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ORIGINAL ARTICLE

Evaluation of the Tuberculosis Surveillance System in Depok, West Java

Fitri Aulia[1*], Helda[2], Hidayat Nuh Ghazali Djadjuli[3]
[1] Department of Epidemiology, Universitas Sriwijaya, Indonesia
[2] Department of Epidemiology, Universitas Indonesia, Indonesia
[3] Depok Health Department, Indonesia

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Correspondence:
Fitri Aulia
Departement of Epidemology,
Universitas Sriwijaya,
Indonesia

Email:
fitri_aulia@fkm.unsri.ac.id

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ABSTRACT

Depok is one of the cities with a high number of TB cases in West Java. The implementation of TB surveillance in Depok revealed challenges in meeting TB control indicators. Evaluating the surveillance system is essential to assess the quality of the existing system and identify barriers in TB surveillance implementation. Therefore, this study aims to evaluate TB surveillance system in Depok based on its components and attributes. This study was an assessment that describes the implementation of the TB surveillance system using both quantitative and qualitative approaches. It highlighted the systemic challenges that hindered effective TB control, such as inadequate knowledge of legal aspects, insufficient private-sector engagement, lack ability of data analysis and interpretation, the high percentage of TB officers who had not received the training was partly due to staff turnover, complex data collection, and low utilization of surveillance data for decision-making. To enhance the effectiveness of TB control efforts, this study recommends targeted training for healthcare workers, sufficient budget allocations, and simplified data management systems.

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Introduction

Tuberculosis (TB) is an infectious disease caused by the *Mycobacterium tuberculosis*, which remains a leading global health problem. Additionally, TB is among the top 10 causes of death worldwide and the leading cause of death from a single infectious agent [1]. Indonesia has the second-highest number of TB cases globally after India, accounting for 8.5% of cases [2]. West Java, along with East Java and Central Java, is among the three provinces with the highest number of TB cases in Indonesia. According to the 2020 Indonesian Health Profile, these three provinces accounted for 46% of all TB cases in the country. In addition to being among the provinces with the highest TB cases in Indonesia, West Java has a high Case Notification Rate (CNR) for all TB cases, exceeding the national average. Data from 2020 indicated a CNR in West Java of 159 cases per 100,000 population, compared to the national average of 130 cases per 100,000 population [3]. Depok is one of the cities with a high number of TB cases in West Java. Based on the 2020 Depok Health Profile, the number of TB cases in Depok was 3,311, with a CNR of 133 cases per 100,000 population [4]. This figure represents an increase compared to the CNR in 2015, which were 121 cases per 100,000 population [5].

Surveillance is one of the TB control outlined in the Minister of Health Regulation Republic Indonesia No. 67 of 2016. According to this regulation, TB surveillance involves the systematic, and continuous monitoring and analysis of data and information regarding TB occurrences or health issues and the factors influencing them, aimed at guiding effective and efficient control actions [7]. Several indicators are used to assess the progress or success of TB control, including impact indicators, main indicators, and operational indicators. Impact indicators, for example, can be measured through the prevalence rate of TB. Meanwhile, main indicators are evaluated based on the treatment coverage of all treated TB cases, the Case Notification Rate (CNR), the treatment success rate of all TB patients, the detection rate of drug-resistant TB cases, the treatment success rate for drug-resistant TB patients, and the percentage of TB patients who are aware of their HIV status [6].

The implementation of TB surveillance in Depok revealed challenges in meeting TB control indicators. The TB prevalence in Depok was 133 cases per 100,000 population, exceeding the target of 117 cases per 100,000 population set for 2020. Furthermore, the treatment coverage rate in 2020 was only 47.40%, representing a significant decline from 2016, when it reached 119.91%. TB mortality rates also increased from 0.78 deaths per 100,000 population in 2016 to 3.54 deaths per 100,000 population in 2020 [7].

Evaluating the surveillance system is essential to assess the quality of the existing system and identify barriers in TB surveillance implementation. Therefore, this study aims to evaluate the TB surveillance system in Depok based on its components and attributes to provide appropriate suggestions and recommendations.

Methods

The evaluation of the TB surveillance system in Depok is an assessment that describes the implementation of the TB surveillance system using both quantitative and qualitative approaches. The quantitative approach was employed to describe the TB surveillance system through observations of TB surveillance reports from Public Health Centers (PHCs), hospitals, clinics/private practitioners, and Depok Health Office in 2021. The qualitative approach was used to describe the surveillance system and the challenges encountered during its implementation, conducted through in-depth interviews with nine TB officers at PHCs and eight TB officers at hospitals. The questionnaire utilized was based on the Guidelines for Monitoring and Evaluating Communicable Disease Surveillance Systems and Response Systems issued by the World Health Organization [8]. Ethics approval is not required for this study.

