



BENEFITS OF IMPLEMENTING MOBILE PHONE-BASED SELF-MANAGEMENT INTERVENTIONS IN CORONARY HEART DISEASE PATIENTS ON MEDICATION ADHERENCE AND REDUCING BLOOD PRESSURE

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ABSTRACT

Coronary Heart Disease (CHD) is a non-communicable disease that is a public health problem and the number is increasing both in the world and in Indonesia. So good self-management skills are needed in effort to improve the patient's ability to manage CHD risk factors, compliance with taking medication and achieving reduced blood pressure. The development of technology makes the use of mobile phones a necessity. Therefore, mobile phone-based self-management interventions are expected to be effective in improving patients' ability to self-manage to achieve medication compliance and reduce blood pressure. Increased compliance with taking medication and a decrease in blood pressure. The design used is a case study with an innovative design in the form of applying research results regarding mobile phone-based self-management interventions for coronary heart disease patients. The self-management intervention took the form of personal education using e-booklets and short WhatsApp text messages for 8 weeks. And the standard questionnaire consists of MMAS8 and SCC HDI. It is known that there is a decrease in systolic blood pressure (SBP) and diastolic blood pressure (DBP), as well as a decrease in total cholesterol levels. Apart from that, there was an increase in patient medication adherence scores and an increase in the self-management ability of CHD patients. There was a significant effect of mobile phone-based self-management intervention on medication adherence, SBP and DBP values, total cholesterol, and self-management abilities.

Keywords: blood pressure; e-booklet education; medication adherence; self-management intervention; whatsapp text messages

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INTRODUCTION

Indonesia faces an increasing threat from non-communicable diseases (NCDs), which pose significant risks to the country's human resource productivity. The growing prevalence of NCDs is particularly alarming because it not only reduces workforce efficiency but also places a substantial financial burden on the government, as managing these diseases requires significant expenditure. The working-age population, which is expected to contribute to national development, is at risk of diminished capacity if their health is compromised by NCDs resulting from unhealthy lifestyle behaviors. The rise in NCDs is linked to lifestyle changes driven by urbanization, modernization, and globalization. Among these diseases, Coronary Heart Disease (CHD) stands out as a major public health issue, with its incidence increasing both globally and within Indonesia. CHD is a condition that disrupts the cardiovascular system, primarily caused by the narrowing of blood vessels due to atherosclerotic plaque buildup. Patients with CHD often present with characteristic pain in the

chest, which may radiate to the neck, jaw, arms, wrists, shoulder blades, abdomen, and back (LeMone, Priscilla, 2016).

According to the World Health Organization (WHO), cardiovascular disease is the leading cause of death and disability worldwide. In 2015, an estimated 17.7 million people died from cardiovascular disease, accounting for 31% of all global deaths. Of these, approximately 7.4 million were due to coronary heart disease (CHD), and 6.7 million were attributed to stroke. Notably, of the 17 million premature deaths (under age 70) recorded in 2015, 82% occurred in low- and middle-income countries, with 37% caused by cardiovascular disease (WHO, 2015). In the Southeast Asia region, the incidence of death from cardiovascular disease is estimated at 3.5 million people, with 52% of these deaths attributed to myocardial infarction. In Indonesia alone, coronary heart disease accounted for 1.25 million deaths from a total population of 250 million. CHD is most prevalent among individuals aged 65-74 (3.6%), followed by those aged 75 and older (3.2%), the 55-64 age group (2.1%), and the 35-44 age group (1.3%). In terms of economic status, the highest prevalence was found in the lower-middle (1.6%) and lower (2.1%) economic groups, according to the 2019 RISKESDAS survey. WHO (2013) also reported that, in Southeast Asia, Indonesia ranks 4th in coronary heart disease prevalence, following Laos, Cambodia, and the Philippines.

