows that the prevalence of mental health disorders in TB patients is 30 respondents (22.22%), with 3.70% of them experiencing severe mental health disorders during the intensive phase of TB treatment. However, the average score of 6.39±5.54 overall is still categorized as no symptoms.

Table 4
Distribution of PHQ-9 Score Assessment in TB Patients

PHQ-9 Score Assessment	Frequency	%
Severe (Score: ≥ 20)	5	3.70
Moderate (Score: 15-19)	10	7.41
Mild (Score: 10-14)	15	11.11
None (Score: < 10)	105	77.78
Total	135	100

Source: Primary Data (2022)

Yield

One factor that influences the feasibility of multiphasic screening that has been carried out is the yield. Stage I, it can be interpreted that the Molecular Rapid Test (GeneXpert MTB/RIF) with a sensitivity value of 99.38% and clinical symptoms of cough > two weeks with a sensitivity of 94.84%, it can be accurately ascertained that a patient is diagnosed with TB. Stage II, nine items in the PHQ-9 were declared valid in the coefficient range: of 0.17-0.66 and reliable with ICC coefficient values in the range: of 0.60-0.83.

TB patients have been given treatment by giving Category I OAT for two months (intensive phase), and TB patients who experience mental health problems have been given counselling and home visits to monitor the regularity of OAT consumption and help patients achieve successful treatment with patient-centred care. This multiphasic screening examination was observed during the patient undergoing treatment for two months (intensive phase), considering that achieving treatment success (success rate) in patients with TB will be achieved well in the early stages of treatment. This is the conversion rate in 97.78% of TB patients with a negative sputum smear.

DISCUSSION

Multiphasic screening, confirmation of diagnosis, and mental health problems of patients with TB carried out at the start of treatment need to be of concern to program implementers at the health office. In Botswana, the PHQ-9 is valid and reliable for measuring the health status of TB patients in primary healthcare (14). Depression appears to be very common in people with TB, and the PHQ-9 is a valuable tool for detecting depression in the context of TB (13). The frequency of symptoms of mental health disorders or depression indicates that it is a manifestation of the illness they are suffering from (15).

Precision and accurate instruments are signs that it is better to know the feasibility of screening and the interventions to be carried out in efforts to prevent and control tuberculosis (16). Clinical symptoms of cough > two weeks are an early indication of surveillance findings for TB sufferers (17), which is not much different from a sensitivity of 94.84% and other clinical symptoms as a manifestation of patients who have experienced an infection caused by Mycobacterium tuberculosis (18). Some of the clinical symptoms used in this screening are satisfactory reliability coefficient values, so it can be ascertained that some clinical symptoms indicated for tuberculosis can be used as instruments and confirmation of TB (17).

The sensitivity and specificity of TB clinical symptom screening are needed as initial screening tools for TB detection. A study in East Java, Indonesia, found that clinical symptoms of cough for more than two weeks or more with confirmation of GeneXpert MTB/RIF were the main symptoms and confirmed that someone could suffer from tuberculosis with a sensitivity and specificity of 96.15% and 13.84%, respectively (19). A study at a TB clinic in Alvorada, RS, Brazil, obtained data that cough ≥ for two weeks is also one of the leading clinical symptoms of patients in confirmation of tuberculosis, with a sensitivity of 100% and a specificity of 93.60% (20). The results of this study indicate that the clinical symptoms of a cough for ≥ two weeks can still be used as an instrument for the early detection of someone suffering from pulmonary TB.

The ICC value in the second screening stage using the PHQ-9 was 0.61-0.83 (p 0.01). Overall, the PHQ-9 items performed well internally (Cronbach's alpha=0.88). The cut-off score of ≥ 10 in PHQ-9 identifies the probable major depressive disorder with a sensitivity of 0.88 (95% CI 0.83 to 0.92) and a specificity of 0.85 (95% CI 0.85 to 0.82) when compared with the semi-structured interview as the reference standard (16). The results of another study are not significantly different in Tanzania and are known by the analysis of Receiver Operating Characteristic analysis, which demonstrated good overall accuracy of the PHQ-9 (AOC=0.87, 95%CI:0.77, 0.96). The optimal cut-off score in this population was 9, with a sensitivity of 0.78 and a specificity of 0.87 (21). The results of a study in Ethiopia stated that screening TB patients' mental health using the PHQ-9 while undergoing TB treatment is necessary, emphasizing patients at risk (15).