Result

1. Structure of The System

1.1. Legal Aspects

The legal framework for implementing the TB surveillance system in Indonesia was regulated under the Ministry of Health Regulation No. 67 of 2016. Based on interviews with TB officers at PHCs and hospitals, it was found that 59% of the officers were unaware of this regulation. When viewed by the type of healthcare facility, the percentage of TB officers at hospitals who were unaware of the legal aspects was higher compared to TB officers in PHCs. Figure 1 showed that only 25% of TB officers in hospitals were aware of the legal aspects of the implementation of the TB surveillance system in Indonesia.

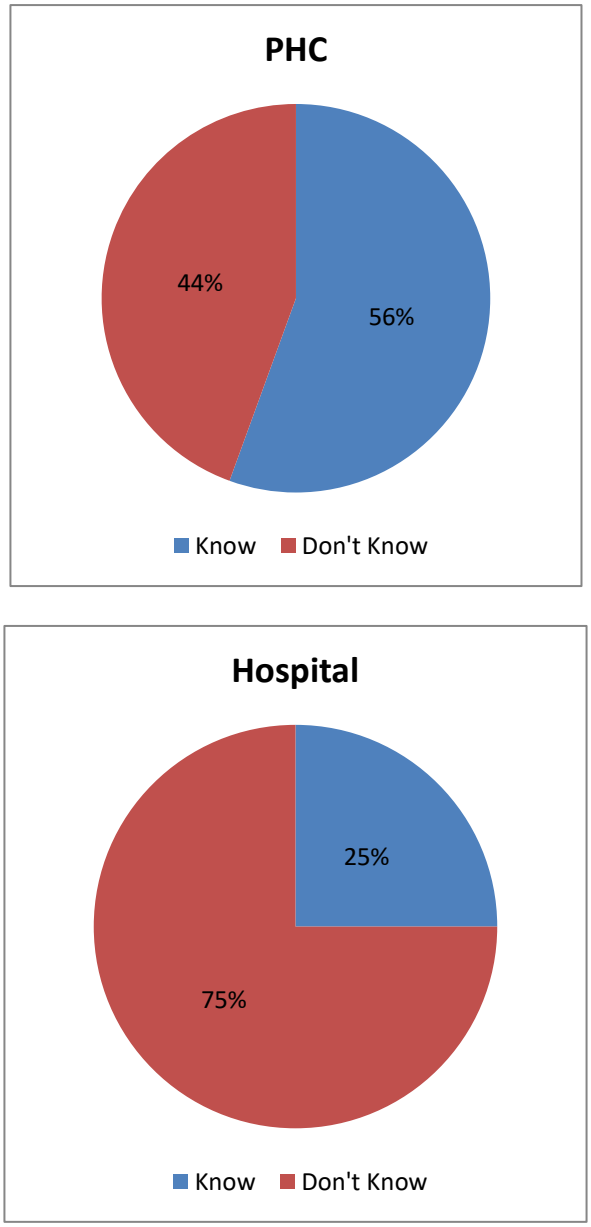

Figure 1. Knowledge of TB Officers in Health Facilities regarding the Legal Aspects of the TB Surveillance System in Depok

TB officers who are also healthcare workers (HCWs) are at an increased risk of contracting TB due to their exposure in clinical settings. A study conducted in Yogyakarta, Indonesia, assessed the knowledge and attitudes of HCWs towards TB and identified factors influencing their understanding. The findings highlighted that inadequate knowledge among HCWs can lead to suboptimal TB control practices, potentially increasing the risk of transmission within healthcare facilities.(9) Furthermore, a review on the medico-legal aspects of TB emphasized the importance of HCWs' understanding of legal frameworks governing TB control. Such knowledge ensures that patient rights are respected, confidentiality is maintained, and legal obligations are fulfilled, thereby enhancing the effectiveness of TB control programs [10].

1.2. Coordination

Depok Health Office (Dinkes) faced coordination challenges with the private sector. In 2021, only 1% of private practitioners collaborated with the Health Office in recording and reporting TB cases, as illustrated in Figure 2.