Coronary Heart Disease is among the top 10 conditions treated at the Heart Polyclinic of Persahabatan Hospital. In March, 131 patients were recorded, but this number decreased to 118 in April. While various factors contribute to this decline, a significant concern is patient non-compliance with treatment. An assessment from the outpatient pharmacy department revealed that the Medication Possession Ratio (MPR) in April was below 80%, further indicating poor treatment adherence. Previous studies have reported that patients demonstrated partial compliance with doctor visits, with approximately 20% not attending at all (Martsevich et al., 2019). Several factors contribute to non-compliance with treatment. Studies suggest that personal beliefs about treatment play a crucial role in non-adherence, and socio-demographic factors, such as the distance patients must travel for treatment, are also significant contributors (Park et al., 2020). Additionally, research has shown that literacy levels influence treatment compliance—higher literacy is associated with better adherence to prescribed therapies (Rahayu et al., 2021). Maintaining adherence to therapeutic regimens is essential in reducing the risk of readmission and complications for patients with cardiovascular disease (Murad et al., 2022).

Intervention is essential to address patient non-compliance with treatment, particularly through secondary prevention strategies that focus on lifestyle modification. Such interventions are an effective means to reduce the burden of cardiovascular disease and are a key priority of the World Heart Federation. Currently, significant gaps exist in the utilization of medications, risk factor control, and the adoption of lifestyle changes. These gaps are often attributed to patients' limited time for hospital consultations or the considerable time and effort required to travel to healthcare facilities. As a result, mobile phone-based self-management interventions are considered a practical and appropriate solution. Mobile phone-based technologies are increasingly being used to encourage physical activity and lifestyle modifications among patients with coronary heart disease (CHD). Text messaging and WhatsApp show promising potential for improving individual health by facilitating self-management and promoting healthy behavior modification (Seto et al., 2020). According to the Indonesian Central Statistics Agency (BPS), mobile phone ownership in Indonesia averages 65.87%, with the highest rate in Jakarta at 81.83%. These interventions typically include education and self-reminders delivered through mobile platforms. WhatsApp, in

particular, is perceived as more effective and efficient because it enables patients to apply self-management practices directly in their homes.

Enhancing self-management is a crucial strategy for patients with chronic diseases. Technology-based self-management interventions, particularly those delivered through smartphone applications, have been shown to increase treatment compliance among patients with coronary heart disease (CHD) (Deri Ramadhan et al., 2023). Previous studies have also developed technology-driven systems like the "Cardio Plan," a cardiac telerehabilitation system consisting of a web platform and smartphone application. This system enables long-term telemonitoring to track adherence to the Mediterranean diet and has demonstrated potential benefits in disease management, clinical outcomes, and improving patients' quality of life (Dalli Peydró et al., 2022). Although many technology-based interventions exist, their full implementation is often hindered by being overly advanced or too narrow in scope, typically focusing on a single component of care. In contrast, mobile phone-based self-management interventions are expected to be more effective in enhancing patients' self-management abilities by offering a more accessible and comprehensive approach. Based on these considerations, the author aims to conduct Evidence-Based Nursing Practice (EBNP) research titled "Benefits of Implementing Mobile Phone-Based Self-Management Interventions for Coronary Heart Disease Patients on Medication Compliance and Blood Pressure Reduction."

METHOD

This study employs a case study design with an innovative approach, focusing on the implementation of mobile phone-based self-management interventions for patients with coronary heart disease (CHD). The intervention includes personalized education delivered through e-booklets and WhatsApp short text messages over 8 weeks. Based on G-Power calculations, the study included 24 participants, accounting for the number of measurements, medium effect size, and the use of a single intervention group. Inclusion criteria: Willingness to participate; adult patients aged >18 years; ability to understand and follow instructions; CHD patients with blood pressure $\geq 140/90$ mmHg, with or without ongoing therapy; CHD patients defined by a history of myocardial infarction, coronary artery bypass graft surgery, or percutaneous coronary intervention; and patients who own a mobile phone and have a WhatsApp number. Exclusion criteria: Patients with cardiac emergency condition. Residents receive a list of control patients with conditions that meet the inclusion criteria. Next, provide information regarding plans for implementing EBNP when the patient is being controlled at the Cardiac Polyclinic. If the respondent agrees, the resident will give a questionnaire before the intervention. Next, provide education using e-booklets and interventions EBNP, after which they are re-evaluated by asking the patient to fill out a questionnaire. The self-management intervention was carried out over 8 weeks via WhatsApp, where short messages promoting a healthy lifestyle for CHD patients were sent on five working days each week, along with daily medication reminders. Further details about the short messages can be found in Appendix 6. Data collection and processing for the EBNP were conducted using specialized computer software. The collected data underwent univariate analysis, including tests for data distribution and normality, followed by bivariate analysis.

