

Original Article

## Healthcare workers' acceptance of the integrated tuberculosis–COVID-19 screening in central Java Private Hospitals, Indonesia



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### المخلص

**أهداف البحث:** أثرت جائحة كوفيد-19 على تشخيص حالات السل وإدارتها، وتم تقديم الفحص المتكامل كوفيد-19—السل كإستراتيجية للتغلب على هذه المشاكل. لذلك، تهدف هذه الدراسة إلى تحديد قبول العاملين في الرعاية الصحية للفحص المتكامل كوفيد-19—السل وتأثيره على تحقيق برنامج السل.

**طريقة البحث:** هذه دراسة مختلطة مع تصميم مضمن. تمت مقارنة البيانات الخاصة بتغطية برنامج مكافحة السل بالمستشفيات من نظام معلومات السل الوطني لجميع مستشفيات المحمدية والعيسى في وسط جاوة قبل وبعد تنفيذ الفحص المتكامل كوفيد-19—السل. علاوة على ذلك، كان المشاركون يتألفون من عمال رعاية صحية من 21 مستشفى في وسط جاوة. تم إجراء مناقشات مجموعة التركيز مع 7 مرضى السل في المستشفيات، و 19 غرفة طوارئ، و 10 مرضى خارجيين، و 6 مرضى داخليين، و 4 موظفين إداريين. كما تم إجراء مقابلة متعمقة مع المسؤول الفني عن شفاء السل رئيس مركز المحمدية. تم تسجيل جميع المقابلات المتعمقة والمناقشات الجامعية المركزة، ونسخها حرفياً، وإخضاعها للتحليل الموضوعي بتوجيه من الإطار النظري للقبول.

**النتائج:** أدى تنفيذ برنامج الفحص المتكامل لـ كوفيد-19—السل إلى زيادة عدد حالات تشخيص السل الجديدة في مستشفيات جاوة الوسطى. علاوة على ذلك، كان البرنامج مقبولاً استناداً إلى سبعة مؤشرات من الإطار النظري للقبول. على الرغم من العقبات التي واجهها العاملون في مجال الرعاية الصحية أثناء عملية التنفيذ، إلا أن البرنامج تمكن من تلبية المعايير.

**الاستنتاجات:** يعد قبول العاملين في الرعاية الصحية عاملاً حاسماً في التنفيذ الناجح للبرنامج، بما في ذلك الفحص المتكامل لـ كوفيد-19—السل. علاوة على ذلك، هناك حاجة إلى نهج متعدد الأوجه وشامل القطاعات لمعالجة القيود المرتبطة بالعملية.

**الكلمات المفتاحية:** المقبولية؛ دراسة التنفيذ؛ الفحص المتكامل كوفيد-19—السل؛ مرض السل

### Abstract

**Objective:** COVID-19 pandemic has negatively impacted the diagnosis and management of tuberculosis (TB) cases, and TB–COVID-19 integrated screening was introduced as a strategy to overcome these problems. This study determined the acceptability of the TB–COVID-19 integrated screening by healthcare workers (HCWs) and its impact on achievement of the TB program.

**Methods:** This was a mixed-method study with an embedded design. Data on hospital TB program coverage from the national TB information system for all Muhammadiyah and Aisiyah Hospitals (MAHs) in Central Java were compared before and after the implementation of TB–COVID-19 integrated screening. The informants consisted of HCWs from 21 MAHs in Central Java. Focus group discussions (FGDs) were carried out with 7 hospital TB, 19 emergency room, 10 outpatient, 6 inpatient, and 4 managerial staff. In-depth interview (IDIs) were also performed with the Technical Officer TB Recovery Head of the Muhammadiyah Center. All IDIs

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and FGDs were recorded, transcribed verbatim, and subjected to thematic analysis guided by the theoretical framework of acceptability (TFA).

**Result:** Implementation of the TB–COVID-19 integrated screening program led to an increase in the number of new TB case diagnoses at the Central Java Hospitals. Moreover, the program was acceptable based on seven indicators from TFA. Despite the obstacles faced by HCWs during the implementation process, the program still managed to meet the standards.

**Conclusion:** Acceptance by HCWs is a critical factor in the successful implementation of programs, including the TB–COVID-19 integrated screening. Furthermore, a multifaceted and cross-sectoral approach is required to address the constraints associated with the process.

