Jurnal Kesehatan
Vol. 15, No. 1, April 2024
ISSN 2086-7751 (*Print*), ISSN 2548-5695 (*Online*)
http://ejurnal.poltekkes-tjk.ac.id/index.php/JK

Utilization for Non-Communicable Diseases Management in Southeast Asia

Farah Luthfi Kaulina*, Sukihananto
Faculty of Nursing, Universitas Indonesia, Depok, Indonesia

ARTICLE INFO

Article history

Received date
25 Jan 2024

Revised date
16 Apr 2024

Accepted date
22 Apr 2024

Keywords:

mHealth;
NCD;
Nursing.

ABSTRACT

Non-communicable diseases (NCDs) are still a morbidity and mortality problem in Southeast Asia. However, NCD in Southeast Asia still needs to be handled faster. WHO recommends the use of digital in treating NCDs in Southeast Asia. Therefore, this literature review study aims to describe how mHealth is utilized to overcome the problem of NCDs in Southeast Asian countries. The author collected articles using Google Scholar and Proquest, which were published in 2019-2023. The focus of the search was articles published in English-language Research Journals. Researchers used advanced search with the keywords NCD, Non-communicable diseases, mHealth, Mobile Health, Nursing, and Health Promotion. Keywords are combined using Boolean and/or the online database that the researcher chose. Articles that have been filtered are filtered again by selecting research locations in Southeast Asian countries. Ten articles obtained came from research in Southeast Asian countries Indonesia (n=4), Malaysia (n=1), Singapore (n=1), Vietnam (n=1), Thailand (1), Cambodia (n=1), Philippines (n=1). All articles discussed the use of mHealth for NCD management in their countries and aimed to determine the barriers (n=3), feasibility (n=1), effectiveness (n=2), impact (n=2), potential (n=1), perception (n=1), and perspective (n=1) of service providers, as well as the experience of using mHealth in remote areas (n=1). It can be concluded that mHealth can be used for independent screening for PTM, providing education about NCDs, and can be applied in rural areas as a comprehensive effort to handle NCDs.

Corresponding author:

Farah Luthfi Kaulina
Faculty of Nursin, Universitas Indonesia, Depok, Indonesia
Email: farah.magister23@gmail.com

INTRODUCTION

Non-communicable diseases (NCDs) are health problems caused by genetic, physiological, environmental, and behavioral factors. NCDs account for 74% of deaths in the world each year. Cardiovascular diseases such as stroke, hypertension, and heart disease are the leading causes of NCD deaths, followed by cancer, chronic respiratory diseases, and diabetes. Physical inactivity, tobacco use, alcohol consumption, and unhealthy diet increase the risk of death from NCDs (WHO, 2023)

77% of the world's NCD deaths occur in low- and middle-income countries (WHO, 2023). Some of the lower-middle-income countries are in Southeast Asia. According to WHO data, 62% of deaths in the region are due to NCDs, 50% of which are under 70 years of age (WHO, 2019). WHO also explained that the Southeast Asian region has significantly progressed in NCD prevention and control. However, progress has been slow and uneven due to substantial gaps in policy implementation and health service expansion. A study conducted (Castillo-Carandang et al., 2020) also explained that the gaps faced in managing NCDs in Southeast Asia are related to clinical health policies and practices in the community.

The high rates of NCD morbidity and mortality in Southeast Asia hinder the achievement of the SDG's 2020 Agenda, which is to reduce by one-third the likelihood of death by age 30-70 through prevention and treatment, and improve mental health and wellbeing, extend the time to 2030. Implementation strategies with digital technology are one of the efforts that need to be considered regionally to prevent and control NCDs, focusing on five NCD risk factors, including air pollution, unhealthy food, harmful alcohol consumption, tobacco use, and physical inactivity (WHO, 2021).

One of the ways digital technology is utilized in the health sector is mobile health (mHealth). Mhealth is a technology that delivers health information, monitors remote health

conditions, and improves overall health service delivery. mHealth can increase efficiency in Health services and reach all regions. Mhealth is proven to be the most innovative field and enables the digital transformation of healthcare globally (Istepanian, 2022). Research conducted by Müller et al. (2016) and Saleh et al. (2018) showed a significant relationship between the use of mHealth and healthier behavior change in NCD prevention.

Based on the phenomenon described by the author, this literature review study was conducted to describe the use of mHealth in addressing NCD problems in Southeast Asian countries.

METHOD

This research design uses a literature review design. The author collected the articles from online scientific databases, namely Proquest and Google Scholar, published in 2019-2023. The search focused on articles in English research journals. Researchers used advanced search with the keywords NCD, NonCommunicable Diseases, mHealth, Mobile Health, Nursing, and Health Promotion. The keywords were combined using boolean AND/OR on the online database that the researcher chose. The articles were filtered again by selecting research locations in Southeast Asian countries. A total of 10 research articles were obtained and are described in results.