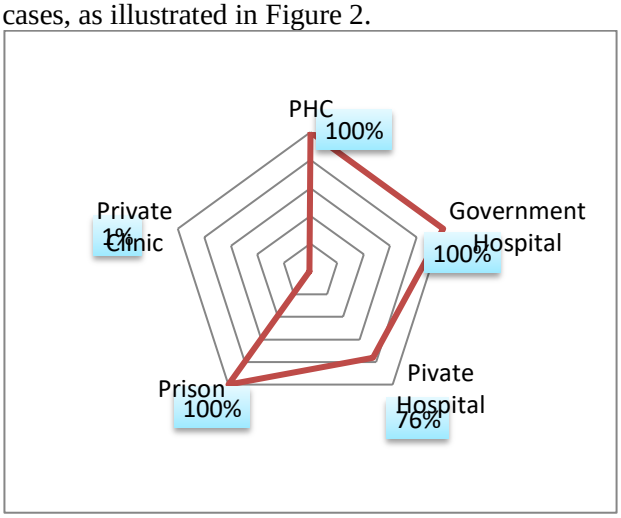

Figure 2. Proportion of Healthcare Facilities Reporting TB Cases in Depok

Besides that, The Health Office had also partnered with a professional organization called the Coalition of Professional Organizations for Tuberculosis Control (KOPI TB). This organization aimed to enhance the involvement of practitioners in national TB control, ensure TB management according to the International Standards for Tuberculosis Care (ISTC) and the National Guidelines for TB Medical Management, notify patients within the National TB Program's information system, and support the success of TB control. In addition, Dinkes had also partnered with communities such as Penabulu-STPI Consortium, which received grants from the Global Fund, and the Indonesian TB Eradication Association (PPTI), which received funding from the local government's budget (APBD) in Depok.

Although advocacy had been conducted, the low interest of the private sectors in collaborating remained challenges for the Health Office in increasing the involvement of the private sectors in national TB control program. Effective TB control relies heavily on coordinated efforts among healthcare providers, public health agencies, and community organizations. A comprehensive model for TB control emphasizes the importance of collaboration between public health staff and private-sector practitioners. This coordination ensures that all parties are aware of their roles and responsibilities, leading to more efficient and

effective TB prevention and treatment strategies [11].

2. Core Functions of Surveillance System

2.1. Case Detection

According to Ministry of Health Regulation No. 67 of 2016, TB case detection was conducted both actively and passively [6]. Based on interview results, it was found that TB case detection in Depok had been carried out passively and actively. Passive case detection was performed through examinations of patients visiting healthcare facilities, while active case detection was conducted through household contact investigations, screenings of prison inmates as part of health day activities in collaboration with HIV and Non-Communicable Diseases (NCD) programs, and TB screenings in 10 PHCs areas targeting the community and high-risk populations.

Despite various efforts, the percentage of TB case detection in Depok in 2021 remained relatively low. Out of an estimated 6,973 TB cases, only 3,974 cases (57%) were detected and treated (Figure 3). One of the reasons for the low percentage of TB case detection was the suboptimal implementation of contact investigations. Based on data observations, 7,553 individuals were investigated from 1,586 index cases. This indicated that the ratio of close contacts investigated was only 5. This figure fallen significantly short of expectations, as Ministry of Health Regulation No. 67 of 2016 stipulated that contact investigations should involve at least 10–15 close contacts per index case.

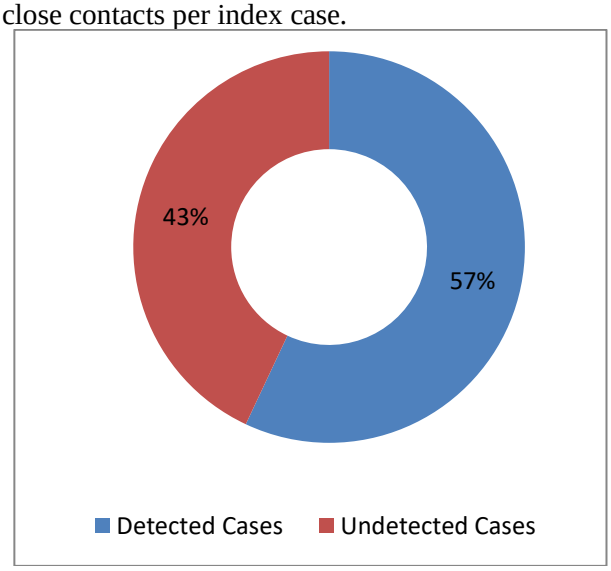

Figure 3. Coverage of TB Case Detection in Depok

Effective tuberculosis (TB) control hinges on the timely detection and treatment of cases. Active case-finding interventions, particularly those implemented within communities, have been shown to identify and treat more individuals with TB compared to standard case detection methods. These interventions involve proactive screening and outreach efforts that reach populations who may not seek care due to various barriers, thereby reducing transmission rates and improving public health outcomes [12].

2.2. Case Confirmation

TB case confirmation could be done either bacteriologically or clinically. Based on Figure 4, the overall TB case diagnosis in Depok was considered good, as it meted the ideal proportion between bacteriologically confirmed and clinically diagnosed cases, in accordance with the criteria issued by the Ministry of Health of Indonesia, which was 60:40. [6].

