International Seminar and Workshop on Public Health Action
https://swopha.dinus.ac.id

Comparison of Face-to-Face and Mobile Health Messaging Interventions to Enhance Hypertension Knowledge among Cadres in Ngabean dan Trisobo Village, Kendal Regency

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Article Info

Article History
Submitted: 19-08-2025
Revised: 14-10-2025
Accepted: 14-10-2025

Keywords:
Hypertension,
Health cadres,
Knowledge,
Attitude,
Health education

Abstract

Hypertension remains the leading risk factor for cardiovascular morbidity and mortality. However, knowledge gaps among the community hinder prevention, early detection, and treatment adherence. Community health cadres play a crucial role as frontline actors in health promotion, screening, and referral. This study aimed to compare the effectiveness of online and face-to-face health education interventions in improving knowledge and attitudes toward hypertension among community health cadres. A pre-experimental one-group pretest–posttest design was conducted from November 2024 to January 2025 in the working area of Boja II Primary Health Care Center, Kendal Regency, Central Java. Thirty-one cadres participated (20 in the online group and 11 in the face-to-face group). The online intervention was delivered via a WhatsApp group over 3 days using 12 educational flyers, while the face-to-face intervention involved a 90-minute session with presentations and discussions. Knowledge and attitudes regarding hypertension were measured using a validated questionnaire (Hypertension Knowledge-Level Scale). Data were analyzed using Wilcoxon signed-rank and Mann–Whitney U tests. In the online group, knowledge scores increased from 11.2 ± 2.1 to 16.5 ± 1.4 and attitude scores from 12.3 ± 1.8 to 16.8 ± 1.5 ($p < 0.001$). In the face-to-face group, knowledge increased from 11.5 ± 2.3 to 17.2 ± 1.1 ($p = 0.003$) and attitudes from 12.6 ± 1.7 to 17.5 ± 1.2 ($p = 0.004$). Posttest comparisons showed significantly higher knowledge ($U = 64.5$, $p = 0.041$) and attitude ($U = 66.0$, $p = 0.048$) scores in the face-to-face group than in the online group. Both online and face-to-face educational interventions significantly improved knowledge and attitudes toward hypertension among health cadres. However, face-to-face education demonstrated superior effectiveness. Strengthening capacity-building programs for cadres through interactive learning may enhance community-based hypertension prevention and control.

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eISSN 3063-2439

Introduction

Hypertension is one of the leading risk factors for cardiovascular morbidity and mortality worldwide. According to World Health Organization, approximately 1.28 billion adults aged 30–79 years are living with hypertension globally, and two-thirds of them reside in low- and middle-income countries (WHO, 2023b). Hypertension significantly contributes to premature deaths due to heart disease, stroke, and kidney failure, making it a critical public health concern (Zhou, B., Perel, P., Mensah, 2021). The disease burden is projected to increase in the coming decades if early detection and control strategies are not strengthened. Although hypertension is largely preventable and manageable, many people remain undiagnosed and untreated. Global data show that only 42% of adults with hypertension are diagnosed, 34% receive treatment, and merely 21% have their blood pressure under control (WHO, 2023b). The low level of awareness and poor control of hypertension is strongly associated with limited health literacy and lack of community-based interventions (Geldsetzer et al., 2019).

In Indonesia, hypertension is also a growing challenge. Data from Kementerian Kesehatan Republik Indonesia show that the prevalence of hypertension among adults is 34.1%, with more than half of the patients unaware of their condition (Kementerian Kesehatan Republik Indonesia, 2023). The World Health Organization notes that this prevalence is among the highest in Southeast Asia (WHO, 2023b). The rise in hypertension cases is closely linked to changes in diet, sedentary behavior, aging, and urbanization. Despite national programs, early detection and control remain suboptimal, particularly in rural and semi-urban communities. A major barrier to hypertension prevention and control is the knowledge gap among community members. Low levels of knowledge regarding risk factors, symptoms, and management can delay diagnosis, reduce treatment adherence, and increase complications (Erkoc et al., 2012). Studies have demonstrated that improved health knowledge can lead to better preventive behaviors, treatment adherence, and lifestyle modifications, which are key to blood pressure control (Michie et al., 2017).

Community health workers or health cadres play a central role in bridging this knowledge gap, particularly in low-resource settings. They serve as frontline actors in health promotion, early screening, and referral (Yuniar, 2025). In Indonesia, cadres are often trusted members of the community, making them effective agents of behavior change. Empowering these cadres with accurate knowledge and skills is therefore essential for strengthening community-based hypertension control programs (Saputri et al., 2025). Health education is a well-recognized strategy to increase knowledge and improve attitudes toward hypertension prevention and control. Face-to-face education has traditionally been the primary method (Kosasih et al., 2019). However, this method requires more resources and can be limited by time, location, and logistics.

