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UTILIZATION OF DIGITAL LIFESTYLE INTERVENTION FOR HYPERTENSIVE PATIENTS: A SCOPING REVIEW

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ABSTRACT

Introduction: High blood pressure remains a major health issue worldwide, particularly in countries with low and middle incomes, where adherence to treatment and lifestyle modifications is often suboptimal. This scoping review sought to investigate the utilization and effectiveness of digital lifestyle interventions for individuals with hypertension. **Methods**: The review process utilized the framework developed by Arksey and O'Malley, and in accordance with the PRISMA guidelines, an extensive search was performed across various electronic databases (PubMed, Sage, Science Direct, and ProQuest) for studies published between 2023 and 2025. Eligible studies included those targeting adults with hypertension and applying digital tools to promote healthy lifestyle. **Result**: A total of nine studies satisfied the inclusion criteria. Most interventions utilized mobile health (mHealth) tools such as smartphone applications, automated text messaging, WeChat, WhatsApp, and web-based platforms. Most of these studies focused on encouraging changes in diet, increasing physical activity, ensuring medication compliance, and monitoring blood pressure independently. **Discussion:** Variations existed in delivery methods and intervention duration, numerous studies have documented modest reductions in both systolic and diastolic blood pressure, as well as enhancements in medication adherence and health-related behaviors.

Keywords: hypertension, digital health, mHealth, lifestyle intervention, behavior change

Introduction

High blood pressure remains a persistent global public health issue and one of the most significant contributors to premature death and disability worldwide. According to global estimates, over 1.28 billion adults aged 30 to 79 are affected by hypertension, and nearly two-thirds of them reside in low-and middle-income countries (LMICs) (World Health Organization, 2023). Despite the availability of pharmacological treatments and well-established guidelines for lifestyle modification, effective blood pressure (BP) control remains suboptimal. It is estimated that less than 50% of treated patients globally achieve target BP levels, and this rate is even lower in LMICs due to limited healthcare infrastructure, economic barriers, and health literacy challenges (NCD Risk Factor Collaboration, 2021). Lifestyle modification is a cornerstone of hypertension management, yet many patients struggle to implement and sustain recommended changes, resulting in increased risk of heart attacks, strokes, and

healthcare costs (Kario et al., 2022; Xu & Long, 2020)

Non-compliance with lifestyle modifications among hypertensive patients is a significant global health concern, with studies consistently reporting low adherence rates. For example, research in Kathmandu, Nepal, found that only 20.8% of hypertensive patients adhered to recommended lifestyle changes, with the lowest adherence observed for adequate intake of fruits and vegetables (30.3%) (Dhakal et al., 2022a). Similarly, a study in Addis Ababa, Ethiopia, reported an adherence rate of just 23% among hypertensive patients (Tibebu et al., 2017), while another study in Dessie, Ethiopia, found an overall adherence rate of 23.6% (Andualem et al., 2020). In Bahir Dar, Ethiopia, adherence to lifestyle modification practices was about 32.4% (Geremew et al., 2023). These findings highlight that the majority of hypertensive patients do not consistently follow recommended lifestyle modifications, which can negatively impact blood pressure regulation and elevate the likelihood of complications. Adherence is influenced by factors such as age, level of education, income, understanding of hypertension, self-confidence, social support, and the relationship between patients and their physicians. (Dhakal et al., 2022b; Geremew et al., 2023).

The rapid advancement and widespread adoption of digital technologies—such as smartphone applications, wearable devices, and telemonitoring systems—have created new opportunities to support lifestyle interventions for hypertension patients (Damodaran, 2024; Kario et al., 2022; Xu & Long, 2020). Digital lifestyle interventions leverage these tools to facilitate self-monitoring, deliver tailored health education, reinforce medication adherence, and provide real-time feedback, thereby enhancing patient engagement and enabling continuous monitoring (Milani et al., 2017).