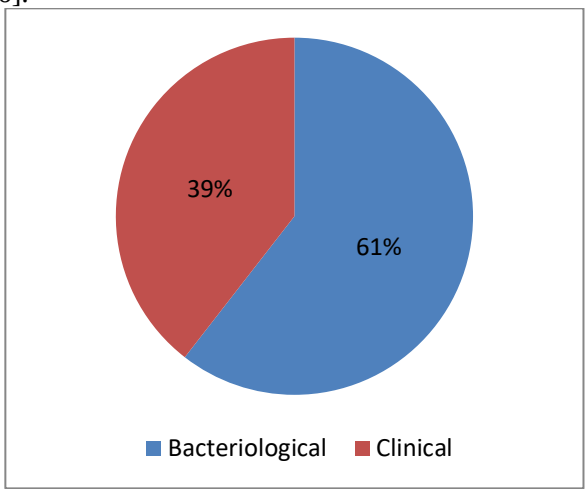

Figure 4. Comparison of Bacteriological and Clinical TB Case Diagnoses in Depok

Accurate and timely diagnosis is fundamental to effective TB control. Early detection enables prompt initiation of treatment, reducing transmission rates and improving patient outcomes. Advancements in diagnostic technologies, such as molecular tests and rapid point-of-care devices, have significantly enhanced the ability to identify TB cases more efficiently. These innovations are particularly crucial in resource-limited settings, where traditional diagnostic methods may be inadequate [13].

2.3. Analysis and Interpretation

Analysis and interpretation of data were crucial to determine appropriate actions that should be taken in response to the situation. At the Health Office level, analysis and interpretation of TB data collected through the TB Information System (SITB) had been conducted. This data was analyzed descriptively in the form of graphs and used for evaluation and decision-making. However, at the hospitals and PHCs level, not all healthcare facilities perform analysis and interpretation of the collected TB data. According to interview results, it was found that 65% of healthcare facilities had not conducted

analysis and interpretation of the collected data. The percentage of PHCs that had not performed data analysis and interpretation was higher compared to that of hospitals (Figure 5). Furthermore, among all healthcare facilities that had conducted analysis, none had performed analytical analysis. The analysis conducted was purely descriptive.

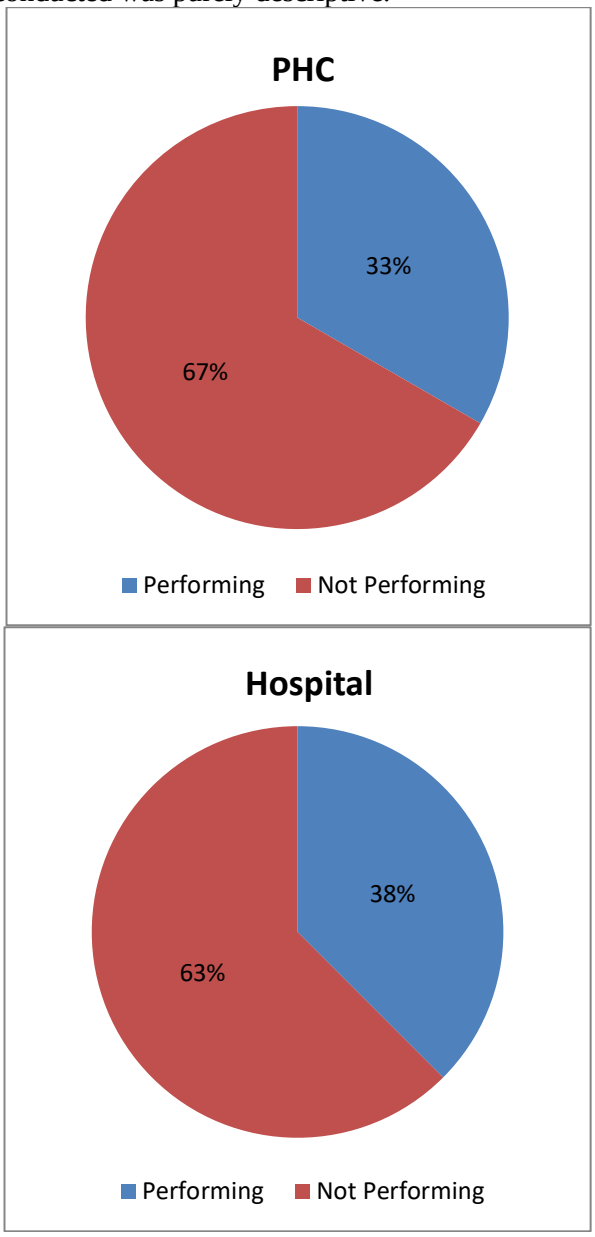

Figure 5. Percentage of Healthcare Facilities Performing Data Analysis and Interpretation in Depok

