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Accuracy of hospital information system database and tuberculosis information system reporting

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Abstract

Background: The accuracy of tuberculosis (TB) reporting in the Tuberculosis Information System (SITB) depends on the quality of patient data management within the Hospital Management Information System (SIMRS).
Purpose: To assess the association between SIMRS database accuracy and the accuracy of SITB reporting at Welas Asih Regional Hospital.
Method: A descriptive quantitative study with a cross-sectional design was conducted using all 1,035 TB records from the fourth quarter of 2025. Data consistency was evaluated by matching six key patient data elements between SIMRS and SITB using a binary scoring method.
Results: SIMRS recording compliance was highest for diagnosis (72.1%) and gender (72.0%), while the address variable showed the greatest discrepancy (49.1%). Accurate SITB reporting was identified in 697 records (67.3%), whereas 338 records (32.7%) were inaccurate. Chi-square analysis demonstrated a significant positive association between SIMRS database accuracy and SITB reporting accuracy (Pearson $\chi^2 = 820.522$; $p < 0.05$). Reporting inaccuracies were primarily related to the absence of an integrated bridging system requiring manual duplicate entry, the lack of SITB-specific standard operating procedures, and inconsistent data reconciliation practices.
Conclusion: Improving reporting accuracy requires accelerated implementation of a SIMRS-SITB bridging system, establishment of technical SOPs, and routine data synchronization.

Keywords: Bridging; Data Accuracy; SIMRS; SITB; Tuberculosis.

INTRODUCTION

Tuberculosis (TB) is a chronic infectious disease caused by Mycobacterium tuberculosis that primarily affects the lungs but may also involve other organs (Ministry of Health of the Republic of Indonesia, 2016; World Health Organization, 2021). Transmission mainly occurs through airborne particles released when individuals with active pulmonary TB cough, sneeze, or speak (Sari et al., 2023). TB remains a major global public health problem and one of the leading causes of death from infectious diseases. Indonesia has one of the highest TB burdens worldwide, ranking third after India and China. According to the 2022 WHO report, among 5.3 million people diagnosed with pulmonary TB globally in 2021, approximately 63% were bacteriologically confirmed, an increase from 59% of 4.8 million cases in 2020 (Nurvita & Meyshella, 2024).

The high burden of TB in Indonesia is influenced by multiple factors, including sociodemographic characteristics, housing conditions, individual behavior, and comorbidities. Low educational attainment, poor socioeconomic conditions, and low Body Mass Index (BMI) may increase vulnerability to

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TB transmission and disease progression. Environmental conditions, such as inadequate natural lighting, poor ventilation, indoor air pollution, and overcrowded housing, may further increase the risk of transmission. Unhealthy behaviors, including smoking, poor cough etiquette, and close contact with individuals with active TB, also contribute to the spread of infection. The risk is particularly concerning among individuals with comorbidities such as HIV, diabetes mellitus, and asthma (Pralambang & Setiawan, 2021).

Patients with severe clinical conditions may require advanced medical treatment and hospitalization. As healthcare facilities, hospitals provide comprehensive medical services through inpatient, outpatient, and emergency departments (Ministry of Health of the Republic of Indonesia, 2020). Effective information governance is essential to support the delivery, monitoring, and evaluation of these healthcare services. Under the Regulation of the Minister of Health of the Republic of Indonesia Number 6 of 2026 concerning Hospitals, hospitals are required to implement a Health Information System that integrates the processing, reporting, and utilization of health information to improve the effectiveness and efficiency of healthcare delivery and support evidence-based decision-making (Ministry of Health of the Republic of Indonesia, 2026). At the hospital operational level, these functions are implemented through the Hospital Management Information System (HMIS), locally referred to as Sistem Informasi Manajemen Rumah Sakit (SIMRS).

However, the implementation of SIMRS does not necessarily guarantee the accuracy and consistency of data used for disease-program reporting. A preliminary study conducted at Welas Asih Regional Hospital indicated that TB patient data recorded in SIMRS must still be re-entered manually into the Tuberculosis Information System (Sistem Informasi Tuberkulosis [SITB]) because the two systems have not yet been integrated through a bridging mechanism. The absence of interoperability—the ability of data to be exchanged and utilized across different information systems—requires healthcare personnel to perform double entry of the same patient information (Ministry of Health of the Republic of Indonesia, 2022). This process increases staff workload and creates potential discrepancies between SIMRS and SITB data, as well as increasing the risk of manual data-entry errors. Extended administrative burdens can also precipitate emotional fatigue and stress among healthcare workers, mimicking the psychological pressures often observed in demanding transitional phases (Agarwal et al., 2020; Astutik et al., 2021). Consequently, TB reporting may be delayed and unavailable in real time, potentially reducing the effectiveness of disease surveillance, monitoring, evaluation, and evidence-based decision-making (Kusnandi et al., 2021).

