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Early Detection of Tuberculosis in Primary Health Centers of West Lombok (2023-2024) : A Mixed-Methods Study

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Abstract
Tuberculosis (TB) remains a major global health challenge, with Indonesia ranking second globally in TB burden. Despite the high prevalence in West Lombok Regency, case detection remains suboptimal. This study aimed to assess TB case detection through early detection activities at community health centers in West Lombok using a parallel convergent mixed-methods design. Quantitative data from the Tuberculosis Information System (SITB) registers (2023–2024) of four community health centers were descriptively analyzed, while qualitative data were obtained through semi-structured interviews with TB program managers and analyzed thematically. Findings from both components were integrated at the interpretation stage to provide a comprehensive understanding of program performance. The highest number of cases was reported in Sekotong and Kediri, while Narmada had the lowest. Contact tracing coverage exceeded 90% in Narmada and Labuapi, improved in Sekotong, but declined to 49.45% in Kediri despite increased cases. Qualitative findings Identified barriers included low community participation, limited population identification, and insufficient field resources. In conclusion, early TB detection in West Lombok shows regional disparities, The mixwd-methods approach highlighting the need for strengthened community-based strategies, enhanced education, and improved administrative support to optimize contact tracing and TB control.
Keywords: Tuberculosis; Early Detection; Contact Tracing; Community Health Centers

INTRODUCTION

Tuberculosis (TB) remains a global health problem and is the leading cause of death from infectious diseases. According to the 2023 Global Tuberculosis Report, approximately 10.6 million people worldwide fell ill with tuberculosis in 2022, with Asia-Pacific accounting for nearly one-fifth of all cases worldwide (*Global Tuberculosis Report 2023*, 2023).

Indonesia itself has experienced an increase in cases since India, with an estimated 969,000 new cases per year and a death toll of around 150,000 people. This situation shows that TB remains a serious concern, both from a health and socio-economic perspective (Noviyani, 2020)

Global tuberculosis control efforts emphasize the importance of early detection as a key strategy for

breaking the chain of transmission, reducing morbidity, and achieving the 2030 tuberculosis elimination target in accordance with *the End TB Strategy* framework. In Indonesia, community health centers (puskesmas) as primary health care services play a key role in screening, diagnosis, treatment, and contact investigation (Kartasasmita, 2016). However, major challenges remain, such as social stigma, limited human resources, low patient compliance, and delayed access to health services (Rasyida et al., 2025).

Specifically, West Nusa Tenggara Province (NTB) is one of the regions with a fairly high prevalence of tuberculosis. Data from the Central Statistics Agency (BPS) in 2024 shows that West Lombok Regency ranks third in the number of tuberculosis cases in NTB with 1,650 cases, after East Lombok and Mataram City. The selection of Kediri, Sekotong, Narmada, and Labuapi subdistricts was based on their large populations and population density compared to other subdistricts in West Lombok Regency. Despite the high disease Previous studies in Indonesia have mostly focused on risk factors, epidemiological burden, or evaluation of TB treatment. However, in-depth studies on variations in early detection rates between health centers and barriers to implementing contact investigation at the community level are still limited (Winardi et al., 2022). Studies on differences in achievements between regions in West Lombok, for example between the Kediri, Sekotong, Narmada, and Labuapi health centers, have not been comprehensively reported. Yet, this information is important for understanding the local factors that influence the success of TB programs (*Global Tuberculosis Report 2023*, 2023; Kartasasmita, 2016).

Existing tuberculosis (TB) studies largely focus on disease burden and treatment outcomes, with limited attention to variations in early detection performance across primary health care facilities within the same district (Ayakaka et al., 2017; Burke et al., 2021). Although contact investigation is widely promoted, there is still a lack of studies that integrate quantitative program data with qualitative insight to explain local implementation gaps (Sari et al., 2026). In addition, administrative barriers, such as incomplete population identification, remain underexplored despite their potential impact on contact tracing effectiveness (Cazabon et al., 2017; Datiko & Lindtjørn, 2020; Van Wyk et al., 2020).

This study offers several novel contributions. First, it applies a parallel convergent mixed-methods approach to

integrate routine surveillance data with field-based qualitative insights, enabling a more comprehensive understanding of TB early detection performance at the primary care level. Second, it provides a comparative analysis of multiple community health centers within a single district, highlighting intra-district disparities that are rarely reported in previous studies (Taylor et al., 2024; Wingfield et al., 2021).

