ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25dec622

Analysis of Use of the Health Information System for Tuberculosis Intervention in Gleno Inpatient Health Center, Ermera Municipality, Timor-Leste

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Publication Date: 2025/12/25

Abstract: The health information system plays a vital role in managing health-related data and improving decision-making regarding tuberculosis (TB) interventions. It addresses public health challenges by identifying program needs, supporting leadership decisions, and fulfilling community health requirements. The objective of this research is to analyze the effectiveness of health information systems used for TB intervention at the Gleno Inpatient Health Center. This study employs a quantitative research methodology with a cross-sectional approach. The sample consists of 34 health personnel from the Gleno Health Center. Data analysis includes both univariate and bivariate analyses, utilizing the Chi-Square test. The results show a p-value of 0.001 ($p < 0.05$), indicating a significant impact of the effectiveness of the health information system and TB interventions at Gleno Inpatient Health Center. To effectively combat tuberculosis, it is crucial to promote the dissemination of health information through education and targeted interventions within communities that are already at risk or exhibiting symptoms of the disease. It is recommended that the Ministry of Health of Timor-Leste provide specific training for the management of Health Information Systems to Health Statistics Officers at all Health Centers in Timor-Leste to improve the quality of data.

Keywords: *Health Information System, Tuberculosis Intervention, Tuberculosis.*

How to Cite: Calisto Ximenes de Deus; Aniceto da Conceição Pacheco; Marcos Carvalho (2025) Analysis of Use of the Health Information System for Tuberculosis Intervention in Gleno Inpatient Health Center, Ermera Municipality, Timor-Leste. *International Journal of Innovative Science and Research Technology*, 10(12), 1543-1547. https://doi.org/10.38124/ijisrt/25dec622

I. INTRODUCTION

Globally, deaths from tuberculosis (TB) decreased by 23% from 2022 to 2023, resulting in an estimated total of 1.25 million deaths. This decline is consistent with levels seen before the pandemic. However, the global incidence rate has only dropped by 8.3% since 2015, falling short of the World Health Organization's (WHO) target of a 50% reduction by 2025. Notable progress has been made in specific regions, including a 24% reduction in Africa and a 27% reduction in Europe, with 79 countries reporting at least a 20% decrease in TB cases (World Health Organization, 2024). Global strategies to combat tuberculosis (TB) have been introduced, notably the WHO's End TB Strategy, which aims to lower TB fatalities, incidence, and patient costs by 2035. This strategy focuses on early diagnosis, enhancing access to quality care, and addressing social determinants. A significant challenge in TB management is treatment adherence, as patients often struggle with the 6-month medication regimen, leading to delays, interruptions, or discontinuation. Non-adherence exacerbates the spread of the disease, increases infectious days, heightens relapse risk, and fosters drug-resistant tuberculosis. (Olowoyo et al., 2025).

Low tuberculosis (TB) case detection remains a major challenge in achieving the End TB targets. New strategies that consider local contexts are needed in countries with high TB burdens, like Ethiopia. (Amare et al., 2025). Health Information Technology plays a crucial role in TB intervention. A previous study recommended the use of Health Information Technology (HIT) in community health clinics to enhance the effectiveness of tuberculosis treatment. Implementing HIT can lead to improved health outcomes for TB patients by enhancing data management, patient tracking, and overall healthcare delivery. (Cruz & Tumibay, 2019). Some study findings indicate that the clinical information systems used in community health centers can manage medical records and register TB patients. However, challenges arise with notifications and reminders, highlighting

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25dec622

the need for better training and access to high-quality data. (Medeiros et al., 2017).

The SISFOTBPARU program provides patient schedules, SMS treatment reminders, and treatment reports, effectively tracking TB therapy. This program directly addresses issues related to TB interventions in Puskesmas by promoting community empowerment and facilitating better oversight of local health personnel. (Trigunarso et al., 2022). Additionally, the report underscores the importance of the SITB application as a key tool for managing TB data in Puskesmas, despite its effectiveness being impeded by technical limitations and increased workloads. Recommendations include improving internet access and providing training to maximize its use. (Simamora et al., 2024). Furthermore, the Android-based SIMANTB application has proven to enhance treatment adherence among pulmonary TB patients, making it a valuable health information system for TB interventions in health centers and contributing to better treatment success rates. (Susanti & Widiyanto, 2025). Despite these advancements, the quality of data collection and processing requires improvement, and the existing health information system lacks sufficient functionality. Nevertheless, increased data utilization has enhanced patient care management and TB treatment success rates in the Lacs Health District. (Afanvi, 2015).