**Keywords:** Acceptability; TB–COVID-19 integrated screening; Tuberculosis, COVID-19, Implementation research, case detection, Theoretical frame work of acceptability

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## Background

Tuberculosis (TB) is one of the most common infectious diseases worldwide, and Indonesia has one of the highest TB prevalence rates, ranking second in the Global Tuberculosis Report 2022 by the World Health Organization (WHO) with an incidence of 9.2%.<sup>1</sup> The high incidence rate has made TB a national problem in Indonesia. The government launched a TB-free program in 1995 to eradicate the disease before 2035. However, in 2017, the prevalence increased by 25,450 cases per 1,000,000 population with a treatment success rate of 88%.<sup>2</sup>

Recent studies have shown that COVID-19 pandemic has impacted TB diagnosis, and there has been a global decrease in the number of newly diagnosed cases. There was a 18% decrease between 2019 and 2020, from 7.1 to 5.8 million. A previous report showed that five countries accounted for 90% of this global reduction, with the highest contributions from India (29%), China (21%), Indonesia (19%), the Philippines (13%), and Myanmar (10%).<sup>1</sup>

The COVID-19 pandemic has significantly impacted the treatment of TB patients. A survey conducted among 106 countries in 2020 revealed that 78% of intervention programs experienced interruptions and delays in drug distribution.<sup>3</sup> A WHO study in 105 countries also reported that 42% of these interventions had problems handling TB cases.<sup>4</sup> Furthermore, the impact of the pandemic on the TB program includes a decrease in budget allocations; delays in monitoring, evaluation, and surveillance activities; and an increased mortality rate due to lung tissue damage caused due COVID-19 comorbidity.<sup>2,5,6</sup>

One of the effective methods to reduce the pandemic's impacts on TB treatment is a comprehensive TB–COVID-19 integrated screening.<sup>7,8</sup> A previous study showed that the adverse effects of external factors on TB programs could be removed by investing in activities to strengthen them, including additional advancements in case detection testing.<sup>9,10</sup> The TB–COVID-19 integrated screening is often carried out along with other programs, such as HIV, diabetes mellitus (DM), antenatal care, and malnutrition.<sup>11–14</sup> Although the implementation of these integration activities is still inadequate, these programs are very beneficial, especially in developing countries.<sup>10</sup>

Healthcare workers (HCWs) also have an essential role in the TB–COVID-19 integrated screening; hence, they must be able to apply and implement the intervention in the routine healthcare setting.<sup>15</sup> Acceptability is a person's ability to respond or accept a particular intervention.<sup>16</sup> Therefore, the compliance of HCWs with the program is significantly influenced by the acceptability of each individual. Previous studies have shown that a lack of TB program acceptance in private practice leads to poor implementation.<sup>15</sup>

Based on the health profile of Central Java, in 2020, the province was one of the regions in Indonesia with a relatively high number of TB cases. In 2020, the TB case notification rate (CNR) was 113 per 1000 population in the area, which was decreased compared to 2019 with 211 per 1000 population.<sup>17</sup> The COVID-19 pandemic reduced visits by patients to health facilities, and the inability of cadres to search for suspects in the field.<sup>17</sup> Muhammadiyah and Aisyiyah Hospitals (MAHs), as faith-affiliated private hospitals network in Indonesia, have made several efforts to screen for COVID-19 and TB during the pandemic to increase the effectiveness of TB case handling. Based on previous findings, there is no evidence regarding the acceptance of HCWs and the impact of TB–COVID-19 integrated screening cases in Indonesia, especially in a private healthcare setting.

Therefore, this study explored the effects of the TB–COVID-19 integrated screening on TB program achievement and HCWs' acceptance of its implementation in the MAHs in Central Java.

## Methods

### Study setting

The study was carried out in MAHs in Central Java Province and limited to the setting of the TB–COVID-19 integrated screening that was implemented (emergency room/ER, outpatient, and inpatient services). The province was divided into 29 regencies and 6 cities, which encompassed 573 subdistricts and 8562 villages. The region has an area of 3.28 million hectares and accounts for approximately 1.70% of the total landmass in Indonesia.<sup>17</sup> The MAHs in this study were 21 private-faith affiliated hospitals that are nonprofit-oriented. They have also been fully accredited nationally by 50 other MAHs in Central Java. Muhammadiyah, which oversees these hospitals, is an Islamic-based

community organization with a network of healthcare charities throughout the country.

### *Study design*

This was a mixed-methods study with an embedded design guided by the theoretical framework of acceptability (TFA), which comprises seven component constructs: affective attitude, burden, ethicality, intervention coherence, opportunity cost, perceived effectiveness, and self-efficacy.<sup>16</sup> The qualitative inquiry was the dominant method in this study, which involved the use of an explorative approach to describe HCWs' acceptability as well as to determine factors influencing the TB–COVID-19 integrated screening implementation. Secondary data were extracted from the national TB information system (SITB). Hospital TB program coverage data before and after the implementation of the TB–COVID-19 integrated screening were also compared.

### *Participants and sampling technique*

The informants in this study consisted of HCWs from 21 MAHs that were purposively selected. The inclusion criteria for participants were HCWs who screened patients for the TB–COVID-19 integrated screening and worked in the ER, outpatient, and inpatient units. FGDs were carried out with a group of 7 TB, 19 ER, 10 outpatient, 6 inpatient, and 4 managerial staff from the MAHs. HCWs were recruited by sending a letter through the Muhammadiyah Central Java Region Board's Public Health Advisory Council (PHAC). Subsequently, the council directed the director of the MAHs to request that HCWs who met the inclusion criteria participate in the FGDs. Informed consent was obtained using Google form before the FGDs began.

