UTILIZATION OF INFORMATION SYSTEMS IN NON-COMMUNICABLE DISEASE SURVEILLANCE IN INDONESIA

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ABSTRAK

Beban penyakit tidak menular (PTM) di Indonesia terus meningkat dan menjadi tantangan besar dalam hal morbiditas, mortalitas, serta beban ekonomi. Surveilans yang efektif sangat penting untuk mengatasi permasalahan ini. Kajian ini bertujuan untuk mengevaluasi pemanfaatan sistem informasi dalam surveilans PTM di Indonesia melalui tinjauan literatur terhadap sepuluh artikel terbuka yang dipublikasikan antara 2018–2023, menggunakan pendekatan analisis isi. Hasil menunjukkan bahwa Indonesia telah menggunakan beberapa platform seperti SI-PTM, PIS-PK, P-Care, dan ASIK untuk mendukung pemantauan data secara *real-time*. Sistem digital ini membantu pengumpulan data, pemantauan, dan evaluasi program. Namun, masih terdapat kendala seperti integrasi sistem yang belum optimal, keterbatasan infrastruktur dan akses internet, serta kemampuan analisis sistem yang belum menyeluruh. Belum semua sistem informasi dilengkapi dengan pilihan penarikan data otomatis. Kurangnya literasi digital petugas dan distribusi perangkat elektronik yang belum merata juga mempengaruhi efektivitas pemanfaatan sistem. Walau demikian, penggunaan sistem digital ini merupakan kemajuan besar dibanding metode manual sebelumnya. Diperlukan upaya peningkatan kapasitas dan penyempurnaan sistem untuk mengoptimalkan efektivitas surveilans PTM di Indonesia.

Kata kunci : Indonesia, penyakit tidak menular, sistem informasi, surveilans, teknologi kesehatan

ABSTRACT

The burden of non-communicable diseases (NCDs) in Indonesia continues to rise, contributing significantly to morbidity, mortality, and economic challenges. Effective surveillance is critical to managing this trend. This literature review aims to evaluate the utilization of information systems for NCD surveillance in Indonesia. Ten open-access articles published between 2018-2023 were reviewed using content analysis. Findings indicate that Indonesia employs several platforms, including SI-PTM, PIS-PK, P-Care, and the newly introduced ASIK, to support real-time data monitoring. These systems facilitate data collection, monitoring, and program evaluation. However, challenges remain in system integration, infrastructure availability, internet access, and the analytical capabilities of some platforms. Not all information systems are equipped to automatically generate the final surveillance outputs required, some needs manual treatment. The review highlights the need for synchronisation among systems and the development of user-friendly interfaces capable of generating automated outputs. Limited digital literacy among health workers and the uneven distribution of technological resources also affect system performance. Despite these limitations, the use of digital systems represents a significant advancement in surveillance compared to previous manual methods. Continuous improvement and capacity-building are essential to maximise the effectiveness of these platforms in reducing the burden of NCDs in Indonesia.

Keywords *: non-communicable disease, surveillance, information system, health technology, Indonesia*

INTRODUCTION

Non-communicable diseases (NCDs) in Indonesia show an increasing trend. The results of the 2018 Basic Health Research (Riskesdas) show that the prevalence of NCDs has increased when compared to Riskesdas 2013 in cancer, stroke, chronic kidney disease, diabetes mellitus

and hypertension. Cancer prevalence increased from 1.4% to 1.8%, stroke prevalence increased from 7% to 10.9%, chronic kidney disease increased from 2% to 3.8%, diabetes mellitus increased from 6.9% to 8.5% (based on blood sugar measurement) and hypertension increased from 25.8% to 34.1% (from blood pressure measurement). The latest results from the Indonesia Health Survey (SKI 2023) show that the prevalence of diabetes among individuals aged ≥15 years is 2.2% based on a doctor's diagnosis and 11.7% based on blood glucose measurements. Meanwhile, the prevalence of hypertension among individuals aged ≥18 years is 8.6% based on a doctor's diagnosis and 30.8% based on blood pressure measurements. These increasing trends not only reflect a growing health concern but also contribute significantly to the national economic burden due to the high cost of long-term treatment and loss of productivity.