Recent systematic reviews and clinical trials have shown that digital health interventions, such as mobile health (mHealth) and telehealth, can lead to substantial lowering of blood pressure and improved compliance with medication, and support lifestyle changes in patients with high blood pressure (Kario et al., 2022; Yap et al., 2024). Recent systematic reviews and clinical trials have shown that digital health interventions, such as mobile health (mHealth) and telehealth, can lead to a significant reduction in blood pressure and enhance medication adherence. (Kario et al., 2021). Additionally, these interventions have been associated with improved patient activation and engagement, which are critical for long-term disease management (Wildenauer et al., 2024).

Methods

This scoping review adhered to the PRISMAScR guidelines to evaluate studies pertinent to the research goals. The methodology was based on Arksey and O'Malley's five-step framework: 1) developing research questions, 2) finding pertinent studies, 3) choosing articles, 4) analyzing data, and 5) presenting data and forming conclusions.

Identifying the research question

The questions guiding this review include: (1) What is the respondent population in the study? (2) What types of digital technologies are utilized in lifestyle interventions for hypertensive patients?

Identifying relevant studies

The literature search, covering publications from January 2023 to June 2025, was conducted using multiple databases such as PubMed, Psycinfo, ScienceDirect, ProQuest, and Sage. To retrieve relevant studies, a combination of Boolean logic operators, free-text terms, and MeSH topic words was utilized. The search employed the following keywords: ('hypertension' OR 'high blood pressure' OR 'elevated blood pressure') AND ('digital health' OR 'digital application' OR 'digital intervention') AND ('lifestyle' OR 'healthy lifestyle' OR 'life change event'). In each database, these keywords were deliberately combined to enhance the identification of studies.

Inclusion and exclusion

Examine academic studies that utilize mHealth to influence the lifestyle of people with hypertension. The criteria for selection include: 1) works written in English and Indonesian; 2) participants of any age; 3) individuals who are solely hypertensive patients, without other non-communicable diseases such as obesity or diabetes mellitus; 4) results of health coaching, including changes in blood pressure, lifestyle adjustments, or self-efficacy; and 5) the implementation of mHealth as a digital intervention.

Conversely, the exclusion criteria encompassed: 1) individuals with hypertension who also suffer from other chronic conditions such as obesity or diabetes mellitus; and 2) studies carried out in environments other than primary care, including clinics, primary care centers, and community health centers, serve as venues where general practitioners and family physicians deliver medical services.

Data extraction

Researchers screened the titles, abstracts, and full texts of identified articles. The extracted data from the chosen articles included: 1) the researcher's name, title of article, and year the article was published; 2) population; 3) platform used; 4) the duration; 5) intervension in research; 6) effect of intervention on blood pressure; 7) lifestyle changes. This information was organized in a table format.

Results

Initially, a search across five databases resulted in 3,864 articles. After removing duplicates, 3,764 articles were left. Screening the titles and abstracts identified 99 articles for full-text review by the researchers. Out of these, 90 articles did not satisfy the criteria, while 9 articles met the study's inclusion and exclusion criteria. (Figure 1).