The accuracy of TB patient data is particularly important because SITB serves as a key information system for recording and reporting TB cases and supporting the monitoring of the national TB control program. Inaccurate, incomplete, inconsistent, or delayed data may affect the reliability of TB reporting and potentially compromise the quality of information used for program evaluation and decision-making. Therefore, ensuring consistency between patient data stored in SIMRS and information reported through SITB is essential for maintaining reliable TB surveillance and reporting at the hospital level.

The novelty of this study lies in its comprehensive analysis of information system and organizational governance gaps using the Human–Organization–Technology Fit (HOT-FIT) model. Unlike previous research, such as Lestari et al. (2024), which primarily emphasized the impact of the absence of internal Standard Operating Procedures (SOPs) on inconsistencies in data recording, this study identifies a broader organizational governance issue. Specifically, the study examines the dual consequences of the absence of a dedicated SOP for SITB data entry: inconsistent recording practices among staff and the lack of internal quality-control mechanisms due to the absence of systematic monitoring and evaluation by the hospital. This situation may result in excessive reliance on external evaluation conducted by the local Health Office (Lestari et al., 2024). Furthermore, this study evaluates the relationship between the accuracy of TB patient data in the SIMRS database and the accuracy of SITB reporting while considering the interaction of human, organizational, and technological factors. This approach provides a more comprehensive understanding of how data-entry practices, system interoperability, organizational procedures, and monitoring mechanisms influence the quality of TB reporting. Accordingly, this study aims to analyze the accuracy of tuberculosis patient data in the SIMRS database in relation to the accuracy of SITB reporting

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at Welas Asih Regional Hospital using the HOT-FIT framework. The findings are expected to provide evidence-based recommendations for improving data quality, strengthening internal information governance, and supporting the development of more integrated and reliable TB reporting processes.

RESEARCH METHOD

This study employed a descriptive quantitative approach with a cross-sectional design to analyze numerical data obtained from matching tuberculosis (TB) patient databases and to provide an objective description of the accuracy of TB reporting at Welas Asih Regional Hospital. The cross-sectional design enables the independent and dependent variables to be measured and analyzed at the same point in time (Sofya et al., 2024). The study variables consisted of the accuracy of TB patient data in the Hospital Management Information System (Sistem Informasi Manajemen Rumah Sakit [SIMRS]) database as the independent variable and the accuracy of reporting in the Tuberculosis Information System (Sistem Informasi Tuberkulosis [SITB]) as the dependent variable. The study population included all TB patient records documented in both systems during the fourth quarter of 2025 (October–December). A total sampling technique was applied, in which the entire population of 1,035 TB patient records was included as the study sample.

Data collection was conducted from January to March 2026. Secondary data were obtained through documentation and extraction of TB patient records for the fourth quarter of 2025 from the SIMRS and SITB databases. Primary data were collected through direct observation and interviews with key personnel involved in TB data management and reporting, including the Head of the Medical Records Department, reporting officers, and the hospital Information Technology (IT) team. These primary data were used to provide contextual information regarding the TB reporting workflow and identify operational factors potentially contributing to data discrepancies between the two systems.

Data processing was performed systematically through several stages. First, editing was conducted to examine the completeness and consistency of the extracted records. Second, coding was performed by assigning numerical codes to facilitate data processing and statistical analysis. Third, cleaning was conducted to identify and remove duplicate or invalid records. Subsequently, data matching was performed by comparing six key patient data elements between SIMRS and SITB: Medical Record Number, Name, gender, Age, Address, and Diagnosis. Each matched variable was assessed using a binary scoring system, with a score of 1 indicating “Matched/Accurate” and 0 indicating “Not Matched/Inaccurate.” The processed data were subsequently organized into frequency and distribution tables through the tabulation process.