In recent years, digital health interventions have emerged as an alternative to conventional education methods. The use of mobile messaging applications, including WhatsApp, has been shown to be effective in delivering health education at scale, especially in remote areas (Wulandari & Sifai, 2025). Online education can provide flexible access to information, enable peer learning, and maintain engagement over time. However, some studies suggest that the impact of online learning on knowledge and attitude may differ from traditional face-to-face education. Given the increasing burden of hypertension and the critical role of cadres in community health promotion, evaluating different methods of health education is necessary. Comparing online and face-to-face interventions can help identify the most effective and sustainable approach to improve knowledge and attitudes toward hypertension. This evidence is essential for guiding public health strategies aimed at strengthening community-based hypertension prevention and control in Indonesia and similar settings.

Kendal Regency, located in Central Java Province, is one of the regions experiencing an increasing trend in non-communicable diseases, particularly hypertension. According to the Kendal District Health Profile 2023, the number of individuals with hypertension who received standard health services rose from 244,921 in 2022 to 262,038 in 2023 (Dinas Kesehatan Kabupaten Kendal, 2023). This reflects not only improved access to health services but also a growing disease burden. The demographic characteristics of Kendal show a varied geographical landscape from coastal to hilly areas and a relatively high proportion of older adults, which contributes to the increasing risk of chronic diseases. Boja II, as one of the primary health care areas in Kendal, was therefore selected as the research site because it represents a setting with a significant hypertension burden and offers a relevant context for implementing and evaluating health education interventions among community health cadres.

Methods

This study employed a pre-experimental design with a one-group pretest–posttest approach. The research compared the outcomes of two intervention groups, one receiving face-to-face education and the other receiving online education in improving knowledge and attitudes toward hypertension among community health cadres. The study was conducted from November 2024 to January 2025 in the working area of the Puskesmas Boja II, Boja Subdistrict, Kendal Regency, Central Java. The selection of this area was based on the 2023 Kendal District Health Profile, which reported that the number of people with hypertension receiving standard health services increased from 244,921 in 2022 to 262,038 in 2023 (Dinas Kesehatan Kabupaten Kendal, 2023).

The study population consisted of community health cadres working in the service area of Puskesmas Boja II. The sample included two groups: cadres from Ngabean Village (online intervention group) and cadres from Trisobo Village (face-to-face intervention group). The site selection was based on internal data from Puskesmas Boja II, which reported 1,828 hypertension cases out of a total population of 6,020 in these areas.

A total sampling technique was used. The sample consisted of 20 cadres from Ngabean and 11 cadres from Trisobo. Inclusion criteria were: (1) active health cadres in the selected area, (2) willingness to participate, and (3) availability throughout the intervention period. Exclusion criteria included cadres who withdrew before the completion of the intervention.

The intervention aimed to strengthen the capacity of community health cadres in supporting local health workers in delivering health promotion messages to the community. The intervention was implemented in two formats:

Online intervention: Conducted through a WhatsApp group with 20 health cadres and one midwife from the local Village Health Post (Pos Kesehatan Desa/PKD) acting as a facilitator. Educational content, discussions, and sharing sessions on hypertension were delivered over three days. A total of 12 educational flyers (four per day) were developed by the researchers. The flyers covered topics such as: definition of hypertension, physical activity, salt and caffeine intake, causes of hypertension, and the role of healthcare providers, the community, and families in hypertension control.

Face-to-face intervention: Conducted with 11 cadres from Trisobo Village. The content was identical to the online intervention, but the flyers were presented as PowerPoint slides. The session included presentations, discussions, and sharing, and lasted approximately 90 minutes.

The research instruments consisted of validated questionnaires. For the online group, data were collected using Google Forms, while for the face-to-face group, paper based questionnaires were used. Data were collected before and after the intervention (pretest–posttest) in both groups. The variables in this study were knowledge and attitudes toward hypertension, measured using the Hypertension Knowledge-Level Scale (Erkoc et al., 2012). The knowledge questionnaire consisted of 19 true/false questions. The attitude questionnaire consisted of 19 agree/disagree items.

Data were analyzed using the Wilcoxon test to compare knowledge and attitude scores between the online and face-to-face intervention groups. The same test was also used to assess pre–post differences within each group. A significance level of $p < 0.05$ was applied.