Third, this study explicitly identifies administrative barriers, such as incomplete population identification systems, as key determinants of contact tracing performance—an aspect that has received limited attention in global TB literature. Finally, it identifies local best practices from high-performing health centers (e.g., Narmada and Labuapi) that can serve as replicable models for strengthening TB control strategies in similar settings.

The objective of this study lies in the need to integrate quantitative data on case findings with qualitative perspectives from health workers directly involved in the field. The mixed-methods approach allows for a broader understanding, not only of epidemiological trends, but also of the structural barriers, community behaviors, and administrative challenges encountered. Thus, the results of this study can provide evidence-based recommendations for strengthening early detection strategies at the community health center level (Noviyani, 2020)

METHOD

This study employed a parallel convergent mixed-methods design, which integrates quantitative and qualitative data concurrently to provide a comprehensive overview of tuberculosis early detection at community health centers in West Lombok Regency.

Integration Strategy

Data integration was conducted using a weaving approach, where quantitative results (e.g., TB case trends and contact tracing coverage) were directly compared and explained using qualitative findings (e.g., perceived barriers and field challenges). In addition, a joint display matrix was developed to align quantitative indicators with qualitative themes, enabling systematic comparison and interpretation across data sources. This study applied a complementary weighting, in which quantitative data served as the primary component to describe trends and performance indicators, while qualitative data played a supportive role in explaining contextual factors underlying the observed patterns. Both components were considered equally important for interpretation.

Population and Sample

1. Quantitative**:** The research population consists of all TB cases recorded in the Tuberculosis Information System (SITB) at four health centers (Kediri, Sekotong, Narmada, and Labuapi Health Centers). The sample includes all secondary data on TB cases found during the 2023–2024 period.

2. Qualitative**:** Informants consisted of health workers managing the TB program at each health center. Informants were selected purposively based on their direct involvement in the program

Research Location and Duration

The study was conducted in four community health centers in West Lombok Regency, West Nusa Tenggara Province: Kediri, Sekotong, Narmada, and Labuapi Community Health Centers. The locations were selected based on the high number of TB cases and population density. The study

period covered January 2023 to December 2024 (BPS NTB, 2024)

Inclusion Criteria

1. Complete TB case data recorded in the SITB register.
2. TB program managers with at least 1 year of experience.

Exclusion Criteria

1. Incomplete or duplicate data.
2. Informants who refuse to give consent for an interview.

Data Collection Procedures

1. Quantitative Data: Taken from the SITB register, including the number of TB cases, diagnostic methods (microscopic, TCM, clinical), and contact examination achievements.
2. Qualitative Data: Semi-structured interviews were conducted with TB program managers through face-to- face meetings or online communication (WhatsApp). Questions covered field experiences, administrative barriers, and strategies for improving early detection.

Data Analysis

Quantitative: Quantitative data were analyzed using both descriptive and comparative approaches. Descriptive statistics were used to summarize TB case trends and contact tracing coverage across health centers. To strengthen the analysis, comparison of proportions were conducted to examine difference in contact tracing coverage between health centers. In addition, a trend analysis (2023-2024) was performed to assess change over time, and percentage change was calculated to quantify increase or declines in program performance across sites.
Qualitative: Interview transcripts were analyzed using *thematic analysis*, including coding, categorization, and extraction of main themes.
Integration: Quantitative and qualitative results are combined at the interpretation stage to compare similarities and differences.

To enhance validity, methodological triangulation was applied by comparing findings from quantitative data (SITB records) and qualitative interviews. Convergence, complementarity, and discrepancies between the two data sources were systematically examined to ensure a comprehensive understanding of TB early detection performance.

Qualitative Component

A total of 4–8 informants (TB program managers from each community health center) were selected using purposive sampling based on their direct involvement in TB program implementation and at least one year of experience. Informants characteristics included professional role (TB program officer), years of experience, and involvement in contact tracing activities. Data collection continued until data saturation was reached, indicated by no emergence of new themes from subsequent interviews.

Research Ethics

All informants in this study provided written consent (informed consent) prior to the interview. Confidentiality of identity was maintained using anonymous codes, and data

was used solely for research purposes. There were no risks to participants during the research process.

