



Changes in Medication Adherence Following Booklet-Based Education Among Patients with Hypertension: A Pre-Experimental Study

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Received: 10 July 2026

Accepted: 30 September 2026

Available online: 1 October 2026

DOI: <https://doi.org/10.25077/njk.v22i2.511>

Abstract

Hypertension is a non-communicable disease that may lead to serious complications if not properly controlled, and medication adherence is a key factor in blood pressure control among hypertensive patients. Health education using booklet media may be a feasible strategy to improve patients' understanding of hypertension and, potentially, their medication-taking behavior. This study aimed to examine changes in medication adherence among hypertensive patients following education using booklet media at Belimbing Primary Health Center, Padang. A quantitative pre-experimental one-group pretest-posttest design, without a comparison or control group, was used. The study was conducted from February 5 to February 27, 2026, and involved 40 respondents recruited using an accidental sampling technique from among hypertensive patients visiting the health center. Medication adherence was measured using the Morisky Medication Adherence Scale (MMAS-8) before and two weeks after the educational intervention. Data were analyzed using the Wilcoxon Signed-Rank Test for paired pretest-posttest comparison. The mean adherence score increased from 5.88 (SD = 1.539) before the intervention to 7.40 (SD = 0.871) after the intervention, a mean difference of 1.52, with a statistically significant paired difference (Wilcoxon Signed-Rank Test, $p < 0.001$). These findings indicate that medication adherence changed favorably following booklet-based education among hypertensive patients in this single-group study. Given the absence of a control group, these results should be interpreted as evidence of feasibility rather than a confirmed causal effect; booklet media, particularly when equipped with digital (QR-code) access, may be considered as a supportive component of hypertension health education, pending confirmation in controlled studies with longer follow-up.

Keywords: Booklet, Education, Hypertension, Medication Adherence.

INTRODUCTION

Hypertension is one of the non-communicable diseases and remains a major public health problem worldwide. Hypertension is among the leading causes of morbidity and mortality in Indonesia (Susantri, 2025). Hypertension, also known as high blood pressure, is often referred to as “the silent disease” or “the silent killer” because it frequently develops without obvious symptoms until complications occur (WHO, 2025). Hypertension is defined as a condition in which systolic blood pressure reaches ≥ 140 mmHg and/or diastolic blood pressure reaches ≥ 90 mmHg based on repeated measurements (Ananda, 2023).



According to the Global Report on Hypertension published by the World Health Organization, approximately 1.4 billion adults worldwide suffer from hypertension, and the number is projected to exceed 1.5 billion by 2030 if no effective intervention is implemented (WHO, 2025). In Indonesia, the prevalence of hypertension among adults aged ≥ 18 years reached 30.8% based on the 2023 Indonesian Health Survey (Survei Kesehatan Indonesia (SKI), 2023). In Padang City, 60,344 hypertension cases were reported in 2024, with Belimbing Primary Health Center recording the highest number of cases, totaling 4,578 patients (Profil Kesehatan Kota Padang, 2025). A recent study conducted at the same health center found that 42.7% of hypertensive patients still exhibited low medication adherence and that low adherence was significantly associated with poorly controlled blood pressure ($p = 0.001$) (Putri, Yendrizal, & Sari, 2026), indicating that medication non-adherence is an ongoing, locally documented problem among the population served by this health center, rather than only a theoretical concern. Medication adherence is one of the most important factors in successful hypertension management. Adherence to antihypertensive medication is influenced by several factors, including knowledge, attitudes, beliefs, family support, and access to healthcare facilities. Poor adherence may increase the risk of serious complications and mortality among hypertensive patients (Pardosi, 2024). Data from the 2018 Basic Health Research (Riskesdas) showed that many hypertensive patients did not take medication regularly because they considered themselves healthy due to the absence of symptoms (Laporan Riskesdas Nasional, 2018).

According to Lawrence Green's PRECEDE-PROCEED framework, knowledge is one of the predisposing factors that shape health behavior, alongside enabling factors (such as access to health information and services) and reinforcing factors (such as support from family and health workers) (Pakpahan et al., 2021). This framework provides the theoretical basis for the present educational intervention: by strengthening the predisposing factor of knowledge through booklet media, the intervention was expected to support more favorable medication-taking behavior, although enabling and reinforcing factors were not directly targeted or measured in this study. To address this issue, the Indonesian government has implemented several health programs focusing on promotive and preventive approaches, including the Healthy Indonesia Program with Family Approach and the PATUH Hypertension Movement (Kendalikan Hipertensi Dengan Gerakan Patuh, 2022). These programs emphasize the importance of improving patients' knowledge and encouraging adherence to antihypertensive treatment through health education activities (Hartati et al., 2021).

