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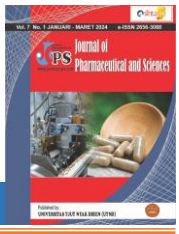

Effectiveness of Two Medication Therapy Management (MTM) Intervention Models in Improving Knowledge, Adherence, and Clinical Outcomes of Hypertension Patients

Efektivitas Dua Model Intervensi *Medication Therapy Management* (MTM) dalam Meningkatkan Pengetahuan, Kepatuhan, dan Luaran Klinis pada Pasien Hipertensi

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Abstract
Hypertension is a major contributor to morbidity and mortality in Indonesia and worldwide. The success of hypertension therapy is strongly influenced by patient knowledge and medication adherence. The 2023 Indonesian Health Survey reported a hypertension prevalence of 30.6% among adults, with a prevalence of 24.4% in North Sumatra. Medication Therapy Management (MTM) represents a strategic approach to optimizing hypertension treatment outcomes. This study aimed to evaluate two MTM intervention models—direct interaction and audio-visual—and assess their effects on knowledge, medication adherence, and clinical outcomes among hypertensive patients at the Aviati Clinic, Medan. This quasi-experimental comparative study employed a three-group pretest–posttest design involving 126 hypertensive patients. Participants were allocated into a control group receiving usual care without structured education, a direct interaction MTM group, and an audio-visual MTM group. Patient knowledge was assessed using the HKLS questionnaire, adherence was measured using the MARS-5 questionnaire, and clinical outcomes were evaluated through blood pressure measurements. Data were analyzed using the Kruskal–Wallis test followed by Bonferroni post hoc analysis. The results demonstrated that both MTM intervention models significantly improved knowledge, medication adherence, and clinical outcomes compared with the control group ($p < 0.001$). Although both intervention groups were effective, the direct interaction MTM model produced a greater reduction in systolic blood pressure than the audio-visual intervention. These findings indicate that structured MTM interventions, particularly those delivered through direct interaction, are effective in improving therapeutic outcomes in patients with hypertension.

***Keywords*: Medication Therapy Management, Hypertension, Knowledge, Adherence, Clinical Outcomes.**

Abstrak
Hipertensi merupakan salah satu penyebab utama peningkatan morbiditas dan mortalitas di Indonesia maupun secara global. Keberhasilan terapi hipertensi sangat dipengaruhi oleh tingkat pengetahuan dan adherensi pengobatan pasien. Survei Kesehatan Indonesia (SKI) tahun 2023 menunjukkan prevalensi hipertensi sebesar 30,6% pada populasi dewasa, dengan prevalensi 24,4% di Provinsi Sumatera Utara. Medication Therapy Management (MTM) merupakan pendekatan strategis dalam mengoptimalkan luaran terapi hipertensi. Penelitian ini bertujuan untuk mengevaluasi dua model intervensi MTM, yaitu interaksi langsung dan audio-visual, serta menilai pengaruhnya terhadap pengetahuan, adherensi pengobatan, dan luaran klinis pada pasien hipertensi di Klinik Aviati Medan. Penelitian ini merupakan studi komparatif kuasi-eksperimental dengan desain tiga kelompok pretest–posttest yang melibatkan 126 pasien hipertensi. Kelompok kontrol menerima pelayanan rutin tanpa edukasi terstruktur, sedangkan kelompok intervensi menerima MTM melalui interaksi langsung atau media audio-visual. Pengetahuan diukur menggunakan kuesioner HKLS, adherensi pengobatan menggunakan kuesioner MARS-5, dan luaran klinis dinilai melalui pengukuran tekanan darah. Analisis data dilakukan menggunakan uji Kruskal–Wallis yang dilanjutkan dengan uji post hoc Bonferroni.Hasil penelitian menunjukkan bahwa kedua model intervensi MTM secara signifikan meningkatkan pengetahuan, adherensi pengobatan, dan luaran klinis dibandingkan kelompok kontrol ($p < 0,001$). Meskipun kedua intervensi efektif, intervensi MTM melalui interaksi langsung menghasilkan penurunan tekanan darah sistolik yang lebih besar dibandingkan intervensi audio-visual. Dengan demikian, penerapan MTM terstruktur, khususnya melalui interaksi langsung, terbukti efektif dalam meningkatkan hasil terapi pasien hipertensi.