Another study in Nepal found that many screened TB-resistant TB patients had depression and treatment for depression was required in the national TB control program (22).

The results of mental health examination screening after confirming the diagnosis of TB using the PHQ-9 instrument revealed that some TB patients experienced mental health problems, suggesting that the PHQ-9 is a practical instrument for confirming patient statements regarding situations, conditions, and complaints experienced during treatment (1). A series of screening activities for the mental health status of TB patients are an integral part of the DOTS function, namely monitoring adherence to OAT consumption and the success of treatment carried out on TB patients (11). Mental health in TB patients is an indicator of treatment success (10). Problem identification and follow-up in dealing with mental health problems in patients with TB at the treatment stage must be prioritized and integrated into TB treatment and management programs.

The status of being diagnosed with TB for a patient is extraordinary and beyond his expectations, let alone undergoing treatment for a relatively long time and accompanied by drug side effects, making it very difficult to continue treatment (11). Research in Ethiopia states that patients with TB experience depression while undergoing treatment (15). This problem needs to be studied for the mental health status of TB patients so that it can be immediately anticipated with appropriate action so that it does not have a severe impact on the failure of the treatment they are undergoing.

The PHQ-9 is a general patient psychometric instrument that is very simple and can be used to determine the mental health status of TB patients with a reliability coefficient of PHQ-9 of 0.88, and can be used as a reliable instrument for measuring mental health problems in TB patients (23). Reliability shows that the instrument is consistent, stable, predictable, and accurate. High reliability is assumed with the data generated in concluding early symptoms of mental health disorders in TB patients and recommendations for what therapy should be given next (13).

The feasibility of screening is determined by the sensitivity of the instrument used to identify patients who have clinical symptoms and are diagnosed with an accurate and precise disease diagnosis (24). The higher the sensitivity of a tool, the greater the success of the disease's treatment, prevention, and control (25). The results of multiphasic screening have been carried out well, and efforts to monitor treatment, situations, and conditions and the development of the patient's health during the initial treatment greatly determine the success of treatment (smear conversion [-]) after each phase of TB treatment. The result of conducting screening is the realization of the continuity of what has been found in the form of integrated and sustainable disease management efforts (26). A study in Ho Chi Minh City, Vietnam, found that screening results were an indicator of TB screening (27).

Studies in Botswana have shown the importance of integrating mental health services at the primary healthcare level (14). Integration of the implementation of multiphasic screening can be used as a solution for strengthening the DOTS TB strategy at first-level health facilities (28) and, of course, has an impact on the readiness of health facilities and resources that are not small. However, at least there are forms of actual service policy in the form of psychological mental health monitoring of TB patients who experience severe mental health disorders, carried out periodically and continuously (1), with patient-centred interventions at the community level (29).

Research Limitations

The multiphasic screening was carried out only for TB patients who underwent an intensive treatment phase for two months, while the Jambi City Health Office followed up the four-month follow-up treatment phase. However, we continued to monitor the progress of treatment and the patient's mental health until the end of treatment. The PHQ-9 questionnaire used in multiphasic screening is only limited to early detection, without comparison (gold standard) in confirming the diagnosis of depression in TB patients. However, patients who show symptoms of mental health disorders have been followed up with counselling and special monitoring with consultations with psychologists from the Faculty of Medicine and Health Sciences, University of Jambi.

CONCLUSION

Multiphasic screening for confirming a diagnosis using the GeneXpert MTB/RIF method shows very high precision and accuracy, and the PHQ-9 is a valid and reliable instrument for TB patients for early detection of mental health

problems during the treatment phase. The development of community mental health service units at first-level health facilities should be a relevant consideration given the lack of non-medical interventions for patients, especially at the community level.

CONFLICT OF INTEREST

The authors declare no conflicts of interest regarding the publication of this paper.

AUTHOR CONTRIBUTIONS

MDI designed the concept, methodology, and drafted the manuscript. RW, UL, H: data curation and writing-original draft preparation. MDI, UL: Visualization and investigation. MDI, RW, and H: software validation. MDI, RW, UL, and H: Writing–reviewing and editing the final version of the manuscript.

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