RESULTS

The results of the selection of articles obtained came from research in Southeast Asian countries, namely Indonesia (n=4), Malaysia (n=1), Singapore (n=1), Vietnam (n=1), and Thailand (1). Cambodia (n=1), Philippines (n=1). All articles discussed the use of mHealth for NCD management in their countries and aimed to determine the barriers (n=3), feasibility (n=1), effectiveness (n=2), impact (n=2), potential (n=1), perception (n=1), and perspective (n=1) of service providers, as well as the experience of using mHealth in remote areas (n=1). More details are presented in Table 1.

Table 1. Use of mHealth in Southeast Asia

No	Author Name and Article Title	Research Methods and Locations	Research Objectives	Research Results	Research Recommendations
1	(Wulandari et al., 2023) Potential Improvement in a Portable Health Clinic for Community Health Service to Control Non-Communicable Diseases in Indonesia	Qualitative study Indonesia	Assess challenges and potential improvements in implementing PHC (community-based mobile health services equipped with telemonitoring and teleconsultation using portable medical devices and Android apps) in Indonesia.	Challenges of implementation are Technical constraints: - Applications are still considered complicated/confusing and not yet integrated - Unstable internet network in some locations, causing the application to load repeatedly. Non-technical constraints: - Online training is considered ineffective - Health workers are still not accustomed to conducting examinations and data entry simultaneously - Participants are not used to it, - availability of doctors who provide teleconsultation - workload at puskesmas.	- The app needs to support offline data entry in case of network issues, allowing for local storage before entry into the database. - Increase the capacity of Community Health workers to use the app so that people gain experience using smartphones and the benefits of emerging technologies and communications. - It requires integrated technology for electronic medical records, high-speed internet access, standardized applications, and mobile devices.

No	Author Name and Article Title	Research Methods and Locations	Research Objectives	Research Results	Research Recommendations
2	(Nguyen et al., 2023) Mobile Health Interventions to Improve Health Behaviors and Healthcare Services among Vietnamese Individuals: A Systematic Review	A systematic review Vietnam	Summarize the feasibility, acceptability, and viability of mHealth interventions to promote health behavior change or improve health services among the Vietnamese population.	- Study participants rated the satisfaction, usefulness, and efficacy of mHealth interventions as high. These results indicate that mHealth is feasible and acceptable to the community. - Short messaging services were most frequently used for health education, supporting smoking cessation, monitoring chronic diseases, providing follow-up, and managing vaccines. - Overall findings suggest that mHealth holds promise in promoting lifestyle behavior change and improving health services	- Integration of mHealth Interventions needed to improve Health in Vietnam - Utilizing SMS to interact with patients and send targeted motivational messages
3	(Yaacob et al., 2020) Effectiveness of the Colorapp MobileApp for Health Education and Promotion for Colorectal Cancer: Quasi-Experimental Study	A quasi-experimental Malaysia	Assessing the effectiveness of the ColorApp mobile app in improving knowledge and attitude towards colorectal cancer among users aged 50 years and above, who are the at-risk population for the disease in Kedah	- There was an increase in knowledge about colorectal cancer after using the ColorApp application. - The intervention group showed significantly higher mean knowledge scores regarding time than the control group. However, there was no significant difference in the mean attitude score between the intervention group and the control group regarding time.	- Increased mobile phone literacy needs to be utilized to deliver health education and promotion
4	(Siregar et al., 2021)	Operational Study	Assessing the potential of	- Of the 846 people reached by cadres,	- Further research is needed on the app's