***Kata Kunci*: Manajemen Terapi Obat, Hipertensi, Pengetahuan, Adherensi, Luaran Klinis.**

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Introduction

One non-communicable disease (NCD) that poses a significant threat to global public health is hypertension. The World Health Organisation (WHO) estimates that 1.28 billion adults globally suffer from hypertension, making it one of the main causes of early death from cardiovascular and renal problems. As part of the NCD control plan, the WHO has established a global goal to lower the prevalence of hypertension by 33% by 2030 in response to this burden [1]. The prevalence of hypertension is still very high in Indonesia. According to data from the Indonesian Health Survey (SKI), the country's adult prevalence of hypertension was 30.6%, with notable regional variations. Mountainous Papua had the lowest prevalence (19.9%), while Central Kalimantan had the greatest (40.7%). The frequency in North Sumatra Province was 24.4%, indicating a significant regional public health issue (Ministry of Health of the Republic of Indonesia, 2023). According to Apsari et al. (2020), smoking, excessive dietary salt intake, obesity, and physical inactivity are major risk factors for Indonesia's high prevalence of hypertension [2].

Reducing cardiovascular morbidity, mortality, and long-term renal consequences is the main objective of managing hypertension. Nonetheless, in clinical practice, inadequate blood pressure regulation is still frequent. One of the primary causes of treatment failure in hypertension patients is generally acknowledged to be poor drug adherence[3]. The risk of uncontrolled hypertension and unfavourable clinical outcomes is further increased by medication-related issues, such as improper drug selection, incorrect dosage, polypharmacy, and drug-drug interactions, in addition to non-adherence. Patients with comorbid conditions like diabetes mellitus, which commonly coexist with hypertension and greatly increase the risk of complications, are most affected by this problem [4]. Beyond medication, a major contributing reason to non-adherence and inadequate disease control is a lack of patient education about hypertension, long-term treatment, and lifestyle changes. Research indicates that intentional or inadvertent non-adherence is frequently caused by a lack of knowledge about the severity of the disease, the advantages of medications, and possible side effects. Consequently, increasing patient awareness is a crucial intermediary goal that can favourably affect adherence patterns and, eventually, clinical results [5].

A organised, patient-centered approach to pharmaceutical treatment, medication therapy management (MTM) aims to improve clinical outcomes, maximise medication use, improve adherence, and identify and address medication-related issues. According to the American Pharmacists Association [APhA] & National Association of Chain Drug Stores [NACDS], 2008, MTM generally consists of elements like medication review, patient education, follow-up evaluation, creation of a customised medication action plan, and cooperation with other medical specialists. MTM has been acknowledged as a strategic strategy to address behavioural and pharmacological impediments to effective treatment in the setting of chronic disorders like hypertension. Several international studies have shown that MTM interventions by chemists can lower healthcare expenditures while simultaneously improving medication adherence, blood pressure control, and patients' quality of life. According to Marupuru et al. (2022), individuals with hypertension who received MTM treatments outperformed those who received standard care in terms of clinical outcomes [6]. In a similar vein, Pratama et al. (2020) shown that MTM interventions significantly improved quality of life and medication adherence, with better adherence linked to better blood pressure control. De Oliveira et al. (2023) also emphasised how the use of MTM in healthcare systems leads to better patient adherence, cost savings, and clinical results [7].

Within the BPJS Kesehatan Referral Program in Indonesia, which serves patients with chronic illnesses in need of long-term treatment, MTM plays a crucial role. It is anticipated that the incorporation of MTM into PRB services will enhance continuity of care, lessen medication-related issues, and facilitate treatment optimisation, especially at the primary healthcare level [8] . However, there are still differences in service intensity, delivery modalities, and resource availability in the actual primary care settings where MTM is being implemented. Crucially, previous research has mostly assessed MTM as a single intervention model, with no investigation into the potential differential effects of several MTM delivery strategies on patient understanding, adherence, and clinical outcomes. There is also a dearth of comparative data regarding the efficacy of various MTM intervention methods, such as regular MTM versus enhanced or structured MTM with intense teaching and follow-up, especially in low- and middle-income country settings [9].