RESULT

The Evidence-Based Nursing Practice (EBNP) was conducted at the Heart Clinic of Persahabatan Hospital, following approval from the hospital's ethics committee. The selection process for the self-management interventions was performed randomly across different days among 26 participants. During the study, the 17th participant passed away in the 3rd week, and

the 24th participant passed away in the 4th week. The results of the EBNP implementation are as follows:

Respondent Characteristics Analysis

The analysis of respondent characteristics, including age, gender, education level, Body Mass Index (BMI), hypertension therapy, and comorbidities, is presented in Table 1. The results in Table 2 show that the average age of the respondents is 68.9 years, with a standard deviation of 5.5 years. The youngest respondent is 60 years old, while the oldest is 83. The analysis further estimates, with a 95% confidence interval (CI), that the average age of respondents lies between 66.6 and 71.3 years.

Implementation Analysis of Mobile Phone-Based Interventions in Coronary Heart Disease Patients on Medication Compliance, Self-Management Ability, SBP, DBP, and Total Cholesterol

The results of the T-test revealed a significant effect of mobile phone-based self-management interventions on total cholesterol levels, systolic blood pressure (SBP), diastolic blood pressure (DBP), the Morisky Medication Adherence Scale (MMAS-8) score, and the Self-Care of Coronary Heart Disease Inventory (SCCHDI) score. However, the intervention did not have a significant effect on Body Mass Index (BMI), with a result of 0.85, indicating a P-value > 0.05 (Table 3).

Table 1.
Distribution of Respondents by Gender, Marital Status, Education Level, Body Mass Index, Hypertension Therapy and Comorbidities (n=24)

Characteristics	f	%
Gender		
Man	12	50
Woman	12	50
Marital status		
Marry	16	66.7
Single	8	33.3
Educational level		
SD	1	4.2
Junior High School	2	8.3
SENIOR HIGH SCHOOL	13	54.2
College	8	33.3
Body Mass Index		
Obesity	6	25
Obesity 1	5	20.8
Overweight	7	29.2
Normal	6	25
Hypertension Therapy		
Candesartan 8 mg	10	41.7
Amlodipine 5 mg	11	45.8
Nifedipine 5 mg	3	12.5
Accompanying Diseases		
≥2 Comorbidities	8	33.3
1 Accompanying Diseases	16	66.7

Description: SD (Elementary School), SLTP (Junior High School), SMA (Senior High School)

Table 2
Distribution of Respondents by Age in the Heart Polyclinic Friendship Hospital (n=24)

Variables	N (%)	Mean	Standard Deviation	Min-Max
Age	24 (100%)	68.96	5.59	60-83

Table 3.
Distribution of Respondents Based on Pre and Post Intervention Mobile Phone Based Self Management (n=24)

Variables	Implementation of Education	Kurtosis		Skewness
		Sig	df	sig
MMAS	Pre	0.782	24	0.589
	Post	0.540	24	0.731
SCCHDI	Pre	2,228	24	1,718
	Post	1,676	24	1,059
SBP	Pre	6,444	24	2,395
	Post	0.891	24	0.136
DBP	Pre	2,228	24	1,771
	Post	1,676	24	0.185
Total Cholesterol	Pre	0.235	24	0.877
	Post	3,027	24	1,063