Univariate analysis was performed to describe the frequency and percentage distribution of data accuracy for each variable in SIMRS and SITB. The analysis was used to determine the proportion of matched and unmatched data across the six patient data elements and to provide an overall description of TB reporting accuracy at Welas Asih Regional Hospital. Furthermore, bivariate analysis using the chi-square test was conducted to examine the association between the accuracy of TB patient data in the SIMRS database and the accuracy of SITB reporting. Statistical significance was determined using a p-value < 0.05, indicating a statistically significant association between the variables. The quantitative findings were further supported by primary data obtained from observations and interviews to identify underlying operational issues, particularly those related to system integration, manual double-entry processes, data interoperability, and the availability and implementation of hospital Standard Operating Procedures (SOPs). This complementary approach provided a more comprehensive interpretation of the factors influencing the accuracy of TB reporting at Welas Asih Regional Hospital.

RESEARCH RESULTS

The chi-square test was used to determine the association between the independent variable, namely the accuracy of TB patient data in the SIMRS database, and the dependent variable, namely the accuracy of SITB reporting. The level of statistical significance was set at $\alpha = 0.05$. The decision criterion was based on the p-value: a p-value < 0.05 indicated a statistically significant association between the accuracy of the SIMRS database (X) and the accuracy of SITB reporting (Y), whereas a p-value ≥ 0.05 indicated no statistically significant association between the two variables. The results of the chi-square analysis were subsequently interpreted to determine whether the accuracy of TB patient data recorded in SIMRS was significantly associated with the accuracy of TB data reported through SITB.

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Table 1. Summary of Descriptive Statistics (N=1,035)

Statistics		Medical Record Number Accuracy	Name Accuracy	Gender Accuracy	Age Accuracy	Address Accuracy	Diagnosis Accuracy
N	Valid	1,035	1,035	1,035	1,035	1,035	1,035
	Missing	0	0	0	0	0	0

Based on Table 1, the examination of all TB patient records from the fourth quarter of 2025 showed that all 1,035 records (100%) included in the study were valid, with no missing or incomplete data identified across the variables of medical record number, patient name, gender, age, address, and diagnosis. These findings indicate that the entire dataset was complete and eligible for further analysis. Therefore, all 1,035 records were included in the subsequent frequency distribution analysis and bivariate statistical testing to evaluate the accuracy of SIMRS data and its association with the accuracy of SITB reporting.

Table 2. Frequency Distribution of Data Accuracy (N=1,035)

Variables	Matched (n/%)	Not Matched (n/%)
Data Accuracy Based on Medical Record Number	715/69.1	320/30.9
Data Accuracy Based on Patient's Full Name	723/69.9	312/30.1
Data Accuracy Based on Gender	745/72.0	290/28.0
Data Accuracy Based on Age	680/65.7	355/34.3
Data Accuracy Based on Address	527/50.9	508/49.1
Data Accuracy Based on Diagnosis	746/72.1	289/27.9

A comparison of six patient data elements between SIMRS and SITB revealed varying levels of consistency. Medical record numbers showed 69.1% agreement (715 records), while 30.9% were discrepant, indicating potential challenges in patient identification, data synchronization, and continuity of care (Saragih et al., 2024). Similarly, patient names were consistent in 69.9% of records (723 records), with discrepancies largely attributable to spelling variations, incomplete entries, and abbreviations, reflecting ongoing issues in documentation completeness (Yuliyanti, 2023).

Gender data demonstrated a relatively high concordance rate of 72.0% (745 records), although 28.0% remained inconsistent, potentially affecting epidemiological analyses and risk-group identification (Muhriati & Lazuardi, 2025). Age data showed lower agreement, with 65.7% matched and 34.3% discrepant, suggesting deficiencies in data updating and validation processes that may compromise demographic and epidemiological analyses (Bella et al., 2023).

Among demographic variables, address exhibited the lowest accuracy, with only 50.9% agreement and 49.1% discrepancy. Variations in residential information and incomplete address documentation may hinder patient tracing, geographic mapping, and TB surveillance activities (Susilowati et al., 2022). In contrast, diagnosis achieved the highest consistency level, with 72.1% agreement, reflecting generally reliable ICD-10 coding practices. Nevertheless, the remaining 27.9% discrepancy rate highlights the need for continued data validation and synchronization to strengthen TB reporting quality (Purba et al., 2024).