Despite growing evidence supporting the effectiveness of Medication Therapy Management (MTM) in improving hypertension outcomes, most existing studies in Indonesia have primarily focused on the general impact of MTM on adherence, blood pressure control, or quality of life without differentiating the mode of intervention delivery. Evidence from Southeast Asia remains limited and largely descriptive, with few studies conducted in primary care clinic settings. Moreover, to date, no published studies in Indonesia have directly compared the effectiveness of different MTM delivery modalities, particularly direct pharmacist patient interaction versus audio-visual–based MTM interventions. Consequently, there is a lack of empirical evidence to guide the selection of the most effective and feasible MTM delivery model within Indonesian primary healthcare services. This study addresses this research gap by comparing two MTM intervention models direct interaction and audio-visual in terms of their impact on patient knowledge, medication adherence, and clinical outcomes among hypertensive patients in a primary care clinic in Medan, Indonesia [10].

Research Design

This study employed a quasi-experimental design using a non-probability consecutive sampling technique. All hypertensive patients attending the Aviati Jamin Ginting and Aviati Padang Bulan Clinics during the study period were screened consecutively and enrolled if they met predefined inclusion criteria. Eligible participants were allocated alternately into three groups based on order of arrival: control group receiving usual care without structured education, direct interaction MTM group, and audio-visual MTM group. Both intervention groups received identical Medication Therapy Management (MTM) content, including medication review, hypertension education, adherence counseling, lifestyle modification guidance, and follow-up evaluation, differing only in the mode of delivery. Interventions were provided by a licensed pharmacist in standardized sessions conducted every two weeks for four weeks. Patient knowledge was assessed using the Indonesian version of the Hypertension Knowledge-Level Scale (HK-LS; total score 0–22), and medication adherence was measured using the MARS-5 questionnaire, both of which demonstrated acceptable validity and reliability in the local context [11].

Populations

The population in this study includes all hypertensive patients at the Aviati Jamin Ginting clinic and the Aviati Padang Bulan clinic, while the accessible population in this study is hypertensive patients at the Aviati Jamin Ginting clinic and the Aviati Padang Bulan clinic during the period of October 2025.

Sample

The research sample consisted of 126 patients who met the inclusion and exclusion criteria. The sample was divided into three groups (42 patients each) using non-probability sampling techniques, with allocation based on order of arrival or criteria set by the researcher.

Research Instruments and Validation

The research instruments used in this study consisted of Patient Documentation Books, knowledge questionnaires using HK-LS, adherence questionnaires using MARS-5, educational videos, and blood pressure measuring devices. Patient knowledge using the HKLS questionnaire has 22 questions, with a value of 1 for a correct answer and zero for an incorrect answer. Patient adherence using the MARS-5 questionnaire has 5 questions, with the measurement scale using a Likert scale. Before use, the HK-LS and MARS-5 questionnaires were validated using a validity test conducted with the Pearson correlation technique on 40

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respondents, where the instrument was considered valid if the correlation value was > 0.3 with a significance of P < 0.05. Reliability testing was conducted using Cronbach's Alpha, and a value above 0.70 is considered to have good reliability.

Data Collection and Intervention Procedures

After receiving approval from the Research Ethics Commission, the research process starts. The patients were split up into three groups of 42 each, according to the researcher's criteria or the sequence in which they arrived: Group 1 (Control): Did not get any structured MTM intervention; they were given normal treatment. Group 2 (Direct Interaction): Individual face-to-face therapy was used to provide MTM. Group 3 (Audio-Visual): Educational videos and other audio-visual media were used to deliver MTM. For four weeks, the researcher visited the patients every two weeks, engaging with them directly at each time.

Data Analysis

Data analysis was performed using SPSS Statistics 26.0 software. The analysis stages were normality test, Wilcoxon test, Kruskal Wallis test, and Post Hoc method, which aimed to describe the characteristics of the research object thru sample data and compare between times within one group (pretest-posttest).

Results and Discussion

Characteristics of Respondent Identity

The characteristics of hypertensive patients at the Aviati Jamin Ginting Clinic and the Aviati Padang Bulan Clinic who participated in this study are presented in Table 1. A total of 126 patients meeting the inclusion criteria were involved in this study.

