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The Effectiveness of M-Health on Self-Efficacy, Self-Management, and Self-Care of Patients Undergoing Maintenance Hemodialysis: A Systematic Review and Meta-Analysis

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ABSTRACT

Background: M-Health is the use of mobile digital technology to support health and well-being by extending education, communication, health interventions, and research beyond the reach of traditional clinical care. Research has developed and tested M-Health, demonstrating its effectiveness in enhancing the self-efficacy of cancer patients. However, there has been no synthesis on the effectiveness of M-Health in enhancing self-efficacy in patients with chronic kidney disease.

Purpose: The purpose of this systematic review and meta-analysis is to determine the effectiveness of M-Health on self-efficacy, self-management, and self-care in chronic kidney disease patients undergoing maintenance hemodialysis.

Methods: The study method is a systematic review and meta-analysis reported according to PRISMA guidelines. We conducted this systematic review across six databases. We included randomized controlled trials, quasi-experimental studies, and cohort studies evaluating self-efficacy, self-management, and self-care in patients with chronic kidney disease. We performed the critical appraisal using the Joanna Briggs Institute Critical Appraisal Checklist. Review Manager version 4.5 synthesized the data.

Results: In this study, a database search was conducted to obtain 1,115 articles. Then, 46 duplicates were identified, and 1,109 articles were excluded for not meeting the inclusion criteria, leaving 6 articles for review. After reviewing the six articles, M-Health was found to be effective for self-efficacy and self-management, but not for self-care, due to the study's short duration.

Conclusion: The conclusion of this study is that M-Health intervention can improve self-efficacy and self-management in patients with chronic kidney disease. However, the effectiveness of self-care results is reduced due to the relatively short observation time. Therefore, it is essential to take into account the duration of the intervention to achieve more optimal outcomes.

Keywords: chronic kidney disease, hemodialysis, M-Health, self-care, self-efficacy, self-management, systematic review

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BACKGROUND

Chronic kidney disease (CKD) is an abnormality in the structure or function of the kidneys that lasts more than 3 months (Chen et al, 2019). Chronic kidney disease (CKD) is a critical global health challenge that affects millions of individuals and is currently considered incurable. This condition, often progressive, demands ongoing management to prevent complications and maintain the quality of life for those affected (Elendu et al., 2023). According to recent research (Sundstrom et al, 2022), chronic kidney disease (CKD) affects approximately 9.1% to 13.4% of the global population, which is equivalent to 700 million to 1 billion people. This significant prevalence results in around 850,000 deaths annually, making CKD the 12th leading cause of mortality and the 17th leading cause of disability worldwide. To improve their quality of life, CKD patients often require treatments, such as hemodialysis (Pakaya et al., 2021).

Hemodialysis is the most common method used to remove metabolic toxins from the body when the kidneys are unable to function normally (Mehmood et al., 2019). Hemodialysis has a psychological impact that can lead to depression. Additionally, patients often struggle with self-care at home, and their beliefs about their ability to self-care can significantly impact their compliance with treatment (Nguyen et al., 2022).

Self-efficacy is defined as the patient's belief in their ability to adhere to, treat, and motivate disease management in achieving the desired goals (Rohmaniah et al, 2022). Self-efficacy helps determine how long patients will survive and is a component of implementing lifestyle changes that can promote disease improvement (Lai et al., 2021). High self-efficacy is characterized by patients being able to perform effective self-management of their disease (Adiyasa & M Cruz, 2020). Self-management refers to an individual's ability to recognize and take control of their health to manage a disease effectively. It encompasses two primary aspects: healthcare and daily life management. In daily life, self-management focuses on achieving and sustaining the necessary care routines. Enhanced self-management practices can significantly improve self-care outcomes (Markossian et al., 2021).

Self-care is an important component in the long-term management of chronic kidney disease. According to (Tsai Mu-Dan et al, 2022) Self-care involves an individual's daily actions aimed at maintaining health and managing illness. To improve patient self-care, it is important to consider factors like self-efficacy and self-management. One effective approach is to integrate disease management strategies with technological advancements, particularly through M-Health-based mobile health solutions, which can support better health outcomes (Marinho et al., 2023).