### *Data collection*

Data collection was carried out by reviewing the TB–COVID-19 integrated screening coverage (TB-03 and TB-06) document and SITB before implementation of the program from September 2020 to August 2021, and after the process had begun from September 2021 to August 2022. TB-03 contained data about drug-sensitive TB (DS-TB) patients treated in hospitals, including sex, age, comorbid (DM and HIV/AIDS), and coinfection (COVID-19). It also consisted of people confirmed bacteriologically and clinically confirmed, as well as patients with pulmonary TB, extrapulmonary TB, pediatrics TB, recovered, died, lost to follow-up, failed, moved, and still on under treatment. TB-06 contained data about the total number of hospitals visited, patients screened for the TB–COVID-19 integrated screening, presumptive TB cases, as well as those with standard diagnosis, non-standard diagnosis, diagnosis of drug-sensitive (DS-TB), confirmed drug-resistant (DR-TB), and not TB.

The FGD lasted approximately 1 h for each group, and the discussion was divided into four sessions. Furthermore, sessions 1, 2, 3, and 4 were for ER employees, outpatient care, inpatient care, and managerial staff, respectively. These FGDs were performed to explore the mode of operation of the screening program in each hospital, HCWs' feelings and

perspectives about its implementation, as well as the obstacles experienced. The discussions were conducted by EL (3rd author) as the moderator, whereas other authors served as observers. IDIs were also carried out by a principal investigator/PI (BWS) with one key informant from Technical Officer (TO) TB Recovery-PHAC Muhammadiyah Central Board (MCB). All IDIs and FGDs were performed in Bahasa Indonesia and mixed with Javanese. The guidelines were not piloted but were reviewed by experts before being used.

Non-participatory observations were also conducted to evaluate the TB–COVID-19 integrated screening operation mode. Field notes were also taken during these processes.

### *Data analyses*

The analyses began by comparing TB-03 and TB-06 data before and after the implementation of TB–COVID-19 integrated screening descriptively, followed by the Mann–Whitney U test, and sensitivity and specificity for TB case detection using this symptoms screening. Furthermore, data from FGDs and IDI recordings were subjected to verbatim processing of transcripts. The transcript results did not need to be translated because the author and informants were both from Indonesia and spoke Javanese. The transcripts were translated into English for manuscript publication and were proofread by a linguistic expert to ensure accuracy. Then thematic analysis was carried out by PI and guided by relevant constructs of TFA to identify codes, categories, and themes. NVivo 12 plus software was used to organize the data obtained. Two other authors reviewed the coding and themes, followed by a discussion about differences that arose.

BWS was a male medical doctor with a background in hospital administration. The second and third authors were female medical doctors who had conducted studies on hospital management and had a formal background in qualitative study methods.

### *Trustworthiness*

The data sources triangulation method was used to increase the trustworthiness of this study. The transcripts and field notes were read and reread for data credibility before coding. Meanwhile, double-check entry was also conducted for TB data. Furthermore, the audit trail was carried out by collecting raw data, field notes, recordings, transcripts, data reduction, and analyses from the observation, FGDs, and IDI. A thick description was also made in the study protocol to describe the transferability.

### *Ethic*

This study was ethically approved by the Health Research Ethics Committee, Faculty of Medicine and Health Sciences, University of Muhammadiyah Yogyakarta, with reference No. 170/EC-KEPK FKIK UMY/VIII/2022. Furthermore, informed consent was obtained from the informants before the process. Information regarding the study's aims, benefits, and potential effects was also disclosed to them.

## Result

### *TB program achievement*

The data in this study were obtained from TB-03 and TB-06 before the implementation of the TB-COVID-19 integrated screening from September 2020 to August 2021, and after the process began from September 2021 to August 2022. Among the 2,328,820 patients who visited the hospitals, 30.05% (699,883) were tested using the TB-COVID-19 integrated screening. Figures 1 and 2 describe the number of screening patients at the 21 MAHs.

When compared to before the implementation of integrated screening, the number of DS-TB patients being treated in the hospitals increased (Figure 1). Some achievements such as treatment, cure, and success therapy are ongoing; hence the data are still being collected.

After the implementation of integrated screening, a total of 1.24% (8692) of the screened patients were suspected of having TB, and 4328 were confirmed as TB cases (DS and DR) (Figure 2). Hence, the sensitivity of TB-COVID-19 integrated screening is 49.8%, and the specificity is 50.2%. There was also an increase in TB cases confirmed after the TB-COVID-19 integrated screening. Furthermore, there was a significant difference in presumptive TB and total TB cases (diagnosed DS-TB and confirmed DR-TB) before and after the integrated screening implementation in 21 MAHs (Table 1).

### *Implementation of the TB-COVID-19 integrated screening*

A total of 46 HCWs informants were involved in this study, consisting of 35 females and 11 males, with an average age of 35.4 years (min = 23, max = 49). The average length of work was >5 years (min = 1–3 years max = >5 years), and the dominant education level was undergraduate (45.7%, n = 21) with some having a Bachelor's Degree (30.4%, n = 14) or Bachelor's in Nursing (23.9%, n = 11).