World Health Organization (WHO) reports that non-communicable diseases (NCDs) are estimated to cause a global economic loss of USD 30 trillion during the period 2011–2030 due to lost productivity and rising healthcare costs (WHO, 2022). The economic burden posed by NCDs can lead to high health expenditure for treatment and long-term care, which can have a negative impact on the economy. Regions with higher NCD mortality rates are countries with lower levels of economic development, especially countries in Africa and some countries in Asia, especially in Southeast Asia, South Asia and beyond (Wang & Wang, 2020). Monitoring and awareness of risk factors and early signs and symptoms of NCDs can be useful to support medical help-seeking and encourage preventive behaviour. Addressing NCDs effectively requires not only treatment but also robust preventive measures supported by accurate and timely information.

The burden of non-communicable diseases (NCDs) requires health interventions that are not only curative but also preventive and promotive, particularly through continuous and data-driven monitoring. In this context, the role of information systems becomes crucial. Health information systems enable the rapid, accurate, and real-time collection, recording, analysis, and presentation of data to support decision-making at various levels, from community health centers (Puskesmas) to the Ministry of Health. With a well-functioning information system, disease trends can be monitored regularly, high-risk groups can be identified early, and public health interventions can be designed in a more targeted and effective manner. One of the key components that strengthens the health information system is disease surveillance.

Surveillance has an important role to play in supporting the prevention and management of these NCDs. Surveillance is needed to monitor trends in prevalence and provide information needed for health programme planning. Identifying and mapping risk factors that contribute to the development of NCDs supports more effective interventions to prevent or manage disease. NCD surveillance data can also provide insight into the burden of disease and its geographical distribution. This information is useful in planning the allocation of health resources, including medical facilities, personnel, and required drugs. Surveillance enables monitoring and evaluation of the effectiveness of NCD prevention and management programmes. By analyzing variations in incidence and risk profiles, the impact of public health strategies can be determined.

In response to this need, the Ministry of Health in Indonesia has developed and implemented various information systems to support NCD control. One of the main systems is the Non-Communicable Disease Information System (SI-PTM), which is used for recording and reporting NCD cases from primary health care facilities such as Puskesmas. This system contains data on early detection, diagnosis, and follow-up of patients with NCDs. Another system in use is PIS-PK (Program Indonesia Sehat dengan Pendekatan Keluarga), which records household information, particularly families with members who have risk factors or a history of NCDs. Additionally, ASIK (Aplikasi Sehat Indonesiaku), introduced in recent years, is a community-based innovation that enables community health volunteers to record NCD risk factor data directly from households. P-Care, a system developed by the National Health

Insurance Agency (BPJS Kesehatan), also provides data on the number of national health insurance participants diagnosed with NCDs, including the status of their treatment. Despite the availability of these systems, a review is needed to evaluate how effectively they support NCD surveillance in Indonesia.

METHOD

This study used a literature review research design with reference sources derived from internet. The keywords used in the search for Indonesian articles were 'information system', surveillance, 'non-communicable disease', Indonesia. The keywords used in the search for English-language articles were 'information system', surveillance, 'non-communicable disease', Indonesia. The databases used in searching for articles are Google Scholar and Garuda. Data analysis from this literature review includes content analysis. Articles were searched using keywords related to information systems and non-communicable disease surveillance in Indonesia, within the 2018–2023 time frame. Selection was done through a screening process based on criteria: the article must discuss the use of information systems in NCD surveillance activities in Indonesia, be open access, and available in full text. Eligible articles were then analyzed by reading the full content and extracting relevant information for synthesis.

RESULTS

All articles that passed the screening process and met the predetermined criteria were subsequently extracted. The extraction process involved grouping information based on the title, author(s), year of publication, and research findings. The results of this data extraction are presented in the table below. A total of ten research articles related to the utilization of information systems in non-communicable disease (NCD) surveillance were identified, consisting of five articles in English and five articles in Indonesian. Following extraction, a content analysis and synthesis were carried out to evaluate the utilization of information systems in NCD surveillance.