Information: SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure, BMI: Body Mass Index, MMAS8: Morisky Medication Adherence Scale 8, SCCHDI: Self Care Coronary Heart Disease Inventory

DISCUSSION

Differences before and after the implementation of self-management intervention

Medication Compliance

Medication adherence among coronary heart disease (CHD) patients improved following the implementation of mobile phone-based self-management interventions. This finding is consistent with other studies, which also support the effectiveness of Evidence-Based Nursing Practice (EBNP) in promoting treatment adherence. For instance, Nuratiqa (2020) reported that the majority of respondents demonstrated compliance with their treatment regimens. Patient compliance can be interpreted as a reflection of the seriousness with which a patient approaches lifelong medical therapy. Similarly, Annisa and Jumaiyah (2021) found that medication adherence was the variable with the highest level of compliance among respondents. According to Kimuyu and Boniface (2014), health behavior theories and models suggest more effective methods and strategies to promote patient compliance and other treatment-related behavioral changes. Factors such as the intention to adhere to the treatment plan, environmental constraints that inhibit compliant behavior, and self-confidence in maintaining compliance can all have a positive impact on health outcomes.

The intervention had a significant effect on improving medication adherence in patients with coronary heart disease. This is consistent with findings by Belete et al. (2023), who demonstrated that mobile phone text messaging interventions positively impacted medication adherence. Most respondents who received reminder messages to take their heart medication expressed positive perceptions of the system. According to their feedback, the reminders were perceived as helpful and supportive in reducing forgetfulness, addressing medication

complexity, and overcoming misunderstandings—factors identified in the World Health Organization (WHO) adherence model. This finding is consistent with other research showing that, following cardiac catheterization, nearly all respondents adhered well to the recommended treatment for coronary heart disease (Ardianti et al., 2022). This high level of compliance can be attributed to patients' self-awareness of their illness, which motivates them to follow the education they have received.

Blood pressure

Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP) decreased following the implementation of self-management interventions. Prolonged high blood pressure gradually damages the arterial system. Fat deposits accumulate on the arterial walls, leading to hardening and narrowing of the blood vessels, which restricts blood flow. When this occurs in the coronary arteries, it can result in coronary heart disease (CHD). Elevated blood pressure is a well-established risk factor for CHD. The risk of death increases linearly when systolic blood pressure exceeds 90 mmHg and diastolic blood pressure exceeds 75 mmHg (PERKI, 2022). High blood pressure is often accompanied by other risk factors for CHD, such as obesity, which can result from unhealthy lifestyle choices, including frequent consumption of fatty and processed foods. Therefore, hypertension is considered one of the primary risk factors for coronary heart disease. The intervention significantly reduced SBP and DBP in coronary heart patients. This contrasts with smartphone and social media-based secondary prevention interventions in China, where no significant changes in DBP were observed, although SBP showed some improvement (Cruz-Cobo et al., 2022). This lack of significant change in DBP may be due to the absence of motivational strategies and feedback in the intervention. It is recommended that self-management interventions incorporate more motivational components and regular feedback to ensure patient adherence to text message reminders, which may lead to meaningful lifestyle changes and, ultimately, improved health outcomes. One such measurable outcome is blood pressure.

Self Management Skills

The self-management ability of coronary heart disease (CHD) patients improved following the implementation of mobile phone-based self-management interventions. This can be attributed to the E-Booklet educational intervention and text message reminders, which were provided in parallel and continuously. These interventions helped motivate patients to adopt and maintain a healthy lifestyle. In a study by Yanan Zhang et al. (2020), self-management behavior and knowledge of coronary heart disease were positively correlated. The study found that self-management is crucial in promoting healthy behaviors. Nursing services that focus on patients should emphasize self-management, particularly for those with chronic conditions. This includes providing support for lifestyle modifications such as a healthy diet, regular physical activity, stress management, and increased knowledge about coronary heart disease. Medication adherence is also highly recommended to reduce the risk of recurrence and minimize the symptoms of coronary heart disease. Effective self-management can improve patients' emotional well-being and, consequently, their overall quality of life.