The integrated screening ran smoothly in 21 MAHs. Each hospital had different operational standards to adjust its resources and other technical aspects and maintained the core elements of the TB-COVID-19 integrated screening procedures. The process was carried out with a collaboration of security guards, nurses, and doctors at the beginning of the patient's arrival at the hospital. After the screening, if some signs and symptoms pointed to TB and COVID-19, the officer consulted the doctor to determine the support examination in the form of a rapid molecular test (geneXpert), chest X-ray, and antigen examination. The following are some excerpts that describe these situations:

*"... the registration officer will ask about the complaints, and what are the symptoms, later if there is one of the symptoms of TB, the TB stamp will be given to the queue number on the ticket. After entering the specialist doctor's room and we suspect TB, we will refer him to a pulmonary specialist."* (ER Nurse, Female, 33 years old)

*"The screening for TB and COVID-19 in the ER is already underway. For the first stage, we immediately screen all incoming patients, whether they are suspected of TB or COVID-19. For every patient, we conduct screening of*

*antigen and thorax. If the X-ray of a suspected TB shows positive result, we consult it with the doctor and then the patient is hospitalized in the isolation TB ward. Additionally, when a patient is suspected to have COVID-19 and the antigen is reactive, consultation to the doctor is conducted, and we put the patient in the isolation COVID-19 room."* (ER Nurse, Female, 33 years old)

### *Perceived effectiveness*

The HCWs' informants believed that the TB-COVID-19 integrated screening program can run effectively and be used to find new TB cases during the pandemic. They also stated that the TB-COVID-19 integrated screening was suitable and could be carried out during this period. Furthermore, it was possible for them to separate suspected patients earlier to prevent disease transmission and treatment delay. The following are excerpts from interviews with the respondents.

*"... it has been very effective. If there is no screening, it can infect other patients in the outpatient, but it was discovered early. For TB, sometimes, screening stage can directly detect someone who is an outpatient for TB. This has also made us more aware."* (ER Nurse, Female, 33 years old)

*".... This double screening activity is quite effective for finding TB suspects in the target MAHs internal, passive but intensive discovery of TB suspects."* (TO TB Recovery-PHAC-MCB, Female, 57 years old)

### *Burden*

The informants stated that there were several obstacles during the program implementation, including the length of a rapid molecular test result, waiting for the results of the consultation with the doctor, a lack of human resources, time taken for the medical record to be ready, and the limitations of COVID-19 and TB isolation rooms. These barriers had an impact on the burden felt by patients and disrupted the activities of the HCWs. The following are responses related to these conditions.

*"It's just that the results can't be made directly to us, (we must) wait for 1 day"* (ER Nurse, Male, 47 years old)

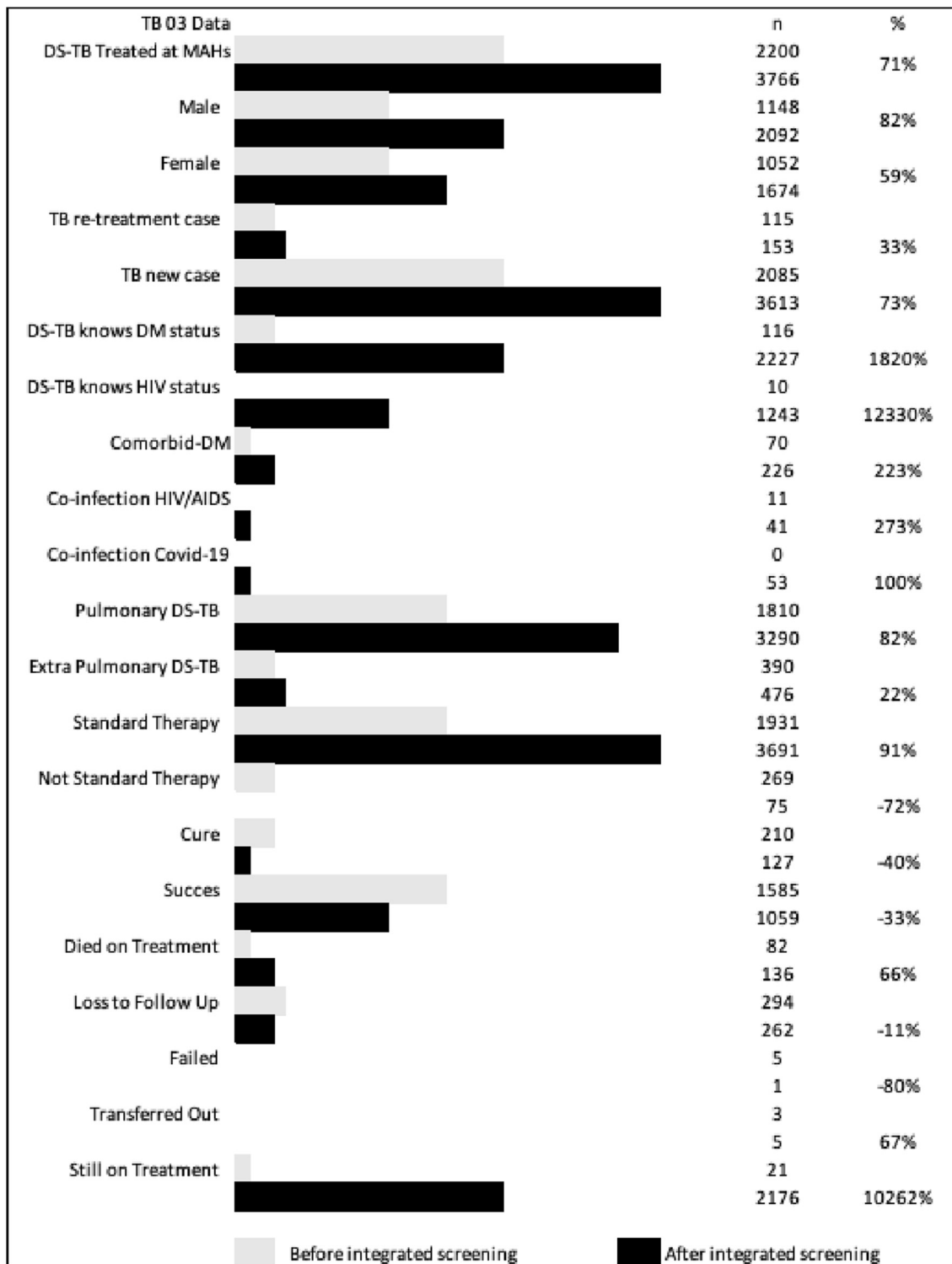
*"... if the patient comes, the status (medical record) is not ready"* (Outpatient nurse, Female, 25 years old)