Table 1. Respondent Characteristics

Characteristics	Sample (n)	Percentage (%)
Gender		
Male	50	39.7
Femele	76	60.3
Age (years)		
18 – 59	51	40.5
> 60	75	59.5
Education		
Primary School	23	18.3
Junior High School	27	21.4
Senior High School	65	51.6
University	11	8.7
Occupation		
Civil Servant	9	7.1
Private Sector Employee	69	54.8
Unemployed	41	32.5
Retired	7	5.6

According to the respondents' demographic information, there were more female respondents—76 patients, or 60.3%—than male respondents—50 patients, or 39.7%. In his study of hypertensive patients in Yogyakarta, Wijaya(2023) also discovered that 82% of women had hypertension, compared to only 18% of men. Due to a decline in the hormones oestrogen and progesterone, which protect women against the risk of atherosclerosis or thickening of blood vessel walls, women are more likely than males to develop hypertension, particularly after menopause [12]. Arsa et al. (2024) also observed similar results, reporting that 60.5% of women in Medan City had hypertension, compared to 39.5% of men. 51 patients (40.5%) were identified based on the age distribution of responders with hypertension, who were between the ages of 18 and 59. 65 respondents (59.5%) who were older than 60 had hypertension. JNC 8 (2014) states that the target blood pressure should be less than 150/90 mmHg for individuals over 60 and less than 140/90 mmHg for those under 60 [13]. Basic Health Research, an individual's physiological risk of acquiring hypertension increases with age. Blood pressure rises as a result of structural alterations in blood vessels, including lumen narrowing

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and stiffening and elasticity loss of the blood channel walls [14]. High school graduates accounted for the largest percentage of hypertension patients (65, or 51.6%), followed by junior high school graduates (27, or 21.4%), elementary school graduates (23, or 18.3%), and university graduates (11, or 8.7%). Higher education is typically linked to more knowledge, which in turn affects the prevalence of hypertension. Research by Sun et al. (2022) also demonstrated that an individual's chance of having hypertension decreases with increasing educational attainment. Nine patients (7.1%) were civil servants, 69 patients (54.8%) were in the private sector, 41 patients (32.5%) were unemployed, and seven patients (5.6%) were pensioners. According to this study, hypertension was most prevalent among employees in the private sector. This is consistent with the 2018 Basic Health Research study, which reports that 34.03% of workers nationwide, especially those in the private sector, have hypertension. This number suggests a comparatively high frequency [15].

The Influence of MTM on the Knowledge Level of Hypertensive Patients

The knowledge level in this study was measured using the HK-LS questionnaire. The results of the normality test showed that the data were not normally distributed, so this data will be tested using the non-parametric Wilcoxon and Kruskal Wallis tests.

Table 2. Data on differences in knowledge levels among control group respondents, direct intervention (IL) group, and audio-visual (AV) group.

Data			Mean± SD	Δ Posttest-Pretest		Δ control/ Intervention
				Mean ± SD	P – Value	
Knowledge	Control Group	Pretest	6.86 ± 4.171	0.17 ± 0.377	0.08[a]	<0.001 *[b]
		Posttest	7.02 ± 4.263			
	IL Group	Pretest	7.62 ± 3.146	5.83 ± 3.932	<0.001[a]	
		Posttest	13.45 ± 5.379			
	AV Group	Pretest	8.29 ± 4.313	4.24 ± 3.106	<0.001[a]	
		Posttest	12.52 ± 4.840			

Note: Wilcoxon test[a] and Kruskal Wallis [b] * significant <0.05

The average knowledge score for the control group only slightly increased (from 6.86 ± 4.171 to 7.02 ± 4.263), according to Table 2's analytical results. The Wilcoxon test revealed that the control group's knowledge levels did not differ significantly (p-value 0.08). A significant increase was observed in both the audio-visual (AV) group (from 8.29 ± 4.313 to 12.52 ± 4.840) and the direct intervention (IL) group (from 7.62 ± 3.146 to 13.45 ± 5.379). The audio-visual (AV) and direct intervention (IL) groups' Wilcoxon test findings revealed a p-value < 0.001. The conclusion is that there is a very significant difference between the knowledge levels before and after the intervention because the p-value is less than 0.05. The control group, direct intervention (IL), and audio-visual (AV) groups had significantly different overall knowledge levels, as indicated by the Kruskal Wallis test p-value of less than 0.001 [16].

Table 3 Results of significant knowledge comparison between the control group, the direct intervention (IL) group, and the audio-visual (AV) group.