Table 1. Review Analysis

No	Title	Author(s)	Published Year	Conclusion
1	Non-Communicable Diseases Information System	Farid Agushybana, Cahya Tri Purnami, Dharminto	2023	The developed NCD Information System has been integrated across four user levels: City Health Office, Head of Puskesmas, Cadres, and Patients. Research using the RAD method remains at the development stage and is currently gathering feedback for future implementation. Full implementation at the Puskesmas level is necessary, followed by a quantitative evaluation to measure the system's effectiveness and utilization.
2	Effectiveness of Kobotoolbox as a Data Processing Medium for Integrated Disease Surveillance at Guntung Manggis Puskesmas	Rifaldi, Anisa Sujarwati, Kamilia Quamila Andriani, Dian Rosadi, Hadrianti HD Lasari, Noor Ahda Fadillah, Rudi Fakhriadi	2023	The TAM evaluation indicates that Kobotoolbox is effective (>76%) for processing STP data, achieving 100% scores in usefulness, ease of use, and actual system use, with an 80% score in behavioural intention to use. Enhancements in data presentation (such as diagrams, graphs, and mapping) are recommended to

				support better decision-making and stakeholder follow-up.
3	Evaluation of the Implementation of the Non-Communicable Disease Surveillance System in Gianyar Regency, Bali Province: A Qualitative Approach Using ISI Analysis	I Nyoman Purnawan	2022	NCD surveillance in Gianyar Regency remains suboptimal, hindered by a shortage of experts, inadequate training, insufficient guidelines, and substandard facilities. Weak monitoring and feedback from the health office were also observed. Comprehensive improvements are needed.
4	Evaluation of Acceptance of Non-Communicable Disease Information System Applications Based on User Experience	Indah Naryanti, Farid Agushybana, Eko Sediyono, Cahya Tri Purnami, Aris Puji Widodo	2022	Most program implementers agreed that SI-PTM helps streamline the reporting and monitoring of NCD cases.
5	Evaluation of Non-Communicable Disease Information System Acceptance (SI-PTM) Using the Technology Acceptance Model (TAM)	Indah Naryanti, Farid Agushybana, Eko Sediyono	2022	SI-PTM facilitates the recording and reporting of NCD cases with clear and comprehensive features. However, integration across regions remains necessary. An integrated Health Information System is needed for better data management.
6	Development of a Mobile Health Infrastructure for Non-Communicable Diseases Using Design Science Research Method: A Case Study	Surahyo Sumarsono, Intan Sulistyaningrum Sakkinah, Adhistya Erna Permanasari, Bernardi Pranggono	2022	mHealth programs can begin with small pilot projects and expand if successful. NusaHealth has demonstrated that pilot projects can be scaled up, but further applications and research are needed for broader health programs and policy integration.
7	Analysis of Risk Factor Surveillance for Non-Communicable Diseases in the Health Department of Sleman Regency	Dewi Ariyani Wulandari, Nur Hidayat, Susi Damayanti	2021	Although NCD risk factor surveillance follows established guidelines, implementation challenges persist. Improving cadre skills, facilities, infrastructure, and coordination is essential to enhance the surveillance system's quality.
8	Relationship between System, Information, and Service Quality and User Satisfaction in Non-Communicable Disease Surveillance in Palembang City	Ira Fitria Yuniarti, Novrikasari, Misnaniarti	2021	The study found significant relationships between system quality, information quality, and service quality with user satisfaction. To improve system usage, the Ministry of Health must enhance these quality aspects.
9	Disparities in Health Program Information Systems in Indonesia: A Cross-Sectional Study Using 2019 Indonesian Health Facility Data	Sri Idaiani, Harimat Hendarwan, Maria Holly Herawati	2019	This analysis identified disparities in health information systems across Indonesian provinces. Some provinces show deficiencies in information systems at the Puskesmas level. Recommendations include improvements to health information systems.
10	Acceptability and Adoption of Facility-Based NCD	Rahayujati, Dewi, Haryatno, Indriani, Sugiarto	2018	While facility-based NCD surveillance has been adopted, participation remains low due to lack

	Surveillance in Kulon Progo District, Yogyakarta	of understanding, multiple job responsibilities, and the burden of data entry. Adequate infrastructure supports adoption, but full optimisation is still needed.