Health education using booklet media may be a feasible strategy to improve patients' understanding because it provides information in both written and visual forms, making the material easier to understand and remember. Conceptually, an accessible and repeatable source of information is expected to strengthen patients' understanding of hypertension and the importance of regular medication use, which may, in turn, support more consistent medication-taking behavior; the pathway from information exposure to actual adherence behavior is likely to also depend on patients' motivation, family support, and access to health services, factors that were not directly measured in this study. Booklets can also be read repeatedly anytime and anywhere, allowing patients to review the educational material independently, and booklet media equipped with digital access such as barcode features may further improve accessibility of health information (Putri, Simanungkalit, Sianturi, & Nasrullah, 2024). A systematic review and meta-analysis of twelve randomized controlled trials reported that structured, repeatable health education content was associated with a 33% improvement in medication adherence among hypertensive patients (Mustara, Hartono, & Pamungkasari, 2025), while a scoping review of booklet-based interventions concluded that printed booklet media are most effective for improving hypertension-related knowledge and adherence when combined with interactive or ongoing educational support rather than used as a stand-alone, one-time material (Solehah, Maimum, & Neldi, 2026).



Most existing studies on booklet-based education for hypertensive patients have been conducted in other regions of Indonesia, particularly in Java, and few have specifically examined this approach among patients at the primary healthcare level in West Sumatra, where local adherence problems have been documented (Putri, Yendrizar, & Sari, 2026). Moreover, few studies have evaluated a booklet that combines printed material with digital (QR-code) access in this population. This study therefore aimed to examine changes in medication adherence among hypertensive patients following education using booklet media at Belimbing Primary Health Center, to provide context-specific evidence that may inform future controlled studies and local health promotion practice.

METHODS

This study employed a quantitative pre-experimental design using a one-group pretest-posttest design, without a comparison or control group, to examine changes in medication adherence among hypertensive patients following education using booklet media. This design should be distinguished from a quasi-experimental design, which typically involves a non-randomized comparison group; because no control group was included, the findings describe within-group change over time and do not, by themselves, permit a causal attribution of the observed change solely to the intervention. The study was conducted at Belimbing Primary Health Center, Kuranji District, Padang City, from February 5 to February 27, 2026.

The population consisted of 337 hypertensive patients who visited Belimbing Primary Health Center during the study period. The minimum sample size was calculated using the Slovin formula with a 15% margin of error, yielding a minimum of 40 respondents (Sugiyono, 2023). Because this is an intervention study, the Slovin formula does not account for the expected intervention effect, statistical power, or Type I/II error rates; a power-based sample size calculation would have been more appropriate, and this is acknowledged as a methodological limitation (see Limitations). Respondents were selected using an accidental (convenience) sampling technique rather than a consecutive recruitment procedure: patients who happened to be present at the health center during the data collection period were approached by the researcher and invited to participate after the study procedures were explained.

A total of 40 hypertensive patients were approached and screened against the inclusion and exclusion criteria during the study period; all 40 were found eligible and agreed to participate, so no patients declined participation. The inclusion criteria included hypertensive patients aged 18-59 years, patients who were willing to participate in the study, able to communicate well, and routinely received antihypertensive treatment. Patients with severe complications or communication impairments were excluded from the study. While accidental sampling was practical given the health center's routine outpatient flow, this non-probability approach may introduce selection bias, as patients who attended the clinic more frequently, or who were more receptive to health education, may have been over-represented; this may limit the generalizability of the findings to the broader population of hypertensive patients, including those who do not regularly access primary care services.