M-Health refers to the use of mobile digital technologies to promote health and well-being by extending education, communication, healthcare interventions, and research beyond conventional clinical settings. It holds great promise in managing chronic kidney disease by enhancing patient education, supporting medication adherence, and helping in dietary adjustments (Daniel et al, 2021). This technology can provide many opportunities for healthcare workers and patients in disease management (Jebraeily et al., 2021). This study aligns with (Tsai et al., 2021) finding that CKD patients who use apps have higher levels of disease knowledge than those receiving traditional education, and that M-Health use is significantly positively associated with increased knowledge. Patients with higher levels of education derive greater knowledge benefits from M-Health.

Numerous studies have indicated that M-Health interventions can enhance self-efficacy in patients with chronic cancer. This highlights the need for a synthesis review to evaluate the effectiveness of M-Health on self-efficacy. Previous reviews have also demonstrated that M-Health is effective in boosting self-efficacy among cancer patients (Anakotta et al., 2023).

However, the literature search has not found any synthesis of the effectiveness of M-Health in patients with CKD, so a systematic review is needed to determine the effectiveness of using M-Health on self-efficacy, self-management, and self-care in patients with chronic kidney disease undergoing hemodialysis.

OBJECTIVE

The purpose of this systematic review and meta-analysis is to determine the effectiveness of M-Health on self-efficacy, self-management, and self-care in chronic kidney disease patients undergoing maintenance hemodialysis.

METHODS

Study Registration and Reporting

This systematic review and meta-analysis followed the guidelines set by the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) (Page et al., 2021). The findings were reported according to PRISMA standards, and the review is registered with PROSPERO under the registration number CRD42023489620.

Data Sources and Search Strategy

This review utilized databases including PubMed, ScienceDirect, Scopus, and Google Scholar. The reviewers conducted a comprehensive search from November 2023 to December 2023. The search terms "M-Health" "Self-efficacy" "self-management" "self-care" "Hemodialysis" "chronic kidney disease" were combined using "OR" and "AND" to develop a search strategy. The reviewers restricted the search to English language only.

Eligibility Criteria

Inclusion criteria are (1) People with chronic kidney disease who are 18 years or older and on hemodialysis; (2) Studies written in English; (3) Published between the first idea of M-Health and 2023; (4) Studies that look at M-Health, self-efficacy, self-management, and self-care outcomes in people on hemodialysis; and (5) Studies that use RCT, quasi-experimental, and research designs with pre-posttest intervention and control groups. Exclusion criteria if (1) articles written as review papers, such as systematic or narrative reviews, protocols, meta-analyses, and concept analyses.

Study selection and data extraction

Rayyan receives all references from all databases once the search is complete. Rayyan is a free web-based management program (Ouzzani et al., 2016). All submissions were analyzed using Rayyan for duplicate identification. Titles and abstracts were independently screened by two reviewers, applying inclusion and exclusion criteria while using the blind-on mode in Rayyan. After completing this initial screening, the reviewers proceeded to evaluate the full texts in accordance with the inclusion criteria, switching to blind-off mode for discussions. The final search results were summarized and visualized using a PRISMA flow diagram.

Appraisal of risk bias

Two reviewers independently assessed the risk of bias and quality of articles using the Joanna Briggs Institute (JBI) instrument. This was done for studies with randomized controlled trials (RCTs), quasi-experimental designs, and cohort studies that reported prevalence data (Aromataris, 2023). The reviewers rated each method using the criteria of the critical appraisal tool as "yes," "no," "unclear," or "not applicable." Reviewers categorized the quality based on Mostafaei et al. (2020). The total score is calculated based on the percentage of "yes" answers to the critical appraisal results using JBI: > 80% is considered high quality, 60%-80% medium quality, and < 60% low quality.

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Data Extraction

Two reviewers extracted data from their final results. Each study collected a table containing the following information: author (year), country, design, participants (number E/C, mean age, total E/C), disease types, intervention (method, duration), control group, measurement tools, and outcome. We used the Microsoft Excel 2010 version to manage all the extracted data. All reviewers will ensure the absence of missing data and discuss any inappropriate items with other reviewers.

Data Analysis

Statistical data analysis was conducted using Review Manager 5.4 software to determine the significance of M-Health on self-efficacy. We conducted the analysis by entering research data, which included the author, years, mean post-intervention, standard deviation, and the number of samples in the intervention and control groups. In this systematic review using a random-effects model due to heterogeneity ($I^2 > 50\%$) and the same instrument, the mean difference was used (Higgins & Thompson, 2002). The effect size results in this study with P-value <0.05 are considered significant (Higgins, 2023).

