A Smart mobile health intervention: improving hypertension self-management through whatsapp-delivered video education

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Abstract. Hypertension remains a leading global health challenge, particularly in low-resource settings where access to health education is limited. This study aimed to evaluate the effectiveness of a video-based educational intervention delivered via WhatsApp in improving self-care management behaviors among hypertensive patients in a rural Indonesian primary care setting. A pre-experimental one-group pre-test–post-test design was used involving 46 patients diagnosed with hypertension at a rural health center. Educational videos covering primary topics –such as hypertension, complications, medication adherence, healthy lifestyle modifications, and blood pressure monitoring– were delivered every three days over two weeks using the WhatsApp platform. Self-care behavior was measured before and after the intervention using the validated Hypertension Self-Management Behavior Questionnaire. Pre-test results revealed that 80.4% of participants had moderate self-care behavior. Following the intervention, 100% achieved good self-care behavior. Statistical analysis using the Wilcoxon signed-rank test revealed a significant improvement in mean scores from 111.67 to 150.48 ($p < 0.001$). Notable improvements were observed in self-regulation and interaction with healthcare providers. These findings support the use of mobile video-based education as a scalable, low-cost strategy to help improve the hypertension self-care in the underserved populations. Further research is highly recommended to explore the long-term effects and broader implementation.

1. Introduction

Hypertension, defined as sustained systolic ≥140 mmHg or diastolic ≥80 mmHg after five minutes of rest, remains a major global health issue. The WHO estimated 1.13 billion cases between 2015–2020, projected to reach 1.5 billion by 2025 [1]. It causes about 9.4 million deaths annually through complications such as stroke, coronary heart disease, and chronic

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kidney disease, placing a heavy burden on health systems, especially in low- and middle-income countries with limited specialized care [2].

Effective hypertension management requires consistent self-care, including medication adherence, healthy diet, exercise, and blood pressure monitoring [3]. However, adherence remains low due to limited literacy, motivation, and socioeconomic barriers. Strengthening self-care improves blood pressure control and reduces complications, emphasizing its key role in hypertension management

Health education is fundamental to improving patient autonomy and self-management. Traditional methods such as: lectures, pamphlets, and counseling—are effective but limited by cost, access, and engagement . Conversely, visual and video-based interventions enhance knowledge retention and behavior change through multisensory and clear messaging [4]. Tarchi et al. (2021) found that video-based materials significantly outperformed text-only interventions in improving understanding and adherence among patients with chronic diseases [5].

The rise of mobile health (mHealth) has transformed health education, with WhatsApp offering accessible, scalable audio-visual delivery. With over two billion users, its multimedia, group interaction, and secure communication make it ideal for remote health promotion [6]. WhatsApp-based video interventions have improved outcomes in noncommunicable diseases such as diabetes, asthma, and hypertension [7], but evidence on their effect on hypertension self-care in rural areas remains limited. Based on the above background, this study aims to examine whether a structured, WhatsApp-delivered video education intervention can improve self-care behaviors among hypertensive adults in a rural health center.

2. Methods

2.1 Study design and participants

This study used a pre-experimental one-group pre-test–post-test design to evaluate the effect of video-based educational interventions on self-management behaviors among hypertensive patients. Although lacking a control group, this design is commonly used in behavioral and public health research to assess short-term intervention effects. The study was conducted over three months (August–October 2024), coinciding with national hypertension control efforts and participant availability. Despite limitations such as maturation and testing effects, the design is suitable for preliminary evaluations in real-world primary care settings This study was applied at the rural health center, Kokap 1 Health Center, Kulonprogo Regency, Yogyakarta, Indonesia. The selection of the location was strategic, as the setting allowed for assessing the feasibility and acceptability of mobile-based health education among populations with limitation in health literacy and high smartphone penetration [8].

Participants were recruited using accidental sampling, a non-probability technique involving eligible individuals available during data collection. Inclusion criteria were adults aged 36–65 years diagnosed with hypertension, capable of using a smartphone, and enrolled in routine care at the health center. Exclusion criteria included cognitive impairment, severe sensory loss, or participation in other behavioral programs. The sample size was calculated using the Lemeshow formula for pre–post studies with continuous variables, targeting 80% power and a 5% significance level, resulting in a final sample of 46 participants after accounting for potential dropouts [9].

2.2 Intervention

The intervention consisted of five short (<5 minutes) video-based educational modules covering hypertension, its complications, blood pressure monitoring, medication adherence, diet, and lifestyle modification. Each video incorporated visual aids and narration in the local language to enhance understanding. The materials were disseminated via WhatsApp, chosen for its wide accessibility and convenience in multimedia sharing. Participants received one video every three days over a two-week period, enabling flexible and self-paced learning, particularly advantageous in rural or low-literacy settings.