Group Comparison	Mean Difference	Std. Error	Adj. Sig.[a]	Interpretation
Control – AV	−54.988	7.828	0.000	Significant difference
Control – IL	−63.369	7.828	0.000	Significant difference
AV – IL	8.738	7.828	0.793	No significant difference

Note: Post Hoc test with Bonferroni correction[a] significant at 0.05

Given the significance of the Kruskal-Wallis test results, a post-hoc test was conducted using Bonferroni correction. The comparisons between Control – AV ($p = 0.000$) and Control – IL ($p = 0.000$) both revealed $p < 0.05$, according to the post-hoc test results. This demonstrates that, in comparison to the control group, both interventions (IL and AV) are statistically significantly better and more successful in raising respondents' knowledge. The p-value for the comparison of AV and IL was 0.793 ($p > 0.05$). These statistical data show that there was no significant difference in the effectiveness of the Direct Intervention and Audio-Visual techniques, even though the average increase in the IL group ($\Delta = 5.83$) was higher than in the AV group ($\Delta = 4.24$).

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The Influence of MTM on Hypertension Patient Adherence

This study was conducted to determine the adherence of hypertensive patients, as patient adherence to treatment impacts the success of hypertension therapy, thereby controlling blood pressure. The level of adherence in this study was assessed using the MARS-5 questionnaire, which consists of 5 questions.

Table 4. Data on differences in adherence levels among control group respondents, direct intervention (IL) group, and audio-visual (AV) group.

Data			Mean± SD	Δ Posttest-Pretest		Δ control/ Intervention
				Mean ± SD	P – Value	
Adherence	Control Group	Pretest	19.64 ± 3.297	0.40 ± 0.544	<0.001 [a]	<0.001 *[b]
		Posttest	20.05 ± 3.261			
	IL Group	Pretest	19.64 ± 3.297	3.57 ± 1.977	<0.001 [a]	
		Posttest	23.21 ± 2.710			
	AV Group	Pretest	19.64 ± 3.297	3.21 ± 2.019	<0.001 [a]	
		Posttest	22.86 ± 2.755			

Note: Wilcoxon test [a] and Kruskal Wallis [b] * significant <0.05

The pretest average adherence score for each of the three groups is consistent (Mean = 19.64 ± 3.297), according to Table 4's analytical results. The Direct Intervention (IL) group had the largest score rise of 3.57 ± 1.977, the Audio-Visual (AV) group had a nearly identical increase of 3.21 ± 2.019, and the Control group's score change (Δ Posttest-Pretest) only exhibited a slight increase of 0.40 ± 0.544. For all three groups (Control, IL, and AV), the Wilcoxon test findings revealed a p-value of less than 0.001. It is determined that there is a significant difference in adherence scores between the Pretest and Posttest since the p-value is less than 0.05. One interpretation of the significance in the control group (Δ=0.40) is that there was little change brought about by outside influences (such as the respondents' knowledge that they were being watched or the impact of the brief encounter during the research period) [17]. The gains in the AV and IL groups, however, show that the intervention impact is significantly larger and more significant than the control group's natural effect. The Kruskal-Wallis test revealed that the p-value was less than 0.001. This finding suggests that the control group, direct intervention (DI), and audio-visual (AV) groups had significantly different levels of adherence overall [18].

Table 5. Results of significant adherence comparison between the control group, the direct intervention (IL) group, and the audio-visual (AV) group.

Group Comparison	Mean Difference	Std. Error	Adj. Sig.[a]	Interpretation
Control – AV	-54,393	7.849	0.000	Significant difference
Control – IL	-61,143	7.849	0.000	Significant difference
AV – IL	6,750	7.849	1	No significant difference

Note: Post Hoc test with Bonferroni correction [a] significant at 0.05

A Post Hoc test with Bonferroni correction was carried out since the Kruskal Wallis test findings were significant. The comparisons between Control – AV (p = 0.000) and Control – IL (p = 0.000) both revealed p < 0.05, according to the Post Hoc test results. This demonstrates that, in comparison to the control group, both interventions (IL and AV) are statistically significantly better and more successful in raising respondents' knowledge. The p-value for the comparison between AV and IL was 1 (p > 0.05). These statistical findings show that there was no discernible difference in the effectiveness of the Direct Intervention and Audio-Visual approaches, despite the fact that the average increase in the IL group (Δ = 3.57) was higher than in the AV group (Δ = 3.21).