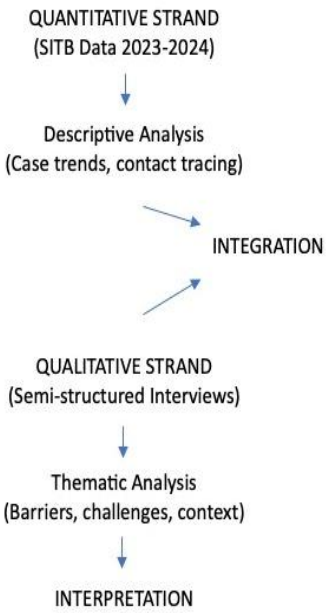

Figure 1. Parallel Convergent Mixed-Methods Design

RESULT

A comparison of TB case trends at the West Lombok Community Health Center in 2023 and 2024 shows significant dynamics between regions. In 2023, the highest number of cases was recorded at the Sekotong Community Health Center (103 cases) and Kediri (79 cases), while the lowest number was in Narmada (74 cases). In 2024, there was a change: Sekotong remained the health center with the highest number of cases (95 cases), while Kediri increased to 91 cases, and Narmada decreased sharply to 60 cases.

In terms of contact tracing, the best results in 2023 were found in the Narmada (93.3%) and Labuapi (85%) Community Health Centers, while the lowest results were found in Kediri (59.5%) and Sekotong (42.8%). In 2024, Narmada's achievement increased to 100% and Labuapi remained high (94%). Sekotong also showed improvement with an increase from 42.8% to 70.5%. Conversely, Kediri actually decreased to 49.5% despite an increase in the number of TB cases.

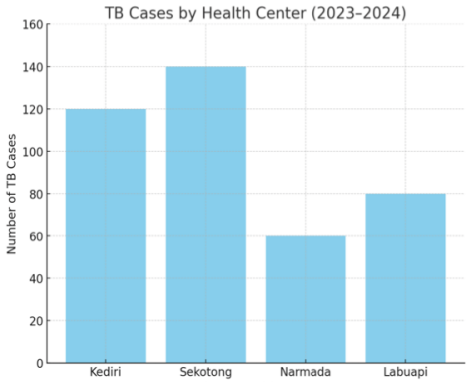

Figure 2. Average number of TB cases at health centers in West Lombok (Kediri Health Center, Sekotong Health Center, Narmada Health Center, and Labuapi Health Center)

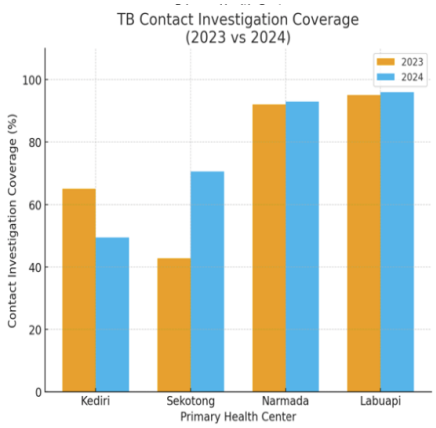

Figure 3. Percentage of TB contact examinations achieved at West Lombok Health Centers (PKM Kediri, PKM Sekotong, PKM Narmada, and PKM Labuapi).

In terms of diagnosis, in 2023 the highest number of TCM cases was in Sekotong (81 cases) and this trend continued in 2024 with 76 cases. Interestingly, clinical cases in Kediri increased from 19 cases (2023) to 33 cases (2024), indicating a shift in the pattern of case detection in the region.

Qualitative Findings

Qualitative analysis identified several key themes that explain variations in tuberculosis (TB) early detection performance across community health centers in West Lombok. These findings provide contextual insights into the quantitative results, particularly the differences in contact tracing coverage.

1. Low Community Participation

Low willingness among community members to participate in TB screening emerged as a major barrier to effective contact tracing. This issue was particularly evident in health centers with lower coverage, such as Kediri.

"Many close contacts refuse to be examined because they are afraid or feel stigmatized." *(Informant 2, TB program manager)*

"Some people do not want to come for screening even after being approached several times." *(Informant 1, TB officer)*

This finding helps explain the decline in contact tracing coverage observed in Kediri, despite an increase in TB cases.

2. Administrative Barriers (Lack of Identification Documents)

Administrative constraints, particularly incomplete identity documentation (e.g., absence of ID cards or family registration numbers), were identified as a significant obstacle in TB case registration and follow-up.

"Some residents do not have ID cards, so we cannot register them for further examination." *(Informant 3, TB program manager)*

"Without proper identification, it is difficult to input patient data into the system." *(Informant 4, TB officer)*

These barriers directly affect the ability of health centers to record and refer suspected TB cases, contributing to under-detection.

3. Limited Human Resources

Informants consistently reported that limited staff availability constrained the implementation of active case finding and contact investigation.

"The number of staff is limited, making it difficult to conduct active case finding optimally." *(Informant 1, TB program manager)*

"We have to handle multiple programs at the same time, so TB activities are sometimes delayed." *(Informant 2, TB officer)*

4. Effectiveness of Community-Based Approaches

Health centers with higher performance, such as Narmada and Labuapi, highlighted the importance of community-based strategies, including active involvement of local cadres and door-to-door approaches.