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	Potential of community-based early detection of cardiovascular disease risk during the COVID-19 pandemic	Indonesia	community-based CVD risk self-screening through mHealth apps.	53% (442 people) did self-screening. - The results of CVD risk self-screening showed that 21.3% were at high risk of developing CVD in the next ten years. - Evaluation results of semi-structured questions showed that about 48% of the community had a positive impression, 22% considered this self-screening to be awareness-raising and informative, and 3% suggested improvements to the self-screening instrument. - The mHealth app, which was not equipped with a lab test, showed high sensitivity in identifying CVD early.	sensitivity in the early detection of CVD diseases. - Realist and systems perspectives are needed to develop, provide, and scale up mHealth that addresses the digital divide and sustainably improves the health of underprivileged communities.
5	(Wattanapisit et al., 2021) Primary Health Care Providers' Perspectives on Developing an eHealth Tool for Physical Activity Counselling: A Qualitative Study	Qualitative Study Thailand	Explore primary healthcare providers' perspectives on developing eHealth tools to assist Physical Activity counseling in resource-limited settings.	- Physical activity programs need to be tailored to the patient's condition. - Counseling using eHealth should be evidence-based - eHealth should be easy to use, provide Physical Activity prescription functionality, and support continued Physical Activity counseling. - eHealth tools are expected to help reduce service and labor barriers and patient limitations.	- The development of eHealth needs to adapt to the perspective of health service providers and see the limitations in Puskesmas. - eHealth for Physical Activity counseling can be incorporated into electronic medical records using features in mobile apps that are easy to understand.
6	(Paluyo et al., 2023) 'Padayon': A new digital health model for	Studi observasional berbasis komunitas Philippines	- Evaluate the effectiveness and scalability of offline-first health apps (apps that can	- The Padayon mHealth app can help meet targets for patient enrollment, BP testing, and	- The low use of digital resources by low-income people requires further efforts to identify

No	Author Name and Article Title	Research Methods and Locations	Research Objectives	Research Results	Research Recommendations
	diabetes and hypertension in rural Philippines		be used without an internet connection and synchronized when back online) - Assess the impact of app-use interventions on hypertension and diabetes	prescribed medication delivery. - Using mHealth Padayon could help improve systolic and diastolic blood pressure control. - "Offline-first" system can overcome barriers to NCD access in developing countries. - Integration of training, screening, and treatment into a simple digital system can significantly improve health outcomes in low-connectivity and low-resource settings. - Quality health data can be collected through community teams with Padayon's offline-first mHealth app, which enables remote monitoring of patients' BP and RBP for precision healthcare at the population level.	ways to accelerate digital literacy. - Subsidies are needed to cover app subscriptions for low-income service users.
7	(Sumarsono et al., 2023) Development of a mobile health infrastructure for non-communicable diseases using design science research method: a case study	Case Study Indonesia	Describe your experience designing and implementing mHealth "NusaHealth" for NCDs in rural areas.	The study shows that the evaluation of the mHealth "NusaHealth" implementation in rural areas is: - It needs a comprehensive approach, and the implementation process should involve relevant partners and stakeholders. - Requires good internet network and scheduled synchronization.	- Future research must be conducted on a larger scale to produce generalizable results. - Future research needs more data to see how mHealth can affect health.

No	Author Name and Article Title	Research Methods and Locations	Research Objectives	Research Results	Research Recommendations
				- Integration of mHealth with other hospital information systems (as it is currently only connected with one hospital). - Need to develop SMS services and other communication features	
8	(Kusnanto et al., 2019) DM-calendar app as a diabetes self-management education on adult type 2 diabetes mellitus: a randomized controlled trial	Randomized experimental design Indonesia	Evaluate the effect of the Diabetes Mellitus Calender mHealth application as a Diabetes Self Management Education (DMSE) program on self-efficacy, HbA1c levels, lipid profiles, and insulin in adults with type 2 diabetes.	Education with DSME with an Android-based DM calendar has improved self-efficacy perceptions and increased good self-management behaviors, as seen from changes in controlled HbA1c levels and lipid and insulin profiles.	Future researchers are expected to intervene with DM-Calender to test insulin receptors and insulin-like-growth factors, as well as the total antioxidant capacity of plasma.
9	(Steinman et al., 2020) Can mHealth and eHealth improve the management of diabetes and hypertension in a hard-to-reach population? — lessons learned from a process evaluation of digital health to support a peer educator model in Cambodia using the RE-AIM framework	RE-AIM method Cambodia	Identify the challenges and successes of implementing mHealth to support Cambodian people with NCDs through the Peer Educator (PE) program.	- Effectiveness: Clinically but not statistically significant improvements in blood pressure and blood sugar in mHealth participants who received at least one message - Implementation: The main barriers encountered were limited cellular access, and mHealth could not overcome the barriers to controlling NCDs in poor communities	Digital health offers opportunities to improve NCD management in places where people live and work and where access to healthcare is limited; however, realist and systems perspectives are needed to develop, provide, and scale digital health tools that close the digital divide and sustainably improve the health and wellbeing of the most marginalized communities.
10	(Mair et al., 2023) Exploring the potential of mobile health interventions to	Qualitative study Singapore	Exploring perceptions, barriers, and facilitators of using mHealth interventions for lifestyle behavior	- Holistic wellbeing is at the core of healthy living (i.e., the importance of physical and mental health)	Future efforts in this area should consider (i) targeting holistic wellbeing, (ii) customizing content to address environment-specific barriers, (iii)