The Influence of MTM on Clinical Outcomes of Hypertensive Patients

This study was conducted to determine the reduction in blood pressure of hypertensive patients. Blood pressure measurements were taken at the beginning of the study and at the end of the study. In this study, systolic and diastolic blood pressure were measured for each hypertensive patient in the control group (pretest and posttest), the direct intervention group (pretest and posttest), and the audio-visual intervention group (pretest and posttest) from a total of 126 hypertensive patients.

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Table 6. Data on differences in systolic blood pressure clinical outcomes among respondents in the control group, the direct intervention (DI) group, and the audio-visual (AV) group.

Data			Mean± SD	Δ Posttest-Pretest		Δ control/ Intervention
				Mean ± SD	P – Value	
Clinical Outcome of Systolic	Control Group	Pretest	154.19 ± 11.392	0.40 ± 0.544	<0.001 [a]	<0.001 *[b]
		Posttest	149.98 ± 10.667			
	IL Group	Pretest	152.24 ± 10.797	3.57 ± 1.977	<0.001 [a]	
		Posttest	131.71 ± 9.821			
	AV Group	Pretest	154.52 ± 9.821	3.21 ± 2.019	<0.001 [a]	
		Posttest	139.74 ± 10.535			

Note: Wilcoxon test[a] and Kruskal Wallis [b] * significant <0.05

The control group's average systolic blood pressure dropped from 154.19±11.392 to 149.98±10.667, according to Table 6. 4.43±5.071 is the average reduction (Δ Posttest-Pretest). Other factors, such the placebo effect or spontaneous lifestyle changes during the study period, could be the cause of this drop in blood pressure. The average systolic blood pressure in the Direct Intervention (DI) group decreased the most, from 152.24±10.797 to 131.71±9.821. 20.52±7.993 was the average decrease (Δ Posttest-Pretest). The average systolic blood pressure in the Audio-Visual (AV) group decreased significantly from 154.52±9.821 to 139.74±10.535. 14.79±6.399 was the average reduction (Δ Posttest-Pretest). A p-value of less than 0.001 was found in the Wilcoxon test findings for the three groups (control, direct intervention (IL), and audio-visual (AV)). It is determined that there is a significant difference between the systolic blood pressure before and after the test because the p-value is less than 0.05. The control, direct intervention (IL), and audio-visual (AV) groups showed significantly different clinical outcomes for systolic blood pressure, with a p-value of less than 0.001 according to the Kruskal Wallis test [6].

Table 7. Results of the significant comparison of systolic blood pressure clinical outcomes between the control group, the Direct Intervention (DI) group, and the Audio-Visual (AV) group.

Group Comparison	Mean Difference	Std. Error	Adj. Sig.[a]	Interpretation
Control – AV	-43.738	7.908	0.000	Significant difference
Control – IL	-65.262	7.908	0.000	Significant difference
AV – IL	21.524	7.908	0.019	No significant difference

Note: Post Hoc test with Bonferroni correction[a] significant at 0.05

Given the significance of the Kruskal-Wallis test results, a Post Hoc test with Bonferroni correction was conducted. The comparisons between Control – AV ($p = 0.000$) and Control – IL ($p = 0.000$) both revealed $p < 0.05$, according to the Post Hoc test results. This demonstrates that, in comparison to the control group, both interventions (IL and AV) are statistically significantly better and more successful in raising respondents' knowledge. A p-value of 0.019 ($p < 0.05$) was found when comparing AV and IL. This statistical finding suggests that the Direct Intervention and Audio-Visual approaches differ significantly in their efficacy.

Table 8. Data on the difference in mean rank of diastolic blood pressure clinical outcomes for the control group, the direct intervention (DI) group, and the audio-visual (AV) group.

Data			Mean± SD	Δ Posttest-Pretest		Δ control/ Intervention
				Mean ± SD	P – Value	
Clinical Outcome of Dyastolik	Control Group	Pretest	93.86 ± 3.128	0.40 ± 0.544	<0.001 [a]	<0.001 *[b]
		Posttest	91.83 ± 3.767			
	IL Group	Pretest	92.79 ± 3.258	3.57 ± 1.977	<0.001 [a]	
		Posttest	83.64 ± 6.056			
	AV Group	Pretest	93.14 ± 3.273	3.21 ± 2.019	<0.001 [a]	
		Posttest	85.57 ± 5.199			

Note: Wilcoxon test[a] and Kruskal Wallis [b] * significant <0.05

Table 8 shows that the average diastolic blood pressure of the control group dropped from 93.86±3.128 to 91.83±3.767. 2.14±3.190 is the average reduction (Δ Posttest-Pretest). Other factors, including the attention effect or natural lifestyle changes during the study period, could be the cause of this drop in blood pressure.