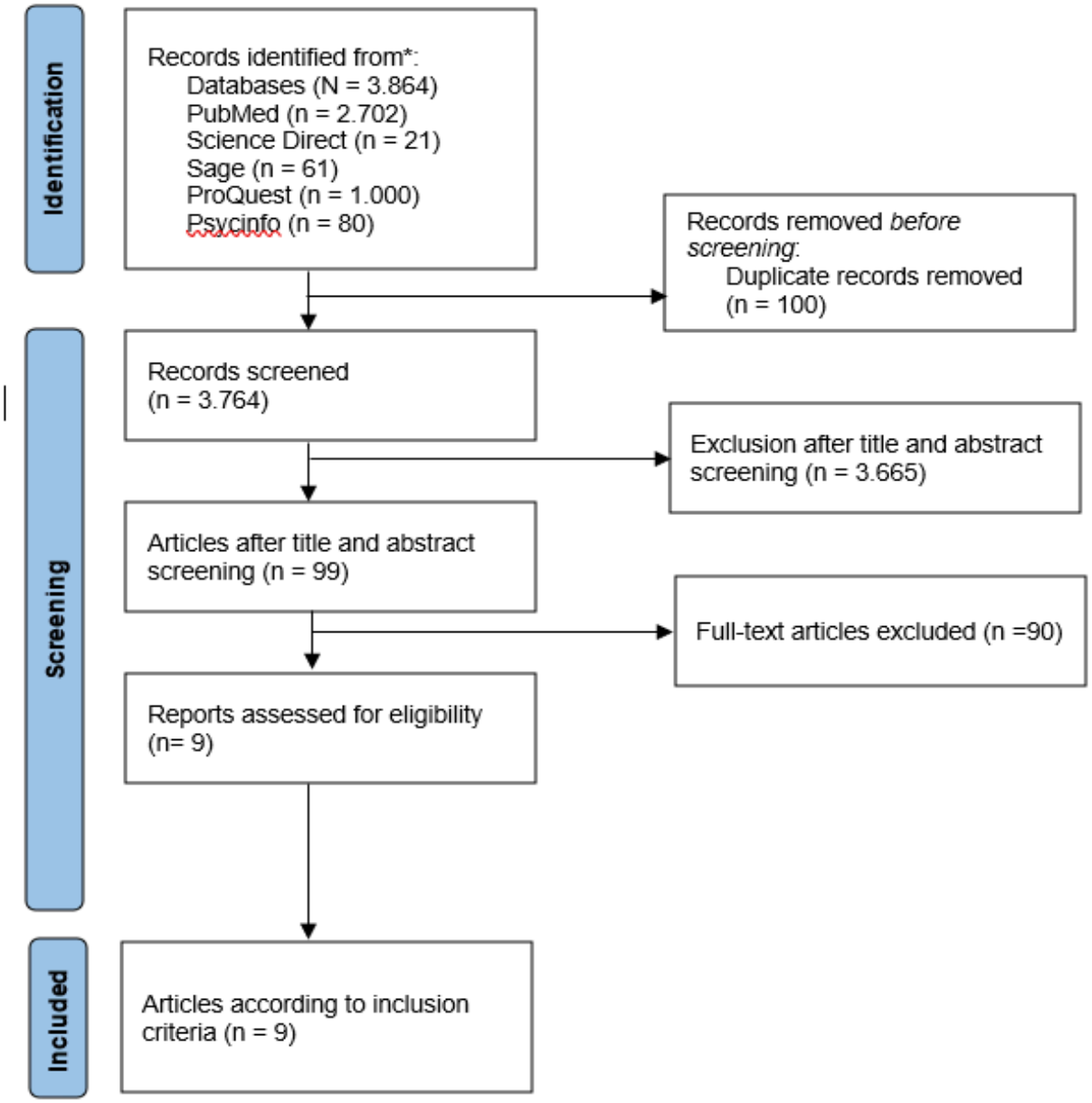

Figure 1. PRISMA-ScR flow diagram of article identification, screening, eligibility, and inclusion.

Study period and location

China was the location for the majority of the studies (n=5, 55.5%) (Lee et al., 2023; Liu et al., 2023; Sun et al., 2024; Tam et al., 2023; Wang et al., 2023). Additional research took place in the United States (Hoppe et al., 2023), Sweden (Borgström Bolmsjö et al., 2025), Iran (Karami et al., 2023), and Indonesia (Upoyo et al., 2024). The year 2023 was the most frequent study period (n=6, 66.6%). The earliest study was from 2023, while the latest was conducted in 2025 in Sweden.