DISCUSSION

Currently, Indonesia's health system has several information systems available to support non-communicable disease (NCD) surveillance. Some of these systems are specifically designed for non-communicable diseases, while others are more general but still contribute relevant data for NCD monitoring. Dedicated systems include the Non-Communicable Disease Information System (NCDIS), launched by the Ministry of Health in 2015. More recently, a new platform, the community-based Healthy IndonesiaKu Application (ASIK), has been introduced to further enhance and expand the capabilities of existing systems. Additionally, electronic medical records (EMR), despite variations in their formats, consistently provide data on patient histories related to non-communicable diseases and associated risk factors. Another system, P-Care, managed by the Social Security Administration (BPJS), includes features that display data on the number of National Health Insurance (JKN) participants diagnosed with hypertension or diabetes mellitus, along with the number of cases under control or otherwise. Furthermore, the Healthy Indonesia information system also plays a role in this surveillance framework.

The Programme with a Family Approach (PIS-PK) application also records families with members suffering from hypertension and individuals with mental disorders (ODGJ) (Ministry of Health, 2016). These records can serve as valuable data sources for non-communicable disease (NCD) surveillance. Various information systems have long been implemented within Indonesia's health care system except for the recently introduced ASIK application — including SI-PTM, RME, P-care, and PIS-PK. Generally, the data in these systems are entered by health care workers at Community Health Centres (Puskesmas). In the case of ASIK, health cadres also contribute by inputting data related to disease risk factors within the community. The data recorded in these information systems can be accessed in real-time by supervising institutions, such as the Health Office and the Ministry of Health, representing a significant improvement over the previous manual reporting methods. This real-time data enables programme managers at both the Health Office and the Ministry of Health to conduct analyses and generate information essential for the surveillance of non-communicable diseases.

The availability of easily accessible and readable data sources, without the need for manual re-entry, facilitates the analysis process and is expected to support faster and more accurate policymaking. However, in the daily use of these information systems for surveillance activities, several implementation challenges have been identified. Based on the reviewed articles, data entry personnel frequently reported issues related to infrastructure and facilities for accessing these systems. Limitations in the availability of electronic devices, internet connectivity, and the ability of personnel to operate modern information systems have hindered the optimal utilization of existing platforms. Additionally, personnel at the Health Office commonly encounter obstacles during the data analysis phase. Processing large datasets and cleaning them into usable formats remains a significant challenge. Not all information systems are equipped to automatically generate the final surveillance outputs required, with some still necessitating manual data treatment to extract necessary surveillance data. Furthermore, the lack of synchronisation across different information systems was frequently cited as a concern, affecting both data input and output processes.

CONCLUSION

The utilization of information systems for non-communicable disease (NCD) surveillance in Indonesia is currently progressing through the integration of several platforms, including SI-PTM, PIS-PK, and ASIK developed by the Ministry of Health, electronic medical records from various providers, and P-Care from BPJS. The collected data can be accessed in real-time by authorised institutions, enhancing the accuracy of NCD surveillance and significantly reducing the time required for data processing. Nevertheless, further improvements are still needed. Challenges remain, particularly regarding the lack of data synchronisation between different information systems, and the fact that not all analytical results can be automatically generated, often requiring manual intervention by surveillance officers. Additionally, the heavy reliance on electronic devices and internet connectivity which are not yet evenly available across all regions continues to pose a significant obstacle.

ACKNOWLEDGEMENT

The author extends sincere gratitude to all parties involved in this research, enabling its timely completion. It is hoped that the findings of this study will benefit society and contribute to the advancement of knowledge. Thank you.

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