Efforts to improve self-care should begin with the patient, by fostering confidence, trust, and self-motivation to establish effective self-management behaviors. This includes managing signs and symptoms, adopting healthy habits, and improving overall healthcare practices. Therefore, coronary heart disease (CHD) patients need to follow the self-care regimens recommended by doctors and nurses. Doing so can increase their self-confidence and enable them to take appropriate action during a heart attack. To enhance the knowledge and

awareness of CHD patients, healthcare professionals should provide education and health promotion related to CHD and self-management (Sidaria et al., 2023).

Total Cholesterol

In the implementation of Evidence-Based Nursing Practice (EBNP), a reduction in total cholesterol levels was observed following the application of mobile phone-based self-management interventions. Elevated cholesterol levels are a significant concern, as they are one of the primary risk factors for coronary heart disease (CHD), a condition associated with high morbidity and mortality. The intervention had a significant impact on reducing cholesterol levels in coronary heart patients. This finding aligns with research that analyzed total cholesterol as an outcome of self-management interventions, showing a substantial effect despite high heterogeneity in the studies reviewed (Cruz-Cobo et al., 2022).

Body Mass Index (BMI)

Body Mass Index (BMI) can be measured by determining height using a stadiometer with an accuracy of 0.1 cm and weight using a digital scale with an accuracy of 0.1 kg. BMI is calculated by dividing weight in kilograms by the square of height in meters (kg/m^2). The interpretation categories are as follows: Underweight (<18.5), Normal ($18.5\text{--}24.9$), Overweight ($25\text{--}29.9$), and Obesity (≥ 30). BMI did not significantly change after the implementation of mobile phone-based self-management interventions. This may be due to the limited duration of the text message reminders, which were only provided for 8 weeks. Although some patients experienced a weight loss of 1 kg, this was not enough to meaningfully change their BMI towards the ideal range. Similar findings were reported by Rahayu et al. (2021), who found no significant effect of obesity on the incidence of coronary heart disease (CHD). It is possible to develop CHD even without obesity, as other factors such as a history of hypertension or a family history of CHD can contribute to the condition. Despite this, respondents tried to follow the text message reminders about healthy lifestyle practices for CHD patients, as indicated by the weight loss experienced by several respondents. Natasha et al. (2019) similarly noted that self-care behaviors play a crucial role in a patient's ability to monitor their health, particularly in food choices and incorporating time for exercise.

CONCLUSION

The provision of mobile phone-based self-management interventions has a significant impact on improving medication adherence and self-management abilities in patients with coronary heart disease. Similarly, systolic blood pressure (SBP), diastolic blood pressure (DBP), and total cholesterol levels showed reductions following the intervention, indicating a significant effect. One of the key advantages of mobile phone-based self-management is its cost-effectiveness and efficiency. Patients receive constant reminders to take their medication and maintain a healthy lifestyle, which is particularly beneficial for managing coronary heart disease. Additionally, short text messages offer a unique advantage over other electronic reminders, such as pagers or interactive voice messages, as they provide more personalized support to patients. However, there are some limitations to mobile phone-based self-management. The frequency and duration of patient engagement with the E-Booklet cannot be measured, as it does not utilize an e-learning system or learning application to track access. Furthermore, the educational process is delivered individually, limiting interaction between patients who share similar conditions. This lack of peer support may reduce the potential for further motivation to adopt and sustain lifestyle changes required for managing coronary heart disease. In conclusion, mobile phone-based self-management interventions can be effectively applied in Evidence-Based Nursing Practice (EBNP). Collaboration with various stakeholders

is essential to ensure comprehensive patient care at the Persahabatan Hospital Heart Polyclinic. This approach is feasible and can be implemented in the outpatient services department.

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