RESULTS

Figure 1 shows the PRISMA diagram. In the process of retrieving literature from four databases, a total of 1,113 articles and two from manual searches were obtained. Then duplicates were obtained from 46 articles, after removing duplicates, the remaining 1,069 articles. Furthermore, title and abstract screening with 2 independent reviewers that resulted in 15 articles, and 1054 studies were excluded. Following that was full text screening which resulted 6 included studies.

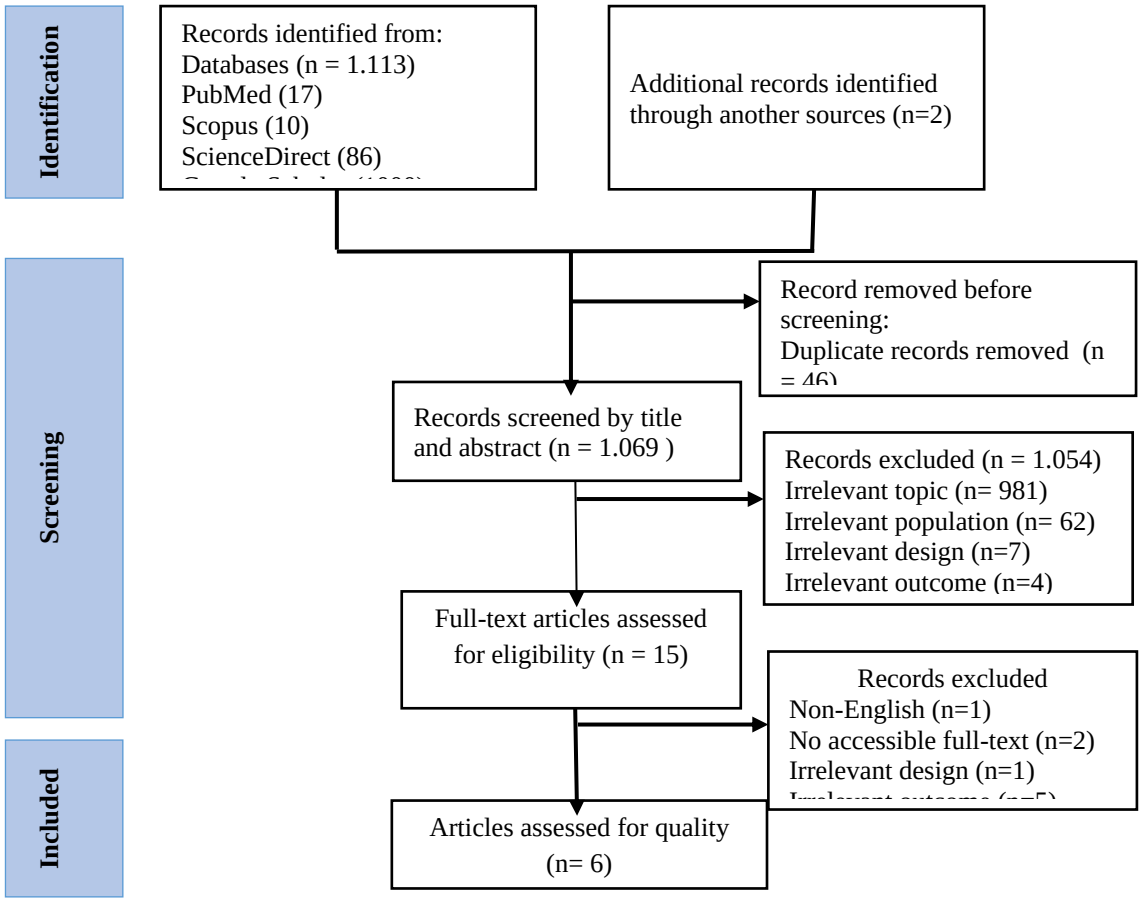

Figure 1. PRISMA diagram

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Characteristics of the include studies

The characteristics of the included studies are addressed in Table 1 with publication years from 2019 to 2023. The included studies (n=6) were conducted in 4 countries: The Netherlands (n=1), Taiwan (n=3), Korea (n=1), and Thailand (n=1). Most of the studies were RCTs (n=3), quasi-experimental (n=2) and cohort studies (n=1).