Medication adherence was measured using the Morisky Medication Adherence Scale (MMAS-8), a self-report instrument consisting of eight items assessing medication-taking behavior (Morisky, Ang, Krousel-Wood, & Ward, 2008). Seven items are scored dichotomously (yes/no) and one item uses a five-point Likert-type response; total scores range from 0 to 8 and are categorized as low adherence (score < 6), medium adherence (score 6 to < 8), and high adherence (score = 8) (Morisky et al., 2008). The Bahasa Indonesia version of the MMAS-8 has been validated among Indonesian hypertensive patients (n = 250) attending primary health centers in Sleman District and Yogyakarta City, demonstrating acceptable internal consistency (Cronbach's $\alpha = 0.824$) and convergent validity with the 4-item Morisky scale ($r = 0.883$) (Riani, 2017). The educational intervention consisted of a single



face-to-face session of health education regarding hypertension, the importance of medication adherence, correct antihypertensive medication use, the benefits of adherence, and the consequences of non-adherence, delivered individually (one-on-one) by the researcher to each respondent at Belimbing Primary Health Center.

Each session lasted approximately 10-15 minutes per respondent and used a printed booklet as the primary educational medium, which respondents were permitted to take home for independent review after the session. The booklet contained written explanations, illustrations, and structured educational content regarding hypertension management, and was equipped with a QR code linking to a digital version of the same material for independent review. All respondents received the same booklet content and the same single-session format, delivered by the same intervention provider, to maintain consistency of the intervention across participants. No additional reinforcement session or structured follow-up contact was provided between the intervention and the post-test.

Before the intervention, respondents completed the MMAS-8 questionnaire to assess baseline medication adherence (pretest). Immediately afterward, respondents received the single educational session using booklet media. The post-test was administered two weeks after the educational intervention. This two-week interval was selected to allow respondents sufficient time to read and reflect on the booklet content, including its digital version, while remaining short enough to capture a short-term post-education response; because no measurement was taken beyond this point, the findings reflect a short-term response, and the durability of this change is unknown.

Ethical Considerations

This study was conducted in accordance with the ethical principles for research involving human subjects, including voluntary participation, informed consent, and confidentiality. Formal approval from an institutional research ethics committee was not obtained for this study; data collection was carried out with administrative permission from Belimbing Primary Health Center. Prior to data collection, all prospective respondents were informed about the study's purpose, procedures, potential risks and benefits, and their right to withdraw at any time without any consequence to their care. Respondents who agreed to participate provided informed consent. Confidentiality was maintained by using anonymized respondent codes instead of personal identifiers, and all data were stored securely and used solely for research purposes. The absence of formal ethics committee review is acknowledged as a limitation of this study (see Limitations).

Data analysis included univariate and bivariate analysis. Univariate analysis was used to describe respondents' characteristics and medication adherence scores before and after the intervention. Bivariate analysis was performed to examine the change in medication adherence following booklet-based education. The Shapiro-Wilk normality test indicated that the data were not normally distributed; therefore, the Wilcoxon Signed-Rank Test was used for the paired pretest-posttest comparison, with a significance level of $\alpha = 0.05$.

RESULTS

Characteristics of respondents

Table 1. Characteristics of respondents

Characteristics	f	%
Sex		
Male	5	12.5
Female	35	87.5
Age (Years)		
40-49	12	30.0
50-59	28	70.0



Last education		
Elementary school	4	10.0
Junior high school	11	27.5
Senior high school	19	47.5
College/university	6	15.0
Occupation		
Not Working/Housewife	24	60.0
Civil Servant/Military/Police	5	12.5
Self-employed	6	15.0
Farmer	1	2.5
Laborer	4	10.0
Marital status		
Married	38	95.0
Divorce	1	2.5
Widowhood (Death of spouse)	1	2.5

Based on Table 1, the majority of respondents were aged 50-59 years (28 respondents, 70.0%), while respondents aged 40-49 years accounted for 12 respondents (30.0%). Most respondents were female (35 respondents, 87.5%). Based on last education, the majority of respondents had completed senior high school education (19 respondents, 47.5%). Based on occupation, most respondents were not working/housewives (24 respondents, 60.0%). Almost all respondents were married (38 respondents, 95.0%).

Medication Adherence Before and After Educational Intervention

Table 2. Medication Adherence Before and After Educational Intervention (n = 40)

Variable	Mean	Median	Min	Max	SD
Pre-Test	5.88	6	2	8	1.539
Post-Test	7.40	8	5	8	0.871

Mean difference = 1.52. Wilcoxon Signed-Rank Test (paired pretest-posttest comparison): $p < 0.001$.