Results

The results show that the mean knowledge score in the online group increased from 11.2 ± 2.1 in the pretest to 16.5 ± 1.4 in the posttest. Similarly, the face-to-face group experienced an increase in the mean knowledge score from 11.5 ± 2.3 to 17.2 ± 1.1 For attitude scores, the online group improved from 12.3 ± 1.8 at pretest to 16.8 ± 1.5 at posttest. Meanwhile, the face-to-face group also showed an increase from 12.6 ± 1.7 to 17.5 ± 1.2.category.

Table 1. Distribution of Knowledge and Attitude Scores Among Health Cadres (n = 31)

Variables	Group	Pretest (Mean±SD)	Posttest (Mean±SD)
Knowledge Score (0-19)	Online (n=20)	11.2 ± 2.1	16.5±1.4
	Face to-face (n=11)	11.5 ± 2.3	17.2 ± 1.1
Attitude score (0–19)	Online (n=20)	12.3 ± 1.8	16.8 ± 1.5
	Face to-face (n=11)	12.6 ± 1.7	17.5 ± 1.2

Source: Processed Primary Data (2025)

Table 2. Pretest and Posttest Scores Within Each Group

Variables	*Group*	*Z Value*	p-value	Interpretation
Knowledge	Online (n=20)	Z = -3.92	< 0.001	Significant increase pre–post
	Face to-face (n=11)	Z = -3.01	0.003	Significant increase pre–post
Attitude	Online (n=20)	Z = -3.84	< 0.001	Significant increase pre–post
	Face to-face (n=11)	Z = -2.93	0.004	Significant increase pre–post

***Wilcoxon (p <0 .05).

Based on the data in table 2. The Wilcoxon signed-rank test was performed to compare pretest and posttest scores within each group. In the online group, there was a statistically significant increase in both knowledge (Z = -3.92, p < 0.001) and attitude scores (Z = -3.84, p < 0.001) after the intervention. Similarly, the face-to-face group showed a significant improvement in knowledge (Z = -3.01, p = 0.003) and attitude (Z = -2.93, p = 0.004).

Table 3. Posttest Scores (Between Group)

Variables	*Group*	*U Value*	p-value	Interpretation
Knowledge Posttest	Online vs Face to-face	U = 64.5	0.041	Face-to-face group significantly higher
Attitude Posttest	Online vs Face to-face	U = 66.0	0.048	Face-to-face group significantly higher

***Mann–Whitney U test (p <0 .05).

The Mann–Whitney U test was used to compare posttest scores between groups. The face-to-face group demonstrated significantly higher posttest knowledge scores ($U = 64.5$, $p = 0.041$) and attitude scores ($U = 66.0$, $p = 0.048$) compared to the online group.

Discussion

This study demonstrated that both online and face-to-face health education interventions significantly improved knowledge and attitudes toward hypertension among community health cadres in Kendal Regency. The pretest–posttest results showed a marked increase in mean scores for both variables in each group, with statistically significant differences. These findings support the effectiveness of structured educational interventions in strengthening community health cadres' capacity as health promoters. Similar results have been reported in previous studies, indicating that health education is a key strategy in increasing community health literacy and improving non-communicable disease control (WHO, 2023a).

The improvement observed in the online group demonstrates the potential of digital platforms to deliver impactful health education. In this study, the use of WhatsApp allowed for flexible access to information, accommodating the schedules of health cadres who often juggle multiple responsibilities. These findings are consistent with prior studies showing that mobile-based health education interventions can significantly improve knowledge and attitudes regarding hypertension and other chronic diseases (Upoyo et al., 2024). Digital learning is especially relevant in areas where physical training may be constrained by logistics or budget limitations.

The face-to-face group, however, exhibited a significantly greater increase in both knowledge and attitude scores compared to the online group. This may be attributed to the interactive and structured learning environment in the face-to-face sessions, which enabled real-time discussion, immediate clarification of misconceptions, and peer engagement. Previous research has shown that interactive health education formats enhance cognitive processing and information retention more effectively than passive learning approaches (Enoch et al., 2022). This aligns with the findings in this study, where the face-to-face format achieved higher posttest scores.

The structured 90-minute session used in the face-to-face intervention allowed for more focused engagement compared to the asynchronous nature of the online intervention. Evidence suggests that structured, time-bound learning experiences tend to produce higher educational impact due to increased learner concentration and reinforcement through discussion (Ichikura et al., 2024) . Although online interventions are valuable, their effectiveness may be limited without interactive components such as live discussions or quizzes.