There are several reasons that TB officers at PHCs and hospitals did not perform analysis and interpretation of the available data. The first reason was the shortage of human resources (HR), which forced officers to take on multiple roles. At hospitals, TB officers were generally nurses who also served as medical assistants and provided patient care. Additionally, at PHCs, TB officers were also responsible for other programs. This resulted in difficulties in performing data analysis and interpretation. The second reason was a lack of time, as officers must divide their time to manage other responsibilities. Moreover, in 2021, their time was further occupied with handling the COVID-19 pandemic, which affected the entire world. During that year, officers were not only busy with COVID-19 case tracing and testing but also involved in vaccinating the community. The third was the lack of ability and commitment among officers to perform data analysis and interpretation. Instead of conducting their own analysis, TB officers relied solely on the graphs produced by the TB Information System (SITB).

Accurate data enables health authorities to monitor disease trends, identify high-risk populations, and allocate resources efficiently. Implementing robust data management systems enhances the capacity to track TB cases, treatment outcomes, and program performance, thereby facilitating informed decision-making and timely interventions [14]. The proficiency of TB officers in data analysis and interpretation is crucial for the success of TB control programs. Training TB officers in these skills has been shown to significantly increase TB case detection rates. A systematic review and meta-analysis revealed that providing training to health professionals and volunteers led to a 60% increase in TB case detection [15].

Furthermore, enhancing TB officers' abilities in data analysis and interpretation contributes to improved infection control practices. Studies have demonstrated that training Tb officers in TB infection control measures positively influences their knowledge, attitudes, and practices, thereby reducing the risk of TB transmission within healthcare settings [16].

2.4. Feedback

Feedback was a response from the higher-level surveillance unit (Depok Health Office) regarding the implementation of TB surveillance at healthcare facilities. Based on interview results, all TB officers at PHCs and hospitals reported that TB supervisor at the Depok Health Office provided feedback to all healthcare facilities regarding the implementation of TB surveillance. That feedback was provided through periodic meetings, which occured every three months, as well as direct discussions, phone calls, or WhatsApp messages.

Regular mentorship and feedback from higher-level units have been shown to significantly improve TB program performance in health facilities. A study highlighted that evidence-based mentorship, feedback, and decision-making were key components of the Standard of Care (SOC)

approach, leading to enhanced TB control efforts. This approach not only improved the quality of care but also strengthened the sense of ownership among health facility managers and workers, ensuring the sustainability of TB program support [17].

3. Support Functions of Surveillance System

3.1. Guideline

Guideline was the foundation for carrying out activities, including TB control. Guideline for TB control was necessary to ensure that those involved and the public were aware of the indicators and steps required to eliminate TB cases. In Indonesia, the guideline for TB control was the Ministry of Health Regulation No. 67 of 2016. This regulation included explanations on TB control targets, strategies, activities, and also contained details on TB surveillance [6].

Based on interviews, it was found that 41% of healthcare facilities could not provide the relevant guideline during the interview, either in hard or digital format. Their inability to present the guidelines was partly due to a turnover of TB officers, leaving new staff unaware of the guidelines' existence. Additionally, some respondents stated that the strategies and activities to be carried out were the responsibility of TB officers at the Health Office, so program officers at PHCs and hospitals only needed to implement them.

Evidence-based guidelines provide standardized protocols for diagnosing, treating, and preventing TB, ensuring consistency and quality across healthcare settings. These guidelines are essential for guiding HCWs in implementing best practices and adhering to recommended procedures [18].

3.2. Training

Training was one of the efforts to enhance the capacity of officers in TB surveillance activities. Some of the basic training required for officers included training on case reporting and recording, as well as contact investigation training specifically for TB officers at PHCs. According to interview results, 53% of TB officers reported that they had never received training on TB case reporting and recording through SITB (Figure 6), and 44% reported they had never received training on TB contact investigations (Figure 7).

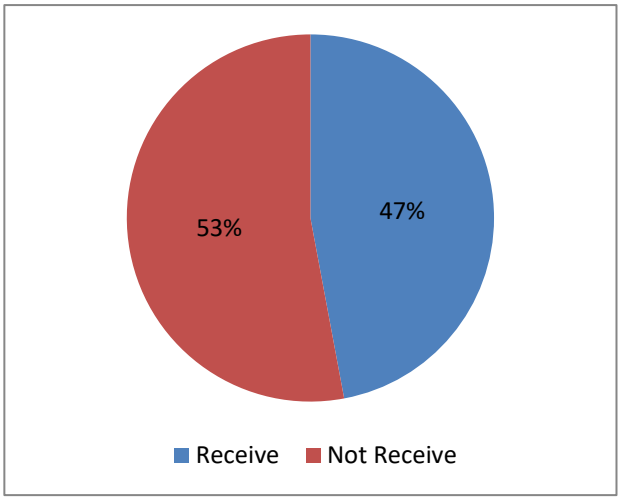

Figure 6. Percentage of TB Officers at Healthcare Facilities Receiving Training on TB Case Recording and Reporting in Depok

Although training on case reporting and recording, as well as contact investigations, had been held before, the high percentage of TB officers who had not received the training was partly due to staff turnover. That caused new officers to rely on previous staff for learning and ask the TB officers at the Health Office about the challenges they faced, or learn independently.