2.3 Instrument

Self-care management was evaluated using the validated Hypertension Self-Management Behavior Questionnaire (HSMBQ), covering five domains: self-integration, self-regulation, interaction with healthcare professionals, blood pressure monitoring, and adherence to recommendations. Responses were scored on a Likert scale, with higher scores indicating better self-care performance. The instrument has demonstrated good reliability and validity among Southeast Asian populations [10].

2.4 Data collection and analysis

Data were analyzed using IBM SPSS Statistics version 26. Normality was tested with the Shapiro–Wilk test, suitable for small samples. Since post-test scores were not normally distributed, the Wilcoxon signed-rank test was used to compare pre- and post-intervention results. Statistical significance was set at $p < 0.05$. This analytical approach ensured methodological rigor for ordinal and non-normally distributed data.

3. Results and discussion

3.1 Demographic characteristics of participants

The final analysis included 46 participants who met the inclusion criteria and completed both pre- and post-test assessments. Table I presents the participants' demographic profile, including gender, age, education level, employment status, and hypertension duration. Most participants were female (91.3%), while only 8.7% were male, consistent with national data showing higher hypertension prevalence among older women. The largest age group was 56–65 years (60.9%), followed by 46–55 years (23.9%) and 36–45 years (15.2%), reflecting the known link between aging and increased blood pressure due to vascular stiffness and endothelial dysfunction.

Table 1. Demographic characteristics of respondents (N = 46)

No	Variable	Category	N (%)	p-value)
1	Gender	Male	4 (8.7)	0.302
		Female	42 (91.3)	
2	Age Group (years)	36–45	7 (15.2)	0.277
		46–55	11 (23.9)	
		56–65	28 (60.9)	
3	Educational Level	Elementary	17 (37.0)	0.051
		Junior High	14 (30.4)	
		High School	11 (23.9)	
		Bachelor	4 (8.7)	
4	Status	Employed	12 (26.1)	0.834

No	Variable	Category	N (%)	p-value)
		Unemployed	34 (73.9)	
5	Duration	<5 years	31 (67.4)	0.605
		>5 years	15 (32.6)	

In terms of educational levels, 17 participants (37.0%) had completed primary school, 14 (30.4%) junior high, 11 (23.9%) high school, and 4 (8.7%) bachelor's degree. The majority of respondents were unemployed (73.9%), with many identified as housewives. Only 12 participants (26.1%) were engaged in formal or informal employment. The duration of hypertension also varied: 31 (67.4%) had been diagnosed within the past five years, while the remaining 15 (32.6%) had lived with the condition for over five years. These patterns reflect common sociodemographic trends observed in rural populations with hypertension-related complaints, where lower education and employment levels are often linked to poorer health literacy and self-care adherence.

3.2 Pre and post-intervention self-care behavior

The baseline assessment utilizing the Hypertension Self-Management Behavior Questionnaire (HSMBQ) revealed that 37 participants (80.4%) demonstrated a moderate level of self-care behavior, while only 9 (19.6%) were classified in the "good" category. None of the respondents were categorized as having poor self-care behavior. These results suggest a general awareness of hypertension management but highlight gaps in consistent and effective behavioral execution.

By domain, self-integration was moderate in 63.0% of participants, while self-regulation was low in 60.9%. Interaction with healthcare professionals was notably weak, with 93.5% scoring poorly in this area. Blood pressure monitoring was moderate in 50% of participants, whereas treatment adherence was relatively high, with 80.4% showing good compliance (Table II). These results highlight the need for focused educational interventions that improve self-monitoring and adherence while fostering stronger patient–provider engagement.

Table 2. Pre-intervention self-management behavior level

Behavior Category	Frequency (N)
Moderate	37 (80.4)
Good	9 (19.6)
Total	**46 (100.0)**

Following delivery of educational video content through WhatsApp over two weeks, a significant improvement in self-care behavior was evaluated among participants. Post-test results showed that all 46 participants (100%) reached the "good" category in self-management behavior, indicating positive change following the intervention (Table III).

Table 3. Post-intervention self-management behavior level

Behavior Category	Frequency (N)
Moderate	0 (0.0)
Good	46 (100.0)
Total	**46 (100.0)**

3.3 Statistical analysis

The Shapiro-Wilk test was used to examine the normality of pre-test and post-test score distributions. Pre-test scores were normally distributed ($p = 0.240$), meanwhile the post-test deviated significantly from normality ($p = 0.012$). Given the non-normal distribution of the

post-intervention scores, the Wilcoxon signed-rank test – a non-parametric alternative to the paired t-test, was utilized for further analysis (Table IV).