An evaluation of an electronic health information system (HIS) at a tuberculosis clinic demonstrated increased productivity and ease of use. However, the need for additional human resources is crucial for successful implementation, as challenges such as parallel data registration and data discrepancies contribute to an increased workload. (Miyazaki et al., 2020). By providing precise, up-to-date, and comprehensive information, the use of electronic medical records (EMRs) could significantly improve healthcare delivery. However, EMR implementation has been slow and often unsuccessful in low-income countries like Ethiopia. Evaluating stakeholder preparedness before EMR adoption is essential, yet little is known about healthcare providers' readiness for EMR deployment in this context. (Ngusie et al., 2022).

The study also assessed the Health Information System (HIS) at the Umbulharjo Community Health Center. It highlighted the importance of efficient data input and reporting processes. However, the study found that inadequate funding and a lack of standard operating procedures (SOPs) impeded the optimal performance of TB treatments. (Sitb et al., 2022). The report suggests that the Kibong'oto Infectious Diseases Hospital requires an integrated Health Management Information System (HIS). It stressed the necessity of designing a TB module within the existing Care2x system to improve data integration and TB care delivery. (Mark et al., 2018). The new TB monitoring system successfully meets the needs of TB interventions by enhancing data quality through automated extraction, timely uploads, and comprehensive patient records. This system facilitates data exchange and effective healthcare management and is modeled after the National Health Information System. (Jiang et al., 2021).

Based on the issues identified, the researcher believes that utilizing information systems is crucial for TB intervention in the Gleno Inpatient Health Center. Therefore, the author aims to research health personnel's use of health information systems for tuberculosis interventions in the Gleno Inpatient Health Center. The objective of this research is to analyze the effectiveness of health information systems used for TB intervention at the Gleno Inpatient Health Center in 2023.

II. RESEARCH METHODS

➢ *Study Design*

This study investigates the influence of health information systems on tuberculosis (TB) intervention initiatives utilizing a quantitative, cross-sectional design. This methodology enables the assessment of variables at a single point in time, yielding a detailed overview of health information systems in TB control. The sample consisted of 34 healthcare professionals from the Gleno Community Health Center in Ermera Municipality, Timor-Leste, in 2023, including nurses, medical officers, laboratory technicians, and community health workers engaged in TB services and data management. A non-probability sampling technique, specifically a total sampling approach, was employed, ensuring the inclusion of all healthcare staff meeting the criteria. This approach was suitable given the small population size, allowing for the collection of comprehensive data reflective of the actual state of TB information management and intervention processes at the health center, thus enhancing the validity of the study's findings.

➢ *Instruments and Data Collection*

The instruments used in this study include a self-report questionnaire and a computer for data entry and analysis. Data collection involves documenting events or characteristics of all or part of the population. Therefore, the data collection techniques for this study will consist of observations and interviews. The study included health professionals working at the health center while excluding cleaners, drivers, individuals who were ill during the data collection period, those traveling outside the office, and staff working in health posts.

➢ *Data Analysis Techniques*

Data analyzed to address the research questions. Univariate analysis used to describe the frequency distribution of each independent variable and to characterize the respondents. Bivariate analysis used the Chi-Square (X^2) test to determine the impact of independent variables on the dependent variable. This analysis was performed using IBM SPSS version 21 to facilitate the calculated of the results. The hypothesis test used alpha α=0.05 to determine the level of significant.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25dec622

III. RESULTS AND DISCUSSION

Table 1. Descriptive Analysis of the Use of the Health Information System for Intervention of Tuberculosis in Gleno Inpatient Health Center

Used a Health Information System	Frequency	Percent
Not effective	11	32.4%
Effective	23	67.6%
Intervention Tuberculosis		
Not effective	7	20.6%
Effective	27	79.4%
Total	34	100%

The analysis of the effectiveness of the health information system for tuberculosis intervention at the Gleno inpatient health center revealed positive results. The system was deemed effective 67.6% of the time, while 32.4% of the assessments indicated it was ineffective. Additionally, tuberculosis interventions at the Gleno inpatient health center demonstrated an effectiveness rate of 79.4%, compared to an ineffectiveness rate of 20.6%. This indicates that the health information system at the Gleno health center is highly effective for tuberculosis intervention.

Table 2. Bivariate Analysis of Used the Health Information Systems for Tuberculosis Intervention in Gleno Inpatient Health Center

Use of the Health Information System	Intervention Tuberculosis			*P=Value*
	Not effective	Effective	Total	
Effective	1 (2.9%)	22 (64.7)	23 (67.6%)	0.001
Not effective	6 (17.6%)	5 (14.7%)	11 (32.4%)	
Total	7 (20.6%)	27 (79.4%)	34 (100%)	

The results indicate that out of 34 respondents, 22 reported that the use of health information systems for tuberculosis intervention was effective, accounting for 64.7% of those surveyed. In contrast, only 1.9% responded that the intervention was ineffective. Hypothesis testing revealed a significant influence of health information systems on tuberculosis interventions, with a p-value of 0.001, which is below the significance level of $\alpha = 0.05$.