In this systematic review, we aimed to synthesize the impact of M-Health on the self-efficacy of chronic kidney disease patients undergoing hemodialysis. Four articles used general self-efficacy instruments to measure patients' self-efficacy levels (Cardol et al., 2023; Chiang et al., 2021; Li et al., 2020) and (Park et al, 2019). The other two articles measured different instruments, the first self-management was measured using the Self-Management Behaviors Questionnaire (SMBQ) instrument (Maneesri et al., 2023) and the second self-care was measured using the CKD Self-Care Questionnaire (CKDSC) (Tsai et al., 2021).

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Table 1. Characteristic of the included studies

Author (year), country	Design	Participant		Disease types	Intervention		Control group	Measurement Tools*	Outcome
		Number E/C	Mean age, total, E/C		Method	Duration			
(Cardol et al., 2023) Belanda	RCT	60/61	12,6/15,0	CKD	At the start of treatment, conduct face-to-face sessions with each patient to carry out measurements that include assessing the patient's physical, psychological and social function. Session 2, the patient receives an E-coach related information module. The final session held a meeting to evaluate the delivery of the intervention.	Face-to-face sessions (90-120 minutes) and telephone sessions (15-30 minutes) for 3-4 months	Regular routine maintenance	1. PHQ-ADS = Patient Health Questionnaire Anxiety and Depression scale 2. PPPQ = Personalized Priority and Progress Questionnaire	This eHealth intervention does not significantly improve psychological distress, quality of life, self-efficacy, and chronic diseases in a short time, but after the intervention is given and improvements are maintained over a long period of time eHealth can improve significantly.
(Chiang et al., 2021) Taiwan	Quasi-experimental	30/30	16,39 (7,40-25,37)	CKD	Patients with the APP-assisted caring program (ACP) group will receive personalized instruction on how to install the mobile app on their smartphone and how to use it. Patients in the Standard caring program (SCP) group are given conventional education. SCP is administered by nurses who handle dialysis directly and includes the following: interpretation of monthly biochemical results (including hemoglobin, electrolyte, phosphate, and albumin levels), dietary	3 months	Standard caring program (SCP) received education in a conventional manner	1. C-DMSES = Chinese version of the Diabetes Management Self-Efficacy Scale 2. Chronic Kidney Disease Patient Self-Efficacy Scale 3. Asthma Patients Self-Efficacy Scale 4. Self-efficacy scales like Strategies Used by People to Promote Health (SUPPH)	In this study, it was found that the APP treatment program was effective for patients undergoing hemodialysis to achieve better dietary phosphate control without reducing appropriate protein intake. Good control will also increase patient self-efficacy.

					counseling, evaluation of oral phosphate binder adherence and adherence, and patient education fact sheets or folding cards as enhancements. Group education on various topics is held quarterly.				
(Li et al., 2020) Taiwan	RCT	25/24	10,98	CKD	The first step is that each participant is given a wearable device (Heart Rate Smart Wristband, GSH405-B6, Golden Smart Home Technology Corporation). Then, participants download the WowGoHealth app to connect with the health management platform (GSH AI health platform) and participants also download the LINE app. The next step was for each participant to be taught how to keep a diet diary (take photos of food) using a smartphone app. A daily target of 7500 steps has been set and used to emphasize the correct concept of exercise.	90 days	The control group was given a wearable device to collect exercise-related data and create a diet diary using a smartphone app.	1. The self-efficacy questionnaire 2. The self-management questionnaire 3. Quality of life was measured by the KDQOL-SF	Before the intervention there was no significant difference in average self-efficacy scores between the intervention and the control group After the 90-day intervention, self-efficacy was significantly higher in the intervention group
(Maneesri et al., 2023) Thailand	RCT	20/20	11,63/10,00	CKD	Session 1: Identifying and measuring risks and protective factors Session 2: Providing CKD knowledge and caring beliefs Session 3: Developing self-regulation skills and providing support from	Session 1 (30 min), Session 2 (60 min), Session 3 (120 min) and Session 1 (30 min)	The control group received only usual care. Regular care is provided by multidisciplinary teams through educational programs and treatment protocols	1. Demographic Questionnaire 2. Clinical Results Record Form 3. Self-Management Behaviors Questionnaire (SMBQ)	The results of this study suggest that the Individual and Family Self-Management Combined mHealth Program can help people with stage 3 chronic kidney