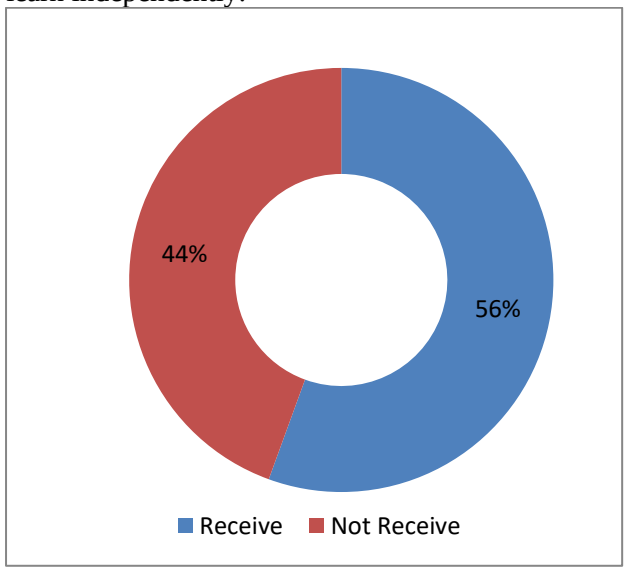

Figure 7. Percentage of TB Officers at Healthcare Facilities Receiving Training on TB Contact Investigation in Depok

Training is a cornerstone of effective TB control, as it equips healthcare workers (HCWs) with the necessary skills and knowledge to manage and prevent the disease. A systematic review and meta-analysis revealed that providing training to health professionals and community volunteers significantly increased TB case detection rates. This enhancement is crucial for identifying and treating

individuals with TB, thereby reducing transmission and improving public health outcomes [15].

Meta-analysis study that studied about effect of tuberculosis infection control training on work performance among health staff in health facilities showed that health personil who received TB training had a 2.35 times better chance of performance compared to health personil without training, and this result was statistically significant (aOR= 2.35; 95% CI= 1.96 to 2.81; p <0.001).(19) It indicates that training can improve the performance of TB officers in health facilities.

3.3. Budget

Regarding the availability of budgets at PHCs and hospitals, 65% of the TB officers interviewed confirmed that they had a budget for the TB program at their institutions. However, 73% of TB officers complained that the available budget was insufficient to implement the TB program (Figure 8). The most frequently complained about budget shortfall was for fieldwork activities in contact investigations.

Adequate funding is essential for the implementation TB control programs. Proper budgeting ensures that all necessary resources—such as diagnostic tools, medications, healthcare infrastructure, and trained personnel—are available to combat TB effectively. Without sufficient financial support, critical components of TB control, including case detection, treatment, and prevention strategies, may be compromised, leading to increased transmission and higher mortality rates. The intersection of TB and health financing requires a collection of health financing approaches, including traditional program management budgets, NGO contracting, social health insurance payments, and social protection payments to patients. Establishing a reliable financing source for public health actions (PHAs) is critical, as dedicated support for PHAs would benefit multiple health areas, particularly TB programs. A lack of such funding can hinder the implementation of effective TB control measures, leading to increased disease burden and associated economic impacts [20].

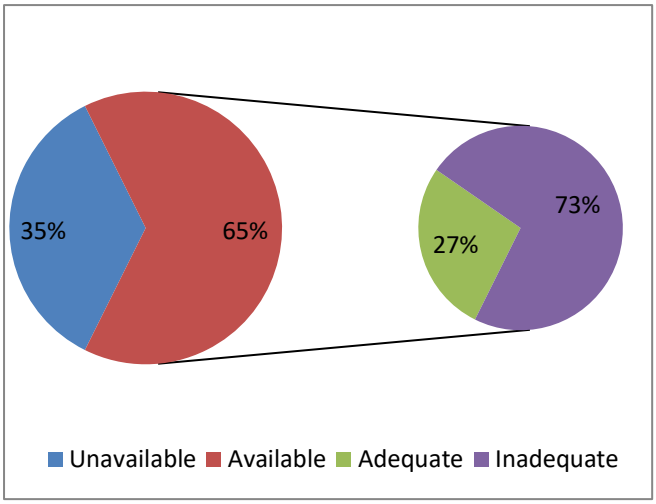

Figure 8. Availability and Adequacy of TB Program Budget at Healthcare Facilities in Depok

4. Surveillace Attributes

4.1. Simplicity

Simplicity was one of the indicators that described the ease with which officers at PHCs and hospitals could carry out TB surveillance activities. According to interview results, 76% of officers at both PHCs and hospitals stated that the TB surveillance system was not simple.