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Table 3. Crosstabulation Between SIMRS Database Accuracy and SITB Reporting Accuracy

SIMRS Database Accuracy	Statistics	Inaccurate SITB Reporting	Accurate SITB Reporting	Total
Inaccurate	Count	293	5	298
	Expected Count	97.3	200.7	298.0
	% within SIMRS Accuracy	98.3%	1.7%	100.0%
Accurate	Count	45	692	737
	Expected Count	240.7	496.3	737.0
	% within SIMRS Accuracy	6.1%	93.9%	100.0%
Total	Count	338	697	1,035
	Expected Count	338.0	697.0	1,035.0
	% within SIMRS Accuracy	32.7%	67.3%	100.0%

Based on Table 3, among the 1,035 records analyzed, 67.3% (697 records) were classified as accurate in SITB reporting, while 32.7% (338 records) were classified as inaccurate. More specifically, among the 298 records with inaccurate SIMRS data, the majority, 98.3% (293 records), resulted in inaccurate SITB reporting, whereas only 1.7% (5 records) were reported accurately in SITB. Conversely, among the 737 records with accurate SIMRS data, 93.9% (692 records) were associated with accurate SITB reporting, while only 6.1% (45 records) were classified as inaccurate.

These findings demonstrate a strong pattern of association between SIMRS database accuracy and SITB reporting accuracy. Records with inaccurate data in SIMRS were predominantly associated with inaccurate SITB reporting, whereas accurate SIMRS records were predominantly associated with accurate SITB reporting. This pattern suggests that the quality and accuracy of TB patient data recorded in SIMRS play an important role in determining the reliability of subsequent SITB reporting. However, statistical significance of this association should be confirmed through the chi-square test, as presented in the subsequent analysis.

Table 4. Chi-Square and Fisher's Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	820.522*a*	1	.000		
Continuity Correction*b*	816.334	1	.000		
Likelihood Ratio	918.046	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	819.729	1	.000		
N of Valid Cases	1035				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 97.32.
b. Computed only for a 2x2 table

Based on Table 4, the chi-square test performed using IBM SPSS Statistics yielded a Pearson Chi-Square value of 820.522 (df = 1; $p < 0.001$). Fisher's Exact Test also yielded a statistically significant result ($p < 0.001$). Since the p-value was lower than the predetermined significance level of $\alpha = 0.05$, the null hypothesis (H_0) was rejected and the alternative hypothesis (H_1) was accepted. These findings demonstrate a statistically significant association between the accuracy of TB patient data in the SIMRS database and the accuracy of SITB reporting at Welas Asih Regional Hospital. In particular, accurate SIMRS data were strongly associated with accurate SITB reporting, whereas inaccurate SIMRS data were predominantly associated with inaccurate SITB reporting. Therefore, maintaining accurate, complete, and consistent TB patient data within SIMRS is essential for improving the reliability of SITB reporting. Note: For scientific reporting, the SPSS output of $p = 0.000$ should be reported as $p < 0.001$ rather than $p = 0.000$.

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DISCUSSION

The analysis of 1,035 TB patient records from the fourth quarter of 2025 at Welas Asih Regional Hospital showed that SIMRS data were predominantly categorized as matched, although substantial discrepancies remained across several data elements. Medical record numbers showed a 69.1% match rate and a 30.9% discrepancy rate. Such discrepancies may increase the risk of duplicate patient records and fragmentation of patients' medical histories. Patient names showed a 69.9% match rate, while 30.1% were inconsistent, primarily due to variations in spelling, incomplete names, and the use of abbreviations. This finding is consistent with a research reporting that the completeness and consistency of patient-name documentation in healthcare facilities remain variable and have not yet achieved the expected 100% standard (Yuliyanti, 2023). The gender variable demonstrated a 72.0% match rate, while 28.0% of records were inconsistent between SIMRS and SITB. Meanwhile, patient age showed a lower match rate of 65.7%, with 34.3% of records categorized as not matched. Age discrepancies may result from differences or errors in calculating, updating, or entering patient age. Such inaccuracies may affect demographic classification and reduce the reliability of epidemiological analyses and disease-trend monitoring.

Among the variables examined, patient address demonstrated the highest discrepancy rate, with 49.1% of records categorized as not matched and only 50.9% categorized as matched. These discrepancies were associated with changes in patients' residential information and incomplete recording of detailed address components, particularly neighborhood units (RT/RW). This finding is consistent with a research stating that in the context of TB control, inaccurate or incomplete address information may interfere with geographic identification of cases and complicate contact tracing, patient follow-up, and area-based TB surveillance (Susilowati et al., 2022). Therefore, the relatively high discrepancy rate in address data represents an important concern for the quality of TB surveillance information.