"We involve community health cadres to help identify and monitor TB contacts." *(Informant 3, TB program manager)*

"Door-to-door visits are very effective to ensure contacts are examined." *(Informant 4, TB officer)*

These approaches were associated with higher contact tracing coverage and may represent best practices that can be replicated in other settings.

DISCUSSION

The results of this study indicate that the achievement of early detection of tuberculosis in four community health centers in West Lombok Regency varies considerably, especially in terms of contact tracing (Putra et al., 2022). High contact examination rates were consistently observed at the Narmada and Labuapi CHCs, while the Kediri CHC showed a significant decline despite an increase in the number of cases. These findings are consistent with the literature, which states that variations in TB detection rates between regions are often influenced by factors such as resources, population density, stigma, and the readiness of the service system (Supriyadi & Wahyuni, 2021).

Nationally, contact tracing coverage in Indonesia is still below the WHO target. A study by Putra et al. (2022) reported that the average contact investigation coverage in Indonesian primary care services only reached 55–65% (A. B. Putra & Sari, 2021), similar to the coverage in Kediri in 2024 (49.5%). In contrast, the achievement of >90% in Narmada and Labuapi shows that these areas are able to exceed the national average and even approach the global recommended standard (≥90%) (WHO, 2023). This confirms that there are potential local *best practices* that can be replicated.

The differences in trends between health centers in this study are also related to structural and non-structural barriers identified through qualitative components. Informants mentioned low community willingness to be examined, incomplete identity documents (ID cards/family cards), and limited field human resources as the main barriers. These findings are consistent with the research by Sriwidadi et al. (2021), which states that stigma, fear of diagnosis, and administrative barriers are the main causes of low contact screening rates in various regions of Indonesia (Sriwidadi & Yuliana, 2021). Administrative barriers such as the absence of a National Identification Number (NIK) have also been reported in areas with similar demographic characteristics, such as East Lombok Regency and Sumbawa Regency, which have resulted in unreported cases and hindered access to TCM (Lestari, 2022)

Interestingly, the increase in Sekotong's achievement from 42.8% to 70.5% illustrates that program interventions such as *door-to-door investigations* and community cadre approaches are effective. These results are in line with a study in Kulon Progo District (2023) which showed that community-based approaches can increase contact tracing coverage by 25–40% in one year (Prasetyo, 2023 ; Reid et al., 2021)

Based on previous studies, several *research gaps* have been identified:

1. There have been limited studies comparing specific TB early detection achievements across health centers within a single district using a mixed-methods approach. Most existing studies focus on a single region or employ a purely quantitative approach (11–14).
2. There is still limited research that integrates administrative barriers (e.g., issues with identity documents) as determinants of contact examination outcomes.However, the findings of this study indicate that these barriers are quite significant and have not been widely discussed in previous studies.
3. There is a lack of research reports on variations in diagnostic methods (TCM vs. clinical) and their influence on case detection trends between regions. Other studies focus more on evaluating treatment or risk factors, rather than diagnostic variations.
4. There are not many local studies discussing 'best practices' between health centers that can be replicated across regions in the context of districts in Indonesia. This study shows that Narmada and Labuapi can serve as models, something that has not been widely mentioned in the literature.

Thus, this study provides a new contribution in the form of a comprehensive overview of the variations in early detection achievements between community health centers, direct obstacles in the field, and the potential of successful regions as models for evidence-based interventions. While this study provides important insights into variations in TB early detection, the findings should be interpreted with caution, as the quantitative analysis is primarily based on aggregated program data and limited statistical testing. Future studies are recommended to apply more advanced analytical methods.

CONCLUSION

This study shows that early tuberculosis detection in community health centers in West Lombok Regency continues to face considerable challenges, particularly in contact tracing in high-burden areas. Quantitative findings indicate that the highest numbers of TB cases were consistently recorded at the Sekotong and Kediri health centers, while the highest contact tracing rates were consistently achieved by Narmada and Labuapi. Although contact tracing performance in Sekotong improved from

2023 to 2024, Kediri experienced a decline despite an increase in the number of TB cases.

Qualitatively, the main obstacles in conducting contact investigations are the low willingness of the community to be examined, the limited availability of identity documents (ID cards/family cards) which hinders recording in the system, and limited resources in the field. This has resulted in the suboptimal implementation of early detection of tuberculosis, especially in areas with high prevalence.

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