*"Manual screening requires a considerable effort, considering that the implementing staff at Outpatient and Emergency Room is limited, and one implementing staff (nurse) does not only serve one clinic."* (TO TB Recovery-PHAC-MCB, Female, 57 years old)

### *Ethicality*

An ethical issue was raised by an ER nurse, who stated that some patients did not accept examination procedures for their TB disease. This situation was in line with the poor community stigma about TB.

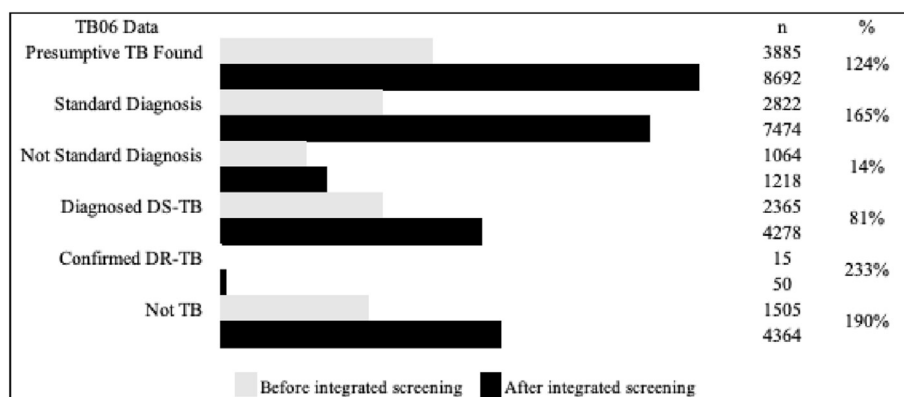




**Figure 1:** TB-03 data from 21 MAHs in Central Java. \*DS-TB: Drug-sensitive tuberculosis; DM: Diabetes mellitus; HIV: Human immunodeficiency virus; AIDS: Acquired immune deficiency syndrome; MAHs: Muhammadiyah and Aisyiyah Hospitals.

*“For the obstacle, not all patients who have established a suspicion, whether it’s TB or COVID-19, will be cooperative if we provide education.” (ER Nurse, Male, 33 years old)*

*“Thank God we are assisted every day by colleagues from Case Manager team to become continuous educators for patient, then there is also the role of the DPJP who gives instructions and decisions so that gradually the patient who*



**Figure 2:** TB-06 data from 21 MAHs in Central Java before and after the TB–COVID-19 Integrated Screening. \*DS-TB: Drug-sensitive tuberculosis; DR-TB: Drug-resistant tuberculosis; MAHs: Muhammadiyah and Aisyiyah Hospitals.