					family and mHealth application Session 4: Developing abilities in self-evaluation and management of responses associated with health behaviors change				disease improve their self-management behaviors and alleviate blood pressure
(Park et al, 2019) Korean	Quasi-experimental	42/42	10,15/9,37	CKD	In the first stage, the researcher explained related to the purpose and use of the mobile application to two nurses (as research assistants). Then they were given 1 week to use and familiarize themselves with the application. Once the research assistants mastered the use of the app, they explained how to use the app to the experimental group. The research assistant installed the app directly on the experimental smartphone and took 15-20 minutes to explain its use and the final stage of the experimental group was evaluated at each hemodialysis visit for 8 weeks.	8 weeks	Regular routine maintenance	1. Self-efficacy was measured by using the scale that had been developed to assess self-efficacy in Korean hemodialysis patients 2. Treatment compliance was measured by using the Compliance of Patient Role Behavior tool that had been developed for Korean hemodialysis patients	Self-efficacy results were significantly higher in the experimental group than in the control group The ratio of interdialytic weight gain to dry weight significantly decreased in the experimental group, compared to the control group. The serum potassium and phosphorus levels in the experimental group were not significantly lower than those of the control group.
(Tsai et al., 2021) Taiwan	Prospective Cohort Study	107/107	11,5 (11,1/11,9)	CKD	Participants received traditional CKD educational materials, including introducing knowledge about kidney function and anatomy, symptoms, risk factors and	3 months	Traditional health education	1. Perceived kidney knowledge survey (PIKS) 2. CKD Self-Care (CKDSC) scale to assess self-care behavior	mHealth can significantly increase disease knowledge in patients with CKD.

	complications of kidney disease, and interpretation of kidney disease laboratory data. In addition, nutrition education is also given about healthy eating patterns and what foods are restricted due to kidney disease. The frequency of traditional education depends on the stages of CKD (once every six months for CKD stages 1–2, every three months for CKD stages 3–4, and once every month for CKD stage 5).	

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Based on Table 2 All studies were assessed for risk of bias, and the quality assessment presents a critical assessment of the 6 included studies. We divided the critical assessment into three study designs: four RCTs, two quasi-experimental studies, and one cohort study. The quality scores of the included studies ranged from 53% to 88% on a maximum quality score scale of 100% using the Joanna Briggs Institute Critical Appraisal Tool. Two studies were included as high quality with an overall score of 88%, three studies were included as moderate quality between 61% - 72%, and one study was included as low quality with an overall score of 53%.

Table 2. Assessment of methodological quality of included studies

	RCT	(Cardol et al., 2023)	(Li et al., 2020)	(Maneesri et al., 2023)
Q1	Was true randomization used for assignment of participants to treatment groups?	Y	N	Y
Q2	Was allocation to treatment groups concealed?	N	N	N
Q3	Were treatment groups similar at the baseline?	N	N	N
Q4	Were participants blind to treatment assignment?	Y	N	N
Q5	Were those delivering treatment blind to treatment assignment?	N	N	N
Q6	Were outcomes assessors blind to treatment assignment?	N	N	N
Q7	Were treatment groups treated identically other than the intervention of interest?	Y	Y	Y
Q8	Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?	N	Y	Y
Q9	Were participants analyzed in the groups to which they were randomized?	Y	Y	Y
Q10	Were outcomes measured in the same way for treatment groups?	Y	Y	Y
Q11	Were outcomes measured in a reliable way?	Y	Y	Y
Q12	Was appropriate statistical analysis used?	Y	Y	Y
Q13	Was the trial design appropriate, and any deviations from the standard RCT design (individual randomization, parallel groups) accounted for in the conduct and analysis of the trial?	Y	Y	Y
Percentage		61%	53%	61%
Category		M	L	M