Table 4. Shapiro-wilk normality test results

Test Variable	Shapiro-Wilk Sig.	Distribution Status
Pre-test	0.24	Normally distributed
Post-test	0.012	Not normally distributed

The results demonstrate a statistically significant increase in self-care behavior after the intervention. The mean pre-test score was 111.67 (SD = 12.019), while mean post-test score rose to 150.48 (SD = 5.977), as shown in Fig. 1. The Wilcoxon test found a p-value of <0.001, indicating that the change was highly significant (Table V).

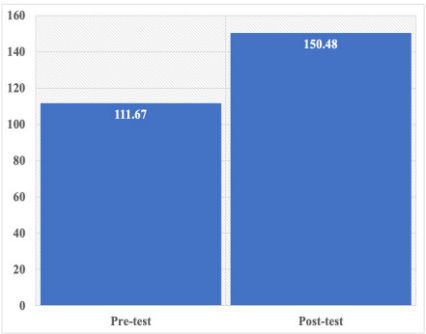

Fig. 1. Comparison of mean pre-test and post-test scores on self-care behavior

The findings are consistent with prior research underlining the effectiveness of video-based health or patient education in improving self-management practices, particularly when it is delivered through accessible and user-friendly platforms like WhatsApp.

Table 5. Wilcoxon signed-rank test of the study

Measurement	N	Mean	SD	Sig. (2-tailed)
Pre-test	46	111.67	12.019	< 0.001
Post-test	46	150.48	5.977	

3.4 Discussion

This study demonstrates a significant improvement in self-care management behaviors among hypertensive patients following a structured video-based educational intervention delivered via WhatsApp. The findings contribute to the growing evidence supporting the role of digital health tools in managing chronic diseases, notably in low-resource settings.

3.5 Principal Findings

The study's main finding was a significant improvement in self-care behavior scores, as measured by the HSMBQ, following exposure to educational videos. DiFilippo et al. (2015) found that mHealth interventions, including videos, improved chronic disease self-management [11], while Ashraf et al. (2023) reported that tailored audiovisual education enhanced adherence and lifestyle modification among hypertensive patients [12] .
Subdomain analysis of the HSMBQ showed that pre-intervention weaknesses were most

evident in self-regulation and interaction with healthcare professionals. These domains improved the most after the intervention, suggesting that audiovisual content functions not only as an information source but also as a motivator promoting accountability and proactive health behaviors. Prior studies support this, showing that narrative or animated education enhances emotional engagement, recall, and readiness to act [13]. The improvement in patient–provider interaction may indicate greater patient empowerment, as a previous study found that culturally appropriate, easy-to-understand education encourages patients to communicate with healthcare providers and take ownership of their care [14].

The successful implementation of this intervention in a rural Indonesian primary care setting demonstrates its scalability. WhatsApp was chosen for its widespread use and reliability in low-bandwidth areas. Similar study has shown that messaging platforms are effective and acceptable tools for health education. This study also supports non-traditional education methods for low-educated populations. Despite over one-third of participants having only elementary education, they showed behavioral improvement, highlighting that linguistically and culturally tailored videos can overcome literacy barriers. As this prior study noted, visual learning reduces cognitive load and enhances behavioral intention among patients with limited health literacy [15].

3.6 Strengths and limitations

This study offers several strengths. It provides real-world, context-specific evidence of low-cost, scalable intervention. Unlike many technology-based studies conducted in urban or tertiary care settings, this research was situated in a primary care facility serving underserved populations. However, this study is not without limitations. The pre-experimental design lacks a control group, restricting causal inference. The relatively short follow-up period precludes assessment of long-term behavior sustainability. In addition, reliance on self-reported measures may introduce response bias, particularly social desirability effects. However, the use of structured and validated tools partially mitigates this concern. Moreover, participant exposure to other sources of hypertension-related information during the intervention period could not be fully controlled. Future studies should consider randomized controlled designs with longer follow-up periods and explore integration of video-based education with face-to-face counseling or telemedicine platforms for enhanced impact.

4 Conclusion

The WhatsApp-delivered video intervention significantly improved self-care management behaviors in hypertensive patients. This study supports mobile video education as an accessible and effective health promotion strategy for low-resource settings. Broader adoption of such interventions could enhance hypertension control and patient empowerment across rural and underserved populations.

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