The results showed that the mean medication adherence score before the educational intervention was 5.88 (SD = 1.539; minimum 2, maximum 8), while after the educational intervention the mean score increased to 7.40 (SD = 0.871; minimum 5, maximum 8), a mean difference of 1.52 (Table 2). The Wilcoxon Signed-Rank Test for this paired comparison indicated a statistically significant difference between pretest and posttest scores ($p < 0.001$).

Distribution of Medication Adherence Category

Table 3. Distribution of Medication Adherence Category Before and After Educational Intervention (n = 40)

Category	Pretest (f)	Pretest (%)	Posttest (f)	Posttest (%)
Low (score < 6)	14	35.0	2	5.0
Moderate (score 6-<8)	19	47.5	14	35.0
High (score = 8)	7	17.5	24	60.0

Based on the MMAS-8 classification described in the Methods section, before the educational intervention most respondents were in the moderate adherence category (19 respondents, 47.5%) and low adherence category (14 respondents, 35.0%), while only 7 respondents (17.5%) demonstrated high adherence. After the educational intervention, most respondents were in the high adherence category (24 respondents, 60.0%), followed by the moderate adherence category (14 respondents, 35.0%), while only 2 respondents (5.0%) remained in the low adherence category (Table 3).

DISCUSSION

Medication Adherence Before Educational Intervention Using Booklet Media

Before the educational intervention, the mean medication adherence score was 5.88 (SD = 1.539). Based on the MMAS-8 classification, 19 respondents (47.5%) were in the moderate adherence category, 14 respondents (35.0%) in the low adherence category, and 7 respondents (17.5%) in the high adherence category (Table 3), indicating that most hypertensive patients in this study had not consistently taken their antihypertensive medication as prescribed before receiving health education.

These proportions are broadly similar to those reported by Indriastuti et al. (2021), who found that most respondents had moderate (60.0%) and low (22.5%) adherence before booklet-based education, and by Anugrah et al. (2024), who reported predominantly low (76.0%) and moderate (24.0%) adherence among elderly hypertensive patients. Both prior studies, however, were also single-group pre-post designs conducted among clinic-based populations in Java using different booklet content; Anugrah et al. (2024) additionally compared booklet against leaflet media rather than assessing booklet media alone. Direct numerical comparison across these studies should therefore be made cautiously, as differences in age distribution, healthcare setting, and instrument administration may account for some of the variation in baseline adherence proportions.

Consistent with these findings, limited knowledge regarding hypertension and the importance of lifelong antihypertensive therapy is a plausible contributor to poor baseline adherence. As introduced earlier, Lawrence Green's PRECEDE-PROCEED framework identifies knowledge as one of several predisposing factors influencing health behavior, alongside enabling and reinforcing factors that were not directly assessed in this study (Pakpahan et al., 2021).

Medication Adherence After Educational Intervention Using Booklet Media

After the educational intervention, the mean medication adherence score increased to 7.40 (SD = 0.871), with 24 respondents (60.0%) in the high adherence category, 14 respondents (35.0%) in the moderate category, and 2 respondents (5.0%) remaining in the low category (Table 3).

Comparable improvement has been reported elsewhere: Anugrah et al. (2024) found that 77.5% of respondents achieved high adherence after booklet-based education (compared with leaflet media) among elderly hypertensive patients, while Indriastuti et al. (2021) reported 65.0% high adherence following a booklet-based session in a clinic population. The present study's post-intervention high-adherence proportion (60.0%) is somewhat lower than both comparators; this may partly reflect differences in intervention intensity, booklet content, and delivery format, as well as differences in participant characteristics – this study's sample was predominantly older, female, and had comparatively lower formal education (Table 1), which may affect information uptake and retention. Because this study, like the two comparators, lacked a control group, none of the three studies can rule out the contribution of repeated testing, natural fluctuation in self-reported adherence, or concurrent routine care to the observed improvement. A recent randomized trial among elderly hypertensive patients using the same adherence scale reported a comparable post-intervention adherence level (mean 7.33, SD 0.41) following peer-led education (Ranjbar, Sadeghi-Vazin, & Bakhshi, 2024), suggesting that structured, repeatable educational content – whether delivered via booklet or trained peer educators – can achieve broadly similar adherence gains.