	Quasy-Experiments	(Park et al, 2019)	(Chiang et al., 2021)
Q1	Is it clear in the study what is the 'cause' and what is the 'effect' (i.e., there is no confusion about which variable comes first)?	Y	Y
Q2	Were the participants included in any comparisons similar?	Y	Y
Q3	Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	Y	Y
Q4	Was there a control group?	Y	Y
Q5	Were there multiple measurements of the outcome both pre and post the intervention/exposure?	Y	Y
Q6	Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?	N	N
Q7	Were the outcomes of participants included in any comparisons measured in the same way?	Y	Y
Q8	Were outcomes measured in a reliable way?	Y	Y
Q9	Was appropriate statistical analysis used?	Y	Y
Percentage		88%	88%
Category		H	H
	Prospective Cohort Study		(Tsai et al., 2021)
Q1	Are the two groups similar and taken from the same population?		Y
Q2	Is exposure measured in a way the same to assign to exposed and unexposed groups exposed?		Y
Q3	Is exposure measured in a way that valid and trustworthy?		Y
Q4	Are confounding factors identified?		Y
Q5	What are the strategies for dealing with factors confounding stated?		Y
Q6	Is the group/participant free from the results at the start of the study (or at during exposure)?		Y
Q7	Are results measured in a way that valid and reliable?		Y
Q8	Whether follow-up time is reported and long enough for results to occur?		N
Q9	Is follow-up complete, and if no, what is the reason for the loss follow-up explained and explored?		N
Q10	What are the strategies for dealing with actions incomplete progress done?		N
Q11	What statistical analysis was used in accordance?		Y
Percentage			72%
Category			M

Notes: Quality research results with Joanna Briggs Institute (JBI). Questions with answer "Y" means "yes". "N" means "NO". A total score of > 80% is considered high quality "H", 60%-80% medium quality "M" and < 60% low quality "L".

Effectiveness of interventions on Self-Efficacy

The effectiveness of M-Health on patient self-efficacy was evaluated in four trials (Cardol et al., 2023; Chiang et al., 2021; Li et al., 2020; Park et al, 2019), which included 303 patients. The results of Figure 2 show the differences between the four studies using the same instrument. The results were very similar, with a value of I^2 = 96% and an effect Z of 2.13 difference (p = 0.03). This means that m-health does improve patient self-efficacy in all four studies, as shown by the significant P value > 0.05 [MD = 5.43, CI 96%, (0.44–10.42), P < 0.00001**].**

This systematic review was conducted to determine how effective M-Health intervention is on self-efficacy, self-management, and self-care in chronic kidney disease patients undergoing hemodialysis. We conducted analysis and synthesis on four studies to examine the impact of M-Health on self-efficacy, one study to assess self-management, and another study to assess self-care. This aligns with prior research that has demonstrated the impact of M-Health-based self-efficacy on patient self-management and self-care. M-Health technology has been shown to have beneficial effects on hemodialysis specific measures. Therefore, it is crucial to develop self-efficacy in order to enhance adherence to self-care activities and support patients in improving their self-management in a sustainable manner (Aminuddin et al., 2021; Delva et al., 2021; Yang et al., 2020).

Effectiveness of M-Health on Self-Management

One trial (Maneesri et al., 2023) including 40 patients evaluated the effectiveness of M-Health on patient self-management. The results were (Mdiff= 13.55, SE=3.96, P-value= 0.003, CI95% (5.26, 21.84), N=20) in the experimental group and (Mdiff= -2.35, SE=4.92, P-value= 0.639, CI95% (-12.66, 7.95), N=20) in the control group. These results indicate that during the follow-up period, the experimental group had higher self-management behaviors than the control group. This study shows that the M-Health program can effectively help patients with chronic kidney disease to improve self-management.

Effectiveness of H-Health on Self-Care

One trial (Tsai et al., 2021) including 214 patients evaluated the effectiveness of M-Health on patient self-care. The study yielded results for the entire group (mean = 64.3, SD = 10.1, N = 214), and subsequently divided the group into two intervention groups (mean = 64.4, SD = 9.4, N = 107) and a control group (mean = 64.1, SD = 10.7, N = 107), indicating a lower effectiveness of M-Health on patient self-care.