In contrast, diagnosis showed the highest match rate among the variables analyzed, with 72.1% of records categorized as matched and 27.9% as not matched. The relatively high level of diagnostic consistency indicates that most TB diagnoses were recorded similarly between SIMRS and SITB. Accurate diagnosis and ICD-10 coding are particularly important because they contribute directly to the validity of morbidity statistics, epidemiological reporting, and information used for healthcare planning and evaluation. The statistical analysis further demonstrated a significant association between SIMRS database accuracy and SITB reporting accuracy. The Pearson Chi-Square test yielded $\chi^2 = 820.522$, $df = 1$, and $p < 0.001$, indicating a statistically significant association between the two variables. Of the 298 records categorized as inaccurate in SIMRS, 293 (98.3%) resulted in inaccurate SITB reporting, whereas only five records were reported accurately. Conversely, among the 737 records categorized as accurate in SIMRS, 692 (93.9%) resulted in accurate SITB reporting, while 45 were classified as inaccurate. Since the p-value was below the significance level of $\alpha = 0.05$, the null hypothesis was rejected, confirming a statistically significant association between SIMRS database accuracy and SITB reporting accuracy.

These results demonstrate that data quality at the SIMRS level is closely associated with the reliability of subsequent SITB reporting. Comparable patterns have been reported internationally, where the completeness and internal consistency of facility-based tuberculosis registers strongly determined the accuracy of subsequent electronic reporting (Murphy et al., 2022; Manesen et al., 2021). Inaccuracies originating from the primary hospital database may be carried forward into the TB reporting process, particularly when data transfer between systems relies on manual re-entry. Conversely, accurate and consistent SIMRS data substantially increase the likelihood of accurate SITB reporting. Therefore, improving the quality of data at the point of initial registration and documentation represents an important strategy for strengthening TB reporting. Despite this significant association, 338 records (32.7%) were still categorized as inaccurate in SITB reporting. Interview findings identified the absence of bridging or interoperability between SIMRS and SITB as one of the primary underlying problems. Because the two systems are not electronically integrated,

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staff are required to perform manual double entry, a barrier consistent with WHO guidance identifying non-interoperable electronic tuberculosis data systems as a major source of duplicated workload and reporting error (Timimi et al., 2012), whereby data already recorded in SIMRS must be entered again into SITB. This process increases staff workload, creates opportunities for transcription and data-entry errors, and may delay the availability of TB reporting data. Such systemic inefficiencies highlight the critical need for robust coping strategies within institutional administration to mitigate staff stress levels (Salsabila et al., 2023; Hasyim et al., 2024).

The absence of an internal Standard Operating Procedure (SOP) specifically regulating SITB data entry and verification was also identified as an organizational constraint. Without standardized procedures, individual staff members may apply different methods when entering, validating, or correcting data, potentially contributing to inconsistencies in reporting practices, a finding consistent with health management information system studies showing that the absence of standardized data-quality procedures and routine supervision is significantly associated with lower reporting accuracy and completeness (Solomon et al., 2021; Li et al., 2021). Furthermore, data synchronization between SIMRS and SITB and internal monitoring and evaluation activities have not been conducted routinely. Consequently, discrepancies between the two systems may not be identified and corrected promptly. Overall, the findings indicate that the accuracy of SITB reporting is influenced not only by the accuracy of individual patient data elements but also by the broader information management process connecting SIMRS and SITB. The significant statistical association between SIMRS accuracy and SITB reporting accuracy emphasizes the importance of improving source-data quality, while the interview findings highlight technological and organizational barriers that may contribute to persistent discrepancies. Furthermore, fostering a positive interpretative environment among hospital staff, rather than just technical fixes, can significantly improve morale and adherence to rigorous data protocols (Ariffin et al., 2022). The implementation of SIMRS–SITB interoperability or bridging, standardized internal SOPs, routine data synchronization, and periodic monitoring and evaluation is therefore essential to minimize manual double entry, improve data consistency, reduce reporting delays, and strengthen the overall quality of TB surveillance and reporting at Welas Asih Regional Hospital.

CONCLUSION

Among 1,035 TB patient records analyzed, SIMRS data accuracy was highest for diagnosis (72.1%) and gender (72.0%), while address data showed the greatest discrepancy (49.1%). A significant association was identified between SIMRS database accuracy and SITB reporting accuracy (Pearson $\chi^2 = 820.522$; $p < 0.001$), indicating that more accurate source data in SIMRS contribute to more reliable TB reporting in SITB.

However, 32.7% of SITB records remained inaccurate. Key contributing factors included the absence of a SIMRS-SITB bridging system requiring manual double entry, the lack of SITB-specific standard operating procedures, and inadequate routine data synchronization and monitoring. Strengthening system interoperability, establishing standardized reporting procedures, and implementing regular data validation are therefore essential to improve the accuracy, consistency, and timeliness of TB reporting.

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