Health education is an important strategy for promoting behavioral change and improving patients' understanding of disease management (Khoirummunawaroh, 2022). In this study, the booklet's written and visual content, together with its QR-code-linked digital version, may have supported repeated review of the material by respondents, consistent with the broader literature indicating that repeatable, accessible educational formats are associated with improved medication-taking



behavior (Mustara et al., 2025; Solehah et al., 2026). However, because motivation, family support, and healthcare access were not measured in this study, the extent to which these factors, rather than the booklet itself, contributed to the observed change cannot be determined from the present data.

Change in Medication Adherence Following Booklet-Based Education

The Wilcoxon Signed-Rank Test indicated a statistically significant paired difference in medication adherence scores between pretest and posttest ($p < 0.001$), consistent with prior single-group studies using booklet-based education (Indriastuti et al., 2021; Anugrah et al., 2024; Khoirummunawaroh & Susana, 2023). Unlike a randomized controlled design, this pre-experimental design cannot exclude alternative explanations for the observed change, such as testing effects (respondents completing the same questionnaire twice), regression to the mean among respondents with initially low scores, or concurrent influences from routine care received during the two-week interval. The consistency of the direction and approximate magnitude of change across several similarly designed studies strengthens confidence that booklet-based education is a plausible contributor to the observed improvement, but a controlled comparison would be required to isolate its specific contribution.

The improvement in medication adherence observed in this study may be attributable to several specific features of the booklet: its structured presentation of information on hypertension, the rationale for regular medication use, and the consequences of non-adherence; its use of illustrations to support comprehension among respondents with varying levels of formal education (more than a third of whom had completed only elementary or junior high school, Table 1); and its QR-code-linked digital version, which allowed repeated, self-paced review beyond the single face-to-face session. Because respondents in this study were predominantly older women who were not formally employed (Table 1), they may have had more available time to review the booklet independently at home, which could partly explain the magnitude of change observed; this interpretation is speculative, however, as time availability and actual booklet-review frequency were not measured.

This study had several limitations. First, the pre-experimental one-group design lacked a control or comparison group, so the observed improvement cannot be attributed to the booklet intervention alone and may partly reflect testing effects, regression to the mean, or concurrent routine care. Second, the sample size ($n = 40$) was determined using the Slovin formula rather than a power-based calculation appropriate for an intervention study, so the statistical power to detect the observed difference cannot be formally established. Third, the use of accidental (convenience) sampling may have introduced selection bias and limits the generalizability of the findings beyond patients who regularly attend the health center. Fourth, medication adherence was measured using a self-report instrument (MMAS-8), which is subject to social desirability and recall bias and may overestimate actual adherence. Fifth, the two-week post-test interval captured only a short-term response, provided only once after the pretest without repeated educational sessions or follow-up monitoring; whether the observed improvement is sustained over a longer period is unknown. Sixth, this study was conducted with administrative permission from the health center rather than formal approval from an institutional research ethics committee, which is a limitation with respect to current standards of research governance. Future studies are recommended to use a randomized controlled or quasi-experimental design with a comparison group, a power-based sample size calculation, probability sampling where feasible, repeated educational sessions, formal institutional ethics committee approval, and periodic follow-up measurement over a longer period to confirm and extend these findings.

CONCLUSION

Medication adherence among hypertensive patients at Belimbing Primary Health Center changed favorably following health education using booklet media, with a statistically significant paired



difference between pretest and posttest scores. These findings support the feasibility and potential usefulness of booklet-based education, equipped with digital (QR-code) access, as a component of health education for hypertensive patients at the primary care level. Because this study used a single-group design without a comparison group, these results should be regarded as preliminary evidence of feasibility rather than confirmation of comparative effectiveness; they do not establish that booklet media are superior to other educational approaches, nor that the observed change is attributable to the booklet alone. Controlled studies with longer follow-up are needed before booklet-based education can be recommended for routine integration into hypertension health promotion programs at primary healthcare facilities.

ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to Poltekkes Kemenkes Padang for its academic support throughout this research. The authors also thank Belimbing Primary Health Center, Padang, for granting permission and facilitating the data collection process. Special appreciation is extended to all respondents who willingly participated in this study. The authors are also grateful to everyone who provided valuable support and assistance throughout the completion of this research.

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