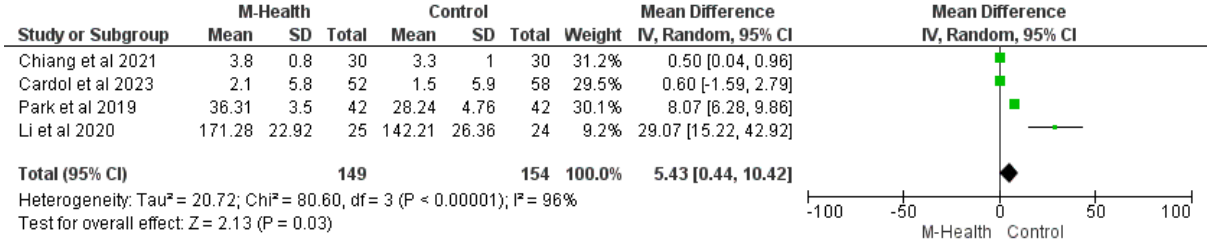

Figure 2. M-Health analysis of self-efficacy of patients undergoing hemodialysis

DISCUSSION

This meta-analysis showed significant improvements in self-efficacy and self-management after the intervention. These four studies showed positive results for improving patients' self-efficacy. These studies include (Cardol et al., 2023; Chiang et al., 2021; Li et al., 2020; Park et al, 2019). One study showed positive results for improving self-management (Maneesri et al., 2023). One study showed a negative result that was not significant for self-care (Tsai et al., 2021).This is due to the relatively short observation time. Patients must internalize knowledge before transforming it into behavior, and they require more time to

comprehend accurate knowledge before demonstrating improvements in their self-care behavior. The length of time in application delivery and the availability of all application components, including educational materials, daily monitoring, and activity schedules, influence the positive impact of digital self-management on patients' self-efficacy and self-care. These results align with previous research. Good self-efficacy will make patients more confident in managing their disease (Ahmad Sharoni et al., 2018; Chen et al, 2023; Mourao et al, 2022; Najafi et al, 2021). These results indicate that digital interventions are effective in increasing self-efficacy, but changes in self-care behavior take longer. Insignificant results in some studies are likely due to the short duration of the interventions. Therefore, the success of mHealth is highly influenced by the continued use of the application and the comprehensiveness of its supporting features.

Previous studies have reported that participation in disease management behaviors is a component of self-management skills and self-efficacy. These two components, if well implemented, will influence changes in patients' daily self-care behaviors. Self-efficacy is a key mechanism for behavior change in disease management (Adu et al., 2020; Alemdag, 2019; Yao et al., 2019). This is in line with previous studies where self-care activities showed substantial improvement with M-Health-based self-management interventions. Encouraging self-management behavior is a key technique associated with improved health behaviors. In addition, maintaining patient engagement is an important factor in the delivery of interventions to improve self-care activities. Increased self-efficacy also contributes to the increase in reported self-care activities. Self-efficacy allows people to trust themselves and use their skills to overcome any challenges encountered, leading to successful adherence to their daily self-care activities (Aminuddin et al., 2021). Self-efficacy is a key factor bridging knowledge and self-care behavior change in patients. Effective M-Health interventions require ongoing emphasis on strengthening patient engagement. With increased self-efficacy, patients become more confident and consistent in carrying out daily self-management and self-care.

According to the literature, patients' lack of knowledge and skills can lead to a decrease in their motivation for self-management, self-efficacy, and self-care. The results showed that there is a significant relationship between self-efficacy, self-management, and self-care. Therefore, the implementation of self-management is necessary to improve patients' self-care and self-efficacy. Improving self-management in patients undergoing hemodialysis is an effective way to reduce mortality and adverse effects of the disease and improve their quality of life (Wood et al., 2020). Improving patient knowledge and skills is the primary foundation for strengthening self-management. Self-efficacy serves as a crucial link between self-management and self-care. Therefore, structured and sustainable interventions are essential to improving the quality of life of hemodialysis patients.

This study has a number of limitations. Firstly, the primary constraint of this systematic review is the restricted number of studies suitable for meta-analysis, as the effectiveness of M-Health on self-efficacy remains scarce. Despite using specific keywords in the database search, only a few RCTs or quasi-experimental studies, as well as cohort studies, were found on the effectiveness of M-Health on self-efficacy. Third, there was only one journal on self-care, so there was no comparison for effectiveness. Fourth, a critical appraisal of the methodology revealed that out of six, there were low-quality studies, highlighting the need for improvement in research quality. Therefore, future research should standardize uniform M-Health using RCT and quasi-experimental designs with high-quality journals to investigate effective M-Health.

CONCLUSION

The conclusion of this study is that M-Health intervention can improve self-efficacy and self-management in patients with chronic kidney disease. However, the effectiveness of

self-care results is reduced due to the relatively short observation time. Therefore, it is essential to take into account the duration of the intervention to achieve more optimal outcomes.

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CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest concerning the authorship and publication of this article.

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