**Table 1: Presumptive Achievements and Total TB Cases Before and After Implementation of TB–COVID-19 Integrated Screening.**

| Hospital's Code | Presumptive TB |       | Saphiro-Wilk Test | Mann–Whitney U Test | Total TB Cases |       | Saphiro–Wilk Test | Mann–Whitney U Test |
|-----------------|----------------|-------|-------------------|---------------------|----------------|-------|-------------------|---------------------|
|                 | Before         | After |                   |                     | Before         | After |                   |                     |
| #1              | 194            | 432   | p = 0.045         | p = 0.000           | 109            | 228   | p = 0.02          | p = 0.012           |
| #2              | 67             | 120   |                   |                     | 31             | 63    |                   |                     |
| #3              | 92             | 280   |                   |                     | 68             | 112   |                   |                     |
| #4              | 342            | 689   |                   |                     | 238            | 301   |                   |                     |
| #5              | 131            | 234   |                   |                     | 54             | 86    |                   |                     |
| #6              | 149            | 321   |                   |                     | 55             | 126   |                   |                     |
| #7              | 182            | 332   |                   |                     | 94             | 179   |                   |                     |
| #8              | 242            | 443   |                   |                     | 118            | 209   |                   |                     |
| #9              | 206            | 340   |                   |                     | 99             | 192   |                   |                     |
| #10             | 109            | 235   |                   |                     | 82             | 115   |                   |                     |
| #11             | 268            | 860   |                   |                     | 151            | 342   |                   |                     |
| #12             | 230            | 448   |                   |                     | 150            | 199   |                   |                     |
| #13             | 130            | 175   |                   |                     | 73             | 87    |                   |                     |
| #14             | 347            | 654   |                   |                     | 268            | 470   |                   |                     |
| #15             | 137            | 329   |                   |                     | 74             | 151   |                   |                     |
| #16             | 94             | 333   |                   |                     | 62             | 82    |                   |                     |
| #17             | 179            | 516   |                   |                     | 81             | 307   |                   |                     |
| #18             | 31             | 143   |                   |                     | 30             | 50    |                   |                     |
| #19             | 228            | 796   |                   |                     | 166            | 404   |                   |                     |
| #20             | 80             | 193   |                   |                     | 34             | 65    |                   |                     |
| #21             | 447            | 819   |                   |                     | 355            | 560   |                   |                     |
| TOTAL           | 3885           | 8692  |                   |                     | 2392           | 4328  |                   |                     |

*initially disagree to being tested, can start giving consent and the treatment can be continued.” (ER Nurse, Male, 33 years old)*

#### Self-efficacy

The informants had mixed feelings regarding their fear and self-efficacy in the TB-COVID-19 integrated screening implementation. They mentioned several conditions that increased their confidence to apply the screening, including support between HCWs, reminding each other, the existence of a Case Manager Team, and the provision of adequate Personal Protective Equipment (PPE).

*“If that’s the problem, there’s a sense of fear, but Inshaallah, because we are very sure about the PPE meeting the standards, there will be no worries. Moreover, along with*

*the infrastructure that we need, everything becomes more confident and optimal.” (ER Nurse, Female, 49 years old)*

*“Our teamwork in the ER is also truly one commitment, maybe this facilitates the screening program” (ER Nurse, Female, 49 years old)*

#### Intervention coherence

Intervention coherence showed whether the TB–COVID integrated screening was in line with existing programs at the hospital. The informants stated that it was in accordance with other TB programs, such as Mentari TB, and several disease collaborative initiatives including TB-DM, TB-HIV, and TBC-Malnutrition care. Furthermore, Mentari TB aimed to expand public access to TB treatment, care, and

services in Indonesia by utilizing Muhammadiyah's network of health facilities.

*"Of course, apart from having Mentari TB, we have support from management as well as doctors."* (ER Nurse, Female, 49 years old)

*"TB-COVID-19 integrated screening has been carried out for a long time, including several programs, such as TBC-DM, TBC-HIV, TBC-Malnutrition, and finally TBC-COVID-19"* (TO TB Recovery-PHAC-MCB, Female, 57 years old)

#### *Affective attitude*

HCWs showed positive attitudes towards the policy of implementing the TB-COVID-19 integrated screening. The comfort factor for HCWs who carry out this program occurred due to their sincerity to solve TB. Furthermore, the screening process was considered simple, and does not require special abilities. The following excerpts represent HCWs' viewpoint on the program.

*"For all of my friends here, we have one goal, we want to eradicate TB because our area has quite a lot of TB patients. Therefore, we agree on how we can work together with the team, ensuring this TB program can be successful."* (Outpatient Nurse, Female, 30 years old)

*"This screening activity does not require a special time, it can be performed at the same time as anamnesis/physical examination. It is enough to get used to (doctors/nurses) to ask the points of screening questions."* (TO TB Recovery-PHAC-MCB, Female, 57 years old)

#### *Opportunity cost*

The HCW's informants acknowledged that this program does not require significant financing or impose costs on the hospital or patients. Several hospitals have also partnered with BPJS-Kesehatan (national health insurance) to cover TB and COVID-19. Furthermore, this program does not require sophisticated tools and resources since all reagents and medications were supplied by the National TB Program (NTP) through the health office. The following quotations from informants explained how the financial factor was affordable or readily handled by the hospital.