In the context of Timor-Leste, enhancing the capacity to provide quality, timely, and reliable data is one of the targets of the Sustainable Development Goals (SDGs), especially for small island nations like Timor-Leste. (Carvalho et al., 2024). Previous research highlighted the necessity of a comprehensive information system at the national, municipal, administrative, and Suco levels, given the current demand for health data and information that is accurate, complete, and easily accessible. (Ximenes et al., 2025). According to a previous study, indicated that improving the quality of health data is essential for effective clinical decision-making and for evaluating health programs. However, ensuring the quality of health data poses a significant challenge in public health. The development of health information systems is progressing rapidly, and the need for efficient data management in all health organizations is increasing. (Pereira et al., 2025) Collaboration among healthcare providers, policymakers, and communities is crucial for effectively addressing the challenges associated with tuberculosis treatment. The study highlights successful telemedicine strategies that enhance health outcomes and patient engagement, underscoring the vital role of telemedicine in promoting universal health coverage and reducing disparities in TB care. By incorporating telemedicine into TB care programs, health systems can ensure that underserved populations receive the necessary support for early diagnosis and treatment adherence, thus advancing the fight against tuberculosis.

Previous research conducted by Maddela (2025) indicated that the integration of healthcare information technology (HIT) significantly enhances global healthcare access. Key initiatives include telemedicine for remote care, mobile health apps for patient engagement, electronic health records for improved coordination, and virtual clinical trials for accessible research. Emerging technologies like blockchain and artificial intelligence offer further improvements in quality, efficiency, and affordability, highlighting the potential for a more equitable healthcare system, particularly in underserved and rural areas. Another study emphasizes that health information systems can result in data surveillance, which raises concerns about human rights. This issue may disproportionately affect underserved populations, potentially hindering their access to TB services due to privacy violations and a lack of trust in health authorities. (Albrecht & Citro, 2020)

According to Falzon et al., (2017) Suggests that healthcare is approaching a significant transformation due to disruptive technologies like personalized medicine and the integration of artificial intelligence and machine learning in clinical tools. Improved software performance and broader internet access will enhance the scalability of digital interventions via mobile devices, contributing to the digital agenda for tuberculosis management. Moreover, products designed to improve TB patient care could also be adapted for other health conditions.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25dec622

The study found that overcoming challenges related to human resource capacity and infrastructure, as well as enhancing the utilization of health information for planning and decision-making, is crucial for the strength and sustainability of the integrated health information system (HIS) on the DHIS2 platform. These factors are similarly important in other developing countries. (Chu et al., 2017)

This study emphasizes that in resource-limited healthcare facilities, health information systems (HIS) have significantly improved the identification and management of tuberculosis (TB). By adopting digital systems, we can effectively monitor TB treatment progress, test results, and patient data. These systems ensure timely communication of diagnostic results and enhance treatment adherence by streamlining processes and increasing access to healthcare. Additionally, HIS targets underprivileged communities through advanced technologies. Ultimately, a health information system facilitates data collection for surveillance, strengthens patient-provider communication, and automates health information management, leading to improved patient outcomes in resource-constrained healthcare settings.

IV. CONCLUSION AND RECOMMENDATION

The results of the data analysis indicate that the p-value is 0.001, which is less than 0.05. This suggests that there is a significant impact of the health information system on the intervention of tuberculosis at the Gleno Inpatient Health Center, Ermera Municipality, Timor-Leste. Based on these findings, the researcher recommends that relevant parties, particularly the Ministry of Health and the Gleno Inpatient Health Center, enhance the capacity of healthcare personnel, especially leaders and program managers. This can be achieved through training that focuses on using data to develop intervention plans for public health challenges, such as the spread of tuberculosis. To effectively combat tuberculosis, it is essential to take action that includes disseminating health information through health education and implementing interventions in communities that are at risk and showing symptoms of the disease.

ACKNOWLEDGMENTS

The authors express their sincere gratitude to Universidade da Paz (UNPAZ) in Timor-Leste for the institutional and academic support that enabled effective coordination during the preparation of this research process. No external funding, technical assistance, laboratory resources, specialized equipment, or material contributions were received for this research. Generative artificial intelligence (GenAI) tools were not utilized in the drafting, analysis, or development of this manuscript. All authors have reviewed and approved the final version and take full responsibility for its accuracy and originality.

- *Conflicts of Interest*

The authors state there are no conflicts of interest. No financial relationships, institutional affiliations, or personal circumstances affected the design, analysis, interpretation, or publication of this study.

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