No	Author Name and Article Title	Research Methods and Locations	Research Objectives	Research Results	Research Recommendations
	address behavioral risk factors for the prevention of non-communicable diseases in Asian populations: A qualitative study		change in Singapore.	- mHealth interventions are influenced by factors such as incentives and government support - Factors for long-term consistency in mHealth adoption are personalization and ease of use that influence sustained engagement with mobile health interventions - Perceptions of chatbots as tools to support healthy lifestyle behaviors are influenced by previous negative experiences with chatbots, which may hinder uptake	partnering with government and/or local (non-profit) agencies in the development and/or promotion of mobile health interventions, (iv) managing expectations related to incentivized use, and (iv) identifying potential alternative or complementary approaches to the use of chatbots, particularly for mental health.

DISCUSSION

Barriers to mHealth use

A qualitative study conducted by Wulandari et al. (2023) found that the challenge of implementing PHC (mHealth telemonitoring and teleconsultation) is that the application still needs to be integrated so it is still considered complicated and confusing. Integration can be done by equalizing data in various health services in one application. According to Petrucka et al. (2013), data integration at various levels of health services can facilitate sustainable decision-making for NCD problems.

Wulandari et al. (2023) found other barriers, such as health workers needing to familiarize themselves with using the application and their availability for health consultation services. These barriers can be overcome with training. Health workers trained to use mHealth provide more effective services (Petrucka et al., 2013).

Another limitation found was limited mobile access in low-income communities. This problem is one of the areas for improvement in mHealth implementation because mobile and internet access is required to use mHealth. However, mobile access in several countries, including Indonesia, increases yearly. Based on BPS data, mobile ownership in Indonesia increased significantly from 2018 to 2022. This needs to be utilized to provide health education and promotion through mHealth (Yaacob et al., 2020).

The potential of mHealth

The study by Siregar et al. (2021) shows that mHealth can potentially be used for self-screening and identification of CVD (Cardio Vascular Diseases). The evaluation results showed that mHealth can show that 21.3% of people will be at high risk of CVD in the next ten years. The results of the semi-structured question evaluation showed that the mHealth-based self-screening was positive and could increase awareness and information about CVD.

In addition to self-screening, mHealth also has the potential to promote lifestyle behavior change and improve health services by providing education through text messaging (Nguyen et al., 2023). Education through mHealth can increase the perception of self-efficacy and improve self-management behavior toward good DM problems. This can be seen from changes in controlled HbA1c levels, lipid profiles, and insulin (Kusnanto et al., 2019)

Yaacob et al. (2020) conducted a study to assess the effectiveness of the ColorApp mobile application in improving knowledge and attitudes towards colorectal cancer. The study showed that the average knowledge score of the intervention group was much higher than that of the control group. This shows that education through the ColorApp application can increase knowledge about colorectal cancer.

Using mHealth in the Philippines shows the potential to improve systolic and diastolic blood pressure control through health education, regular blood pressure monitoring, and affordable medication. This finding is in line with the study of Santo & Redfern (2019), which showed that mHealth can improve hypertension control by facilitating regular blood pressure monitoring, health education, and medication reminders.

Perspectives and perceptions of mHealth service providers

The perceptions of mHealth service providers are described in a study conducted byWattanapisit et al. (2021). This study was conducted on health services implementing mHealth to support physical activity to prevent NCDs. The results explained that mHealth should be easy to use, provide Physical Activity recommendations, and support Physical Activity counseling by adding medical record features so that counseling can be provided continuously.

Evaluation of mHealth use in rural and low-income areas

mHealth is expected to help address NCDs as a whole, which, in this sense, can reach all regions, including remote areas. Sumarsono et al.'s (2023) study conducted in rural Indonesia found that developing mHealth for remote areas in developing countries requires a comprehensive approach, and partners and stakeholders must be involved in the implementation process.

The main thing to consider when implementing mHealth interventions in remote and low-income areas is the ability to access mobile phones and the internet. This limitation can be overcome using an "offline-first" system that synchronizes data when connected to the internet.

Areas with low connectivity and resources require integrating training, screening, and treatment into a simple digital system that can significantly improve health levels.

In addition, Garner et al. (2020) suggested that the implementation process of providing health literacy through mHealth applications to rural residents with various sociodemographic characteristics must be innovative and culturally appropriate.

CONCLUSION

The utilization of mHealth apps to address NCD problems, especially for hard-to-reach populations, needs further consideration. This review identified some of the benefits of using mHealth apps to improve NCD care in Southeast Asian countries and some of the challenges and barriers associated with implementing mHealth apps for NCD interventions. The review concluded that mHealth can be used for NCD self-screening and NCD education and can be applied in rural areas for comprehensive NCD management.

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