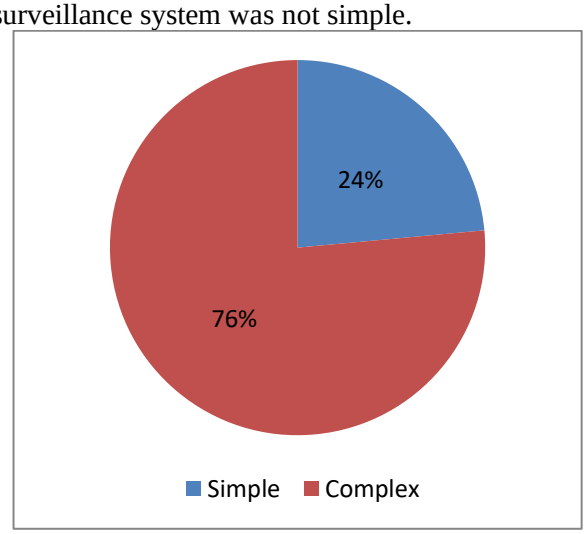

Figure 9. Simplicity of the TB Surveillance System at Healthcare Facilities in Depok

According to the interview results, there were several aspects of the TB surveillance system considered complex. (Figure 10) The aspect most commonly identified as complicated was related to data analysis. Additionally, the large volume of supplementary data and the complex recording and reporting system made officers feel that the TB surveillance system was not simple.

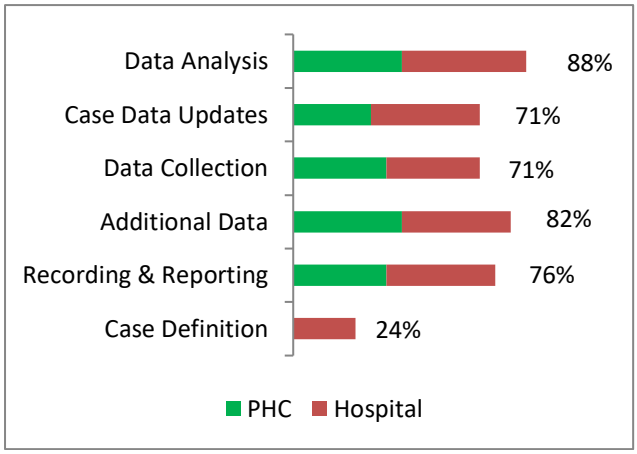

Figure 10. Aspects of TB Surveillance System Perceived as Not Simple in Depok

Simplicity in TB surveillance systems is crucial for effective disease monitoring and control. A study evaluating Ireland's transition from the National Tuberculosis Surveillance System (NTBSS) to the Computerized Infectious Disease Reporting System (CIDR) found that while CIDR improved the flexibility and usefulness of data collection, it did not enhance data completeness and actually increased the median time from diagnosis to notification. This suggests that while advanced systems may offer more features, they can also introduce complexities that hinder timely reporting [21].

The importance of simplicity is further emphasized in the evaluation of TB surveillance systems in Bulilima District, Zimbabwe. The study assessed the perceptions of TB officers regarding the simplicity of the TB case notification surveillance system. Simpler systems were easier to operate and maintain, leading to better data quality and more efficient disease monitoring [22].

4.2. Completeness

The completeness of the reported data referred to the number of TB patients diagnosed clinically and confirmed bacteriologically, as recorded in the SITB, compared to the number of TB cases recorded in the TB 03 book. According to the interview results, it was found that 5% of TB cases in PHCs and hospitals in Depok were not reported in 2021.

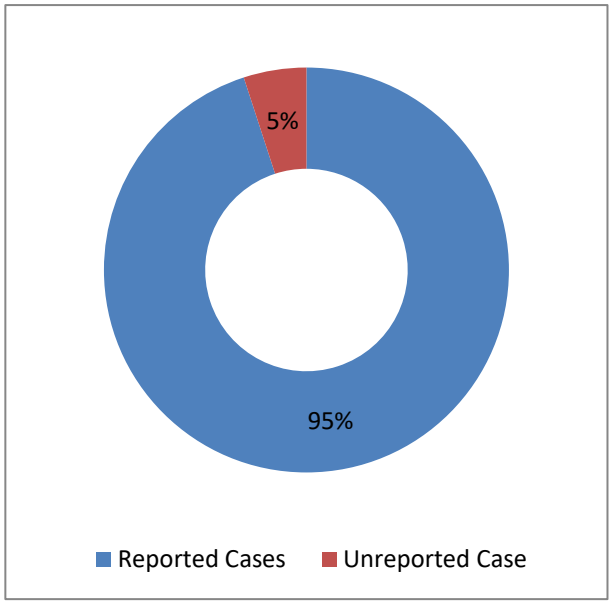

Figure 11. Completeness of Reported TB Case Data at Healthcare Facilities in Depok