*"In terms of finance, we can afford almost 99% of everything, it's covered by BPJS-Kesehatan although it's expensive. Maybe the term doesn't matter for the patient. Anyway, I don't think it's a burden because it's covered by BPJS-Kesehatan, but for the hospital, of course, there will be material costs regarding the examination."* (ER Nurse, Female, 49 years old)

*"For TB patients, we are collaborating with the health office. There is nothing burdensome here because when the patients come to the hospital, both drugs and reagents are received from the health office. TB examination does not burden hospital costs at all, most of them are also from BPJS-Kesehatan, hence, there is no problem with the financing."* (Outpatient Nurse, Female, 30 years old)

#### *Supporting factors*

The HCWs had some clear ideas about the sustainability of this program, which was supported by several parties. These supporting factors included help from the hospital management and doctor, internal motivation of HCWs, supply of reagents and drugs from the district health office, cooperation of health financing with BPJS-Kesehatan, the existence of a particular TB financing program from the NTP and Mentari TB, and the availability of appropriate PPE. The following are the responses outlining aspects that enable HCWs to implement the program.

*"...apart from having Mentari TB, we have support from (hospital) management and doctors."* (ER Nurse, Female, 49 years old)

*"Yes, the supporting factors are in facilities, such as appropriate PPE, and TB drugs, we also have no problems because we work together with the Health Office."* (ER Nurse, Female, 38 years old)

#### *Obstacle factor*

Based on the informants' statements, medical personnel did not consider this program an onerous burden. Furthermore, the obstacles faced during the implementation included community stigma, the waiting time to obtain laboratory test results, the waiting time for consultation with the doctor, a lack of human resources, high patient administrative burden, unavailability of electronic medical record, and a lack of COVID-19 and TB isolation rooms. The following are excerpts from the informants.

*"Manual screening requires a large amount of effort, considering that the implementing staff at the outpatient/ER is limited, and one implementing staff (nurse) does not only serve one clinic. Not all target MAHs use e-MR, which is very helpful in the screening process, and the results are more accountable."* (TO TB Recovery-PHAC-MCB, Female, 57 years old)

*"To determine TB without the molecular test examination, it turns out that the results of the examination take a long time."* (ER Nurse, Male, 47 years old)

*"Meanwhile, in the ER, there is only one isolation room, that is for the isolation of COVID-19 and TB."* (ER Nurse, Female, 25 years old)

## **Discussion**

This study focused on assessing the acceptability of HCWs in the TB-COVID-19 integrated screening implementation in private hospitals and its impacts on improving TB programs. The screening was generally acceptable, and it helped to improve the TB case detection. Furthermore, internal and external factors influenced the program execution by HCWs at MAHs. Certain technical adjustments to the standard operating procedures were required to ensure a seamless implementation process.

The results of this study showed that after the TB–COVID-19 integrated screening was implemented, there was a significant increase in the number of presumptive TB and new TB case diagnoses. The data also revealed that more TB suspects were likely to be discovered as the program was being conducted more frequently. Likewise, TB cases treated have also increased. These findings are in accordance with a study in India showing that TB–COVID-19 integrated screening can improve TB case management.<sup>18</sup> This was also consistent with a study by MacLean et al.,<sup>19</sup> which showed that the program helped to identify TB patients who were afraid to access health facilities during the COVID-19 pandemic.

According to the findings of this study, the sensitivity (49.8%) and specificity (50.2%) of integrated TB–COVID-19 screening are both low. This result might be because the low sensitivity rate was due to screening in the general population rather than people with risk factors. These findings are consistent with the findings of Cheng et al.,<sup>20</sup> which showed that symptom screening in pulmonary TB cases in China had a sensitivity of 42.9% that increased to 51.4% in the population at risk. A good screening test has a sensitivity and specificity of 80–90%, whereas traditional screening using signs and symptoms of TB has a low sensitivity and specificity.<sup>21</sup> Symptom screening is appealing because it is simple and does not necessitate expensive equipment and skills.<sup>20</sup> As per our study, this tool is not intended to be used as an independent mass screening in a community-based active case finding but is to be used as the first step in systematic screening for active tuberculosis in population visiting healthcare facilities and also has the added benefit of reducing missed cases opportunities for TB case detection.<sup>21</sup>

The study showed that HCWs experienced technical obstacles in executing the program. These internal barriers included supporting examination as the follow-up regimen, length of time for a doctor consultation, a lack of human resources, medical record unreadiness, and a lack of isolation rooms. These findings are in line with a study in Uganda, which showed that some of the challenges in developing countries are inadequate staffing; concern about acquiring COVID-19 infection; and a lack of resources, straightforward standard operating procedures, and data collection tools.<sup>22</sup> Furthermore, a study in East African countries reported that the TB–COVID-19 integrated screening system with other diseases was not optimal. The high patient burden, weak laboratory specimen referral system, shortage of trained personnel, and frequent interruptions in laboratory supply were the major challenges in TB diagnosis.<sup>10</sup>

External barrier factors affecting the program included patients' administrative burden and stigma related to the disease, which has a negative effect on its prevention, services, and policy. Based on the results, educating patients was an effective method to overcome the negative stigma, which arose as an ethical issue in this study. Regular patients education by a case manager led to an increased willingness to partake in examinations. Arini et al.<sup>23</sup> emphasized that patients often face a cascade of obstacles in accessing healthcare, including bio-psycho-socio-economy burden, low health literacy, and stigma. Therefore, it is necessary to reorient the healthcare system on chronic care readiness that

is more integrated and increases patients' capacity to improve healthcare quality.