Despite the lower scores compared to the face-to-face group, the online intervention remains a strategic and scalable approach, particularly in rural or resource-limited settings like Kendal. Mobile health interventions have been successfully implemented in various community health programs in Indonesia, showing improved knowledge and behavior change (Br Karo Sekali et al., 2022). Online delivery also reduces costs and allows for broader reach, making it suitable for large-scale training of health cadres without requiring extensive logistical support (Ahmed et al., 2025).

The study setting in Kendal Regency, particularly in the working area of Puskesmas Boja II, provides important contextual insights. According to local health data, hypertension cases have been steadily increasing, from 244,921 in 2022 to 262,038 in 2023 (Dinas Kesehatan Kabupaten Kendal, 2023). This trend underscores the urgent need for community-based prevention strategies. Strengthening the role of community health cadres is critical, as they serve as trusted agents who can bridge the gap between health facilities and the community, particularly in promoting lifestyle changes and early screening.

Community health cadres in Kendal, like many other regions in Indonesia, are integral to primary health care delivery. They are often the first point of contact for community members seeking health information, especially in rural areas. Previous studies in Central Java have emphasized that trained cadres can significantly increase the coverage and quality of hypertension screening and health promotion activities (Sadewa, 2023). By enhancing their knowledge and attitudes, cadres can play a more proactive role in reducing the burden of hypertension in Kendal.

The results of this study also align with Indonesia's national strategy for non-communicable disease control, which emphasizes the empowerment of community-based health workers. Cadres are expected to conduct early detection, support behavioral change, and facilitate referrals (Kementrian Kesehatan RI, 2020). Education and training are therefore essential components in preparing cadres to effectively fulfill these responsibilities.

Looking forward, blended learning models may provide an optimal solution by combining the strengths of both online and face-to-face approaches. This hybrid strategy has been proven effective in health education, increasing engagement, retention, and flexibility (Mulenga & Shilongo, 2024).

Incorporating interactive features in digital platforms could help improve the impact of online training to be comparable with face-to-face sessions (Fitzpatrick, 2023).

In summary, this study confirms that both online and face-to-face educational interventions can effectively improve hypertension-related knowledge and attitudes among community health cadres in Kendal Regency. Face-to-face education demonstrated superior effectiveness, but online delivery offers scalability and accessibility. Integrating both methods could strengthen cadre capacity building and support the implementation of hypertension prevention strategies at the community level. Considering the rising hypertension prevalence in Kendal, empowering cadres through continuous education is a vital step in achieving better public health outcomes.

This study has several limitations that should be acknowledged. First, the use of a pre-experimental one-group pretest–posttest design without randomization or a control group limits the ability to infer causality and may introduce potential biases. Second, the small sample size of 31 cadres and the use of a total sampling method from only two villages may affect the generalizability of the findings to other areas. Third, the short duration of the intervention and follow-up may not fully capture long-term knowledge retention or behavior change among cadres. Fourth, the online intervention relied on passive information delivery through WhatsApp, which may have limited engagement compared to interactive platforms. Lastly, self-reported questionnaires may be subject to response bias, as participants may provide socially desirable answers. Future studies should consider randomized controlled designs, larger and more diverse samples, longer follow-up periods, and interactive digital tools to strengthen the evidence base.

Conclusion

This study demonstrated that both online and face-to-face health education interventions significantly improved knowledge and attitudes toward hypertension among community health cadres in Kendal Regency. The face-to-face intervention showed a greater increase in posttest scores compared to the online intervention, indicating its superior effectiveness in enhancing understanding and positive attitudes. However, the online intervention also proved beneficial as a flexible and accessible learning medium. Given the increasing prevalence of hypertension in Kendal, strengthening the capacity of cadres through effective educational strategies is crucial to support community-based hypertension prevention and control.

Based on the findings of this study, it is recommended that health education programs on hypertension for community health cadres be implemented more widely using both face-to-face and online methods. However, because face-to-face interventions produced significantly higher posttest knowledge and attitude scores, this method can be prioritized for cadres in areas where in-person sessions are feasible. Meanwhile, the online method can be used as a complementary strategy, especially in regions with geographical or time constraints. Furthermore, the development of more interactive online learning modules, such as videos, quizzes, and case-based discussions, may help enhance engagement and learning outcomes. Continuous training and periodic refreshers should also be provided to maintain and strengthen the knowledge and attitudes gained. Finally, collaboration with local health offices and community organizations is essential to ensure program sustainability and broader reach.

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