Table 1. Data extraction and synthesis of results

No	*Country/ Author/ Year*	*Population*	*Platform*	*Duration*	*Intervension*	*BP*	*Lifestyle Modification*
1	China (Sun et al., 2024)	68 hypertensive patients	*WeChat*	12 weeks	1. DASH education 2. physical activity (exercise prescription) 3. blood pressure monitoring 4. medication adherence	SBP decreased by 7.36 mmHg (P = 0.002)	Increased adherence to 1. exercise 2. DASH diet 3. blood pressure monitoring 4. medication adherence
2	United States of America (Hoppe et al., 2023)	316 adults with uncontrolled hypertension	*Telephone*	6 months	1. Education 2. Motivation 3. Blood pressure monitoring	The intervention did not significantly lower blood pressure.	Significant improvement in 1. Home blood pressure monitoring, 2. Physical activity, 3. Sodium reduction
3	China (Lee et al., 2023)	148 hypertensive patients	the Monitoring Wearable Device and mHealth	12 weeks	1. Education 2. Lifestyle modification at home 3. Blood pressure monitoring 4. Reminder to take medication 5. Family support	Significant SBP reduction: -8.52 mmHg	1. hypertension compliance increased 2. Self-eficacy 3. Quality of life a. physical health increased b. mental health increased
4.	China (Wang et al., 2023)	175 hypertensive patients	*WeChat*	6 months	1. Lifestyle modification 2. Personal education **3.** Blood pressure monitoring	SBP reduction	1. Improved sleep quality 2. Decreased anxiety & depression
5.	China (Liu et al., 2023)	297 hypertensive patients	WeChat	6 months	1. Blood Pressure Monitoring Reminder 2. Education	SBP decrease: -25.83 mmHg DBP decrease: -14.28 mmHg	1. Hypertension knowledge and compliance increased significantly 2. Increased healthy diet, reduced salt intake, physical activity

6	Iran (Karami et al., 2023)	118 hypertensive patients	mHealth	**3** months	Programmed instruction via M-health on: 1. Health literacy 2. Medication adherence 3. Blood pressure (SBP and DBP) in uncontrolled hypertension patients.	SBP: Decreased from 149.83 → 148.98 mmHg DBP: No significant decrease	1. Increasing Health Literacy 2. Increased Medication Adherence
7	Sweden (Borgström Bolmsjö et al., 2025)	401 hypertensive patients	SMS	6 months	Participants received one message per week from each of the following topics: 1. Physical activity: recommended brisk walking of 150 minutes/wee 2. Healthy diet: education on reducing salt intake 3. General cardiovascular health information: education on the impact of hypertension, alcohol, and the role of medication	(SBP): Intervention: –3.9 mmHg Diastolic (DBP): Intervention: –3.2 mmHg	1. Medication compliance was not measured directly with a scale instrument, only seen from reports of use and changes. 2. Physical Activity and Lifestyle: 31.9% of all participants were categorized as having a sedentary lifestyle (<150 minutes/week).
8	Indonesia (Upoyo et al., 2024)	96 hypertensive patients	WhatApps Group	8 months	1. Hypertension and complication education 2. Healthy lifestyle: low salt and fat diet, physical activity, stress management 3. Blood pressure and lifestyle monitoring **4.** Increased motivation and self-efficacy	SBP: Decreased from 153.48 mmHg → 143.02 mmHg DBP: Decreased from 90.31 mmHg → 85.79 mmHg	Significant increase in: 1. Knowledge (HKLS, p<0.001) 2. Motivation, from 62.90 → 68.42 3. Self-efficacy, from 57.50 → 61.35 4. Self-care behavior, from 49.52 → 61.10

9	China (Tam et al., 2023)	69 hypertensive patients	SMS	12 weeks	Weekly SMS containing healthy lifestyle tips 1. Diet 2. Exercise 3. Medication compliance	SBP decreased by 10.64 mmHg	1. Self-efficacy increased 2. Medication Adherence was not significant

Study design and participants

The study designs in the chosen articles differed. Most of them were randomized controlled trials (n=7) and quasi-experiments (n=3). The smallest number of participants was 68 in China (Sun et al., 2024), while the largest number was 401 in Sweden (Borgström Bolmsjö et al., 2025).

Intervention

The review indicated that health coaching was effective in enhancing blood pressure management. The interventions implemented across all studies included education and blood pressure regulation. Additional interventions involved utilizing the WeChat digital platform (n=3) (Liu et al., 2023; Sun et al., 2024; Wang et al., 2023), SMS (n=2)(Borgström Bolmsjö et al., 2025; Tam et al., 2023), a website (n=1) (Lee et al., 2023), telephone (n=1) (Hoppe et al., 2023), WhatsApps (n=1) (Upoyo et al., 2024), and mobile health (n=1) (Karami et al., 2023). The educational interventions varied, covering topics such as low-salt diet education, physical activity recommendations, and medication adherence.