Although the percentage of reported TB cases at healthcare facilities had reached 95% (Figure 11), the results do not fully reflect the actual situation because the collected data in hospitals had not been synchronized with the data in the Hospital Management Information System (SIMRS). The data only consisted of patient information recorded in the DOTS clinic at the time of the interview. The lack of synchronization between the SIMRS data and the SITB data, coupled with time constraints, had led to difficulties for staff in tracking and following up on TB cases within the hospital.

Maintaining high standards of data completeness are achievable and beneficial for effective TB control [23]. Evaluating TB notification completeness is important for monitoring TB surveillance systems, while estimating the TB disease burden is crucial for control strategies. A study evaluating TB notification completeness in Poland in 2018 found that while the completeness of reporting was high, certain data elements were missing in some cases. This underscores the need for comprehensive data collection to ensure effective monitoring and response to TB [24].

Similarly, an assessment of the U.S. National Tuberculosis Surveillance System revealed that while most reported cases had complete information, certain data fields, such as the country of birth of the primary guardian for pediatric patients, had lower completeness. This highlights the importance of ensuring that all relevant data fields are consistently reported to enhance the quality of surveillance data [25].

4.3. Usefulness

Data utilization in TB surveillance systems is essential for informed decision-making and effective program implementation. According to the interview results, 65% of TB officers in PHCs and hospitals stated that they had not utilized the data. The collected data was only used for routine reports to the Health Office and had not been used as a reference for policy-making related to TB control.

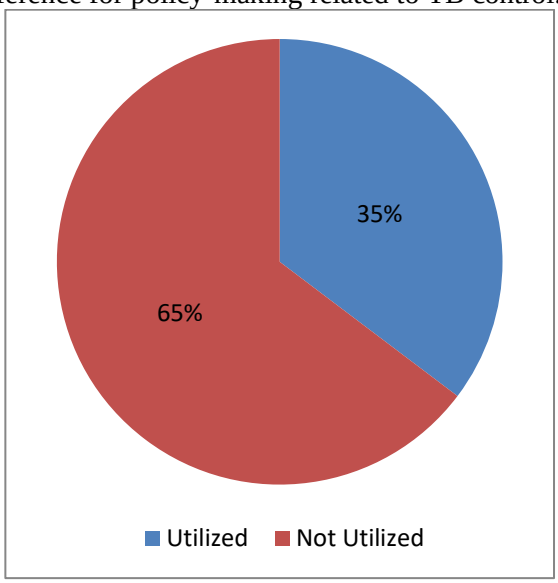

Figure 12. Percentage of TB Data Utilization at Healthcare Facilities in Depok

A study on the use of TB surveillance data for program evaluation highlighted that reliable surveillance systems enable the assessment of TB programs through routinely collected data, facilitating evidence-based evaluations and operational research. By collecting information on each newly reported TB case, it provided comprehensive data that supports public health initiatives, policy development, and resource allocation [26].

Thus, this study was a descriptive assessment and conducted in Pandemic Covid-19. During that year, officers were not only busy with COVID-19 case tracing and testing but also involved in vaccinating the community and it affected to the performance of TB surveillance system. It is a need to future assessment to a better understanding of implementing TB surveillance system in Depok.

Conclusion

This study provided an evaluation of TB surveillance system in Depok, uncovered critical gaps in structure of the system, core functions, support functions, and quality of surveillance system. It highlighted the systemic challenges that hindered effective TB control, such as inadequate knowledge of legal aspects, insufficient private-sector engagement, lack ability of data analysis and interpretation, the high percentage of TB officers who had not received the training was partly due to staff turnover, complex data collection, and low utilization of surveillance data for decision-making. The research integrated operational, legal, and community engagement aspects, offered fresh insights into the interplay between healthcare systems and TB management, particularly in urban settings like Depok. By bridging these gaps, the findings contributed to advancing the theoretical understanding of the implementation of TB surveillance system.

To enhance the effectiveness of TB control efforts, this study recommends targeted training for healthcare workers, sufficient budget allocations, and simplified data management systems. Strengthening public-private partnerships and leveraging community-based interventions, such as collaborations with professional organizations and grassroots initiatives, are critical for sustainable improvements. Advocacy and education should also be prioritized to increase legal and operational awareness among stakeholders.

Conflict of Interest

No conflict of interest in this study

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