This study also revealed the necessity of the synergic role of multisector parties that support the TB–COVID-19 integrated screening implementation in private hospitals. It is important to note that intervention with minimal additional expenditures, such as the TB–COVID-19 integrated screening, is one of the factors enabling the running of the national program in the private sector. The supply of reagents and medication, payment for healthcare services, and support from Non-Government Organizations helped strengthen the continuity and facilitated follow-up of the integrated screening. Furthermore, these findings are in accordance with a previous study showing that an efficient network of comprehensive and high-quality health services is required to effectively achieve the global targets for TB control.<sup>24</sup> There is also a need to develop a solid Public-Private Mix to support implementation of the TB–COVID-19 integrated screening.<sup>24</sup>

Despite the burden and obstacles faced by HCWs, the informants revealed that the TB–COVID-19 integrated screening was acceptable. The results showed that the program is easy to implement, cost-effective, and does not significantly increase officers' workload. This finding is consistent with previous studies showing that an effective TB program requires an easy-to-run system.<sup>25</sup> Furthermore, this indicates that the development of TB–COVID-19 integrated screening or tests performed on one platform with the same sample, is expected to streamline and raise the cost-effectiveness of simultaneous testing.<sup>26</sup> Previous studies have also disclosed that policymakers must consider several main problems affecting HCWs acceptability such as a lack of human resources, dissemination of policies regarding handling TB cases, considering TB screening as a burden for HCWs, and ethical issues related to patient privacy.<sup>15</sup>

The results of this study indicated continuous and comprehensive efforts are needed to increase acceptance at every stage of its application. Although the program was declared acceptable in this study, acceptability was one of the indicators of dynamic implementation. To achieve a better program in the future, periodic training, supportive supervision, and periodic evaluations are needed based on Phalkey's recommendation.<sup>27</sup> Internal obstacles, such as a lack of HCWs, facilities, and the availability of isolation rooms, can be overcome by increasing the number of HCWs and analyzing workload. However, increasing the number of employees has an impact on the hospital's financial burden and is not easy to accomplish. A human resource management strategy must also be implemented, including innovative efforts such as implementing lean management, as well as utilizing integrated information systems and digital platforms.<sup>28,29</sup> Lean approaches are aimed toward reducing waste while increasing added-value work. The use of these methods has the potential to increase the flexibility and effectiveness of HCWs' performance.<sup>30</sup>

## Conclusion

The TB–COVID-19 integrated screening program was perceived acceptable by HCWs, as indicated by the seven constructs of TFA as well as its ability to improve case



findings. Despite the barriers faced, this program was considered simple to implement, adaptable, and offered several advantages including early detection and treatment for TB and COVID-19 patients. Multisector roles are also needed to support the continuity and comprehensiveness of its implementation.

**Abbreviations:** TB, Tuberculosis; HCWs, Healthcare workers; MAHs, Muhammadiyah and Aisyiyah Hospitals; FGDs, Focus group discussions; IDI, In-depth interviews; TFA, Theoretical framework of acceptability; CNR, Case notification rate; SITB, TB information system; DS-TB, Drug-sensitive TB; DR-TB, Drug-resistant TB; TO, Technical Officer; PPE, Personal protective equipment; BPJS-Kesehatan, National Health insurance; NGOs, Non-Government Organizations.

### Limitation

The heterogeneity of interviewees from 21 different hospitals contributed to the study's strength, but the research was contextualized in MAHs in Central Java. Therefore, pertinent excerpts were used to describe their applicability to different healthcare settings. Positive bias occurred because the informants were asked to report what they performed is likely to occur in the implementation study. Hence, the authors conducted triangulation by making observations at some hospitals. Further studies are needed to evaluate the subsequent implementation indicators in various phases to improve the program.

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### Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

### Ethical approval

Ethical approval for this study was obtained from the Health Research Committee of the Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta No. 170/EC-KEPK FKIK UMY/VIII/2022.

### Consent

Written informed consent was obtained from the participants before data collection was obtained for their anonymized information to be published in this article.

### Authors' contributions

BWS and MA conceived the study and were involved in developing interview guidelines. BWS gained ethical

approval, patient recruitment, and data analysis and wrote the first draft of the manuscript. All authors contributed to data collecting, critically reviewed and approved the final draft, and are responsible for the content and similarity index of the manuscript.

### Data accessibility statement

Some raw data used to support the findings are included in the article and can be made available from the corresponding author upon request.

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