The duration of the study varied, ranging from 3 to 7 months. The results indicated that the most substantial reduction in blood pressure occurred in systolic blood pressure, with a less pronounced effect observed in diastolic blood pressure (DBP). Additional findings pertained to lifestyle modifications, including alterations in diet, physical activity, sleep quality, self-efficacy, alcohol consumption, and medication adherence.

Discussion

This scoping review underscores the increasing adoption of digital lifestyle interventions in the management of hypertension, particularly in low- and middle-income countries where healthcare access remains constrained. The studies reviewed indicate that a range of digital platforms including mHealth applications, WeChat, WhatsApp, Telephone, Website and SMS, based interventions have been employed to facilitate lifestyle modification and self-management among hypertensive patients. These platforms have been utilized to deliver education, promote medication adherence, encourage physical activity, monitor blood pressure, and support dietary modifications.

Consistent with previous findings(Kario et al., 2021; Milani et al., 2017), the majority of interventions examined in this study were associated with modest yet clinically significant reductions in systolic blood pressure (SBP), and nonsignificant decreases in diastolic blood pressure (DBP). For example, (Liu et al., 2023) reported an SBP reduction of 25.83 mmHg and a DBP reduction of 14.28 mmHg through a WeChat-based intervention. Similarly, (Upoyo et al., 2024) demonstrated a significant decrease in both SBP and DBP using WhatsApp based group education, highlighting the potential of group-based communication platforms in delivering peer-supported health promotion.

The success of these interventions may be attributed to their incorporation of behavior change techniques including reminders, feedback loops, and educational content tailored to patient needs. These approaches are consistent with Bandura's social cognitive theory, which suggests that self-efficacy and perceived behavioral control are essential for sustained behavior change. Indeed,

several studies (Karami et al., 2023; Upoyo et al., 2024) observed increases in motivation and self-efficacy among participants, indicating that digital interventions can positively influence psychological readiness and self-care agency.

Despite these promising results, not all interventions achieved significant BP reductions. For instance, (Hoppe et al., 2023) found that a telephone-based coaching intervention improved lifestyle behaviors but did not significantly affect BP outcomes. This suggests that while digital interventions can facilitate behavior change, additional factors such as intervention intensity, duration, content personalization, and user engagement may determine their efficacy.

Notably, SMS-based interventions, although more accessible and low-cost, tended to show more modest outcomes compared to app-based or multimedia platforms. This highlights a potential trade-off between accessibility and intervention richness. Platforms like WeChat and mHealth apps offer more interactive and engaging content, which may lead to better adherence and health outcomes.

In terms of lifestyle behavior changes, most interventions reported improvements in dietary habits, physical activity, and medication adherence. These findings are consistent with prior meta-analyses that support the integration of digital tools into chronic disease self-management (Yap et al., 2024). The role of family support and community-based group models (e.g., WhatsApp group discussions) also appeared to enhance compliance, particularly in culturally collectivist societies.

The review also revealed heterogeneity in study designs, sample sizes, and outcome measures, which limits direct comparisons across studies. Furthermore, the majority of studies had follow-up durations of only 3 to 6 months, which raises concerns about the long-term maintenance of behavior changes and blood pressure management.

Conclusion

This scoping review presents strong evidence that digital lifestyle interventions, facilitated through mHealth apps, messaging services, and telecommunication technologies, can effectively aid in managing hypertension by encouraging self-care, enhancing medication compliance, and lowering blood pressure. The majority of studies observed positive shifts in lifestyle habits and slight decreases in SBP and DBP, indicating that digital health strategies are both practical and effective. The integration of behaviorchange frameworks and the customization of content further boost the success of these interventions. As digital infrastructure continues to grow, particularly in low and middle income nations, digital tools offer a promising scalable method to supplement traditional hypertension management approaches.

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