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The average systolic blood pressure decreased the most in the Direct Intervention (DI) group, from 92.79±3.258 to 83.64±6.056. 9.38±6.313 was the average reduction (Δ Posttest-Pretest). The average diastolic blood pressure in the Audio-Visual (AV) group decreased significantly from 93.14±3.273 to 85.57±5.199. 7.81±4.712 was the average reduction (Δ Posttest-Pretest). A p-value of less than 0.001 was found in the Wilcoxon test findings for the three groups (control, direct intervention (DI), and audio-visual (AV). Systolic blood pressure before and after the intervention were shown to differ significantly since the p-value was less than 0.05. The control, direct intervention (DI), and audio-visual (AV) groups' systolic blood pressure clinical outcomes differed significantly overall, as indicated by the Kruskal-Wallis test's p-value of less than 0.001.

Table 9. Results of significant comparison of diastolic blood pressure clinical outcomes between the control group, the direct intervention (IL) group, and the audio-visual (AV) group.

Group Comparison	Mean Difference	Std. Error	Adj. Sig.[a]	Interpretation
Control – AV	-40.679	7.846	0.000	Significant difference
Control – IL	-47.143	7.846	0.000	Significant difference
AV – IL	6.464	7.846	1	No significant difference

Note: Post Hoc test with Bonferroni correction [a] significant at 0.05

A Post Hoc test with Bonferroni correction was carried out since the Kruskal Wallis test findings were significant. The comparisons between Control – AV ($p = 0.000$) and Control – IL ($p = 0.000$) both revealed $p < 0.05$, according to the Post Hoc test results. This demonstrates that, in comparison to the control group, both interventions (IL and AV) are statistically significantly better and more successful in raising respondents' knowledge. The p-value for the comparison between AV and IL was 1 ($p > 0.05$). These statistical findings show that there was no discernible difference in the effectiveness of the Direct Intervention and Audio-Visual approaches, despite the fact that the average drop in the IL group ($\Delta = 9.38$) was higher descriptively than in the AV group ($\Delta = 7.81$).

Disscusion

In terms of enhancing patients' knowledge, adherence, and clinical outcomes, the research findings show that MTM implementation whether through direct interaction or audio-visual means—is significantly ($p < 0.001$) better than the control group. It is evident that the three groups differ significantly from one another, suggesting that the intervention strategy is crucial to MTM's success. The Direct Interaction Group showed the greatest gain in patient knowledge, followed by the Audio-Visual Group. Because a deeper comprehension of illnesses and treatments is a basic requirement for improved decision-making and long-term adherence, this gain in knowledge validates the role of chemists in MTM as essential educators [19]. Despite improvements in both intervention groups, the study's findings indicate that patient adherence to antihypertensive medication also dramatically increased. The Direct Intervention Group was more successful in increasing adherence than the other group, according to the significant difference found by the Bonferroni test. This might be because face-to-face engagement has stronger motivational and building components. The efficacy of MTM is demonstrated by improved clinical outcomes, such as a decrease in blood pressure. When compared to the control group, the Direct Intervention and Audio-visual groups' blood pressure significantly decreased, according to the data. This is a direct result of better understanding and, above all, better patient adherence [20]. These findings demonstrate that, although being non-pharmacological, clinical pharmacy interventions like MTM have a quantifiable and noteworthy clinical impact in preventing sequelae from hypertension. Especially in Indonesia, this study significantly advances the use of clinical pharmacy services in primary healthcare facilities. The best and most effective MTM delivery methodology for PRB patients is strongly supported by empirical data from this study [12,21].

Conclusion

This study demonstrates that both Medication Therapy Management (MTM) intervention models—direct interaction and audio-visual—are effective in improving patient knowledge, medication adherence, and clinical outcomes compared with usual care among hypertensive patients in a primary care setting. The findings indicate that for several outcomes, including knowledge level, medication adherence, and diastolic blood pressure reduction, the effectiveness of the two MTM delivery methods was comparable. However, the

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direct interaction MTM model showed an additional advantage in achieving greater systolic blood pressure reduction. These results suggest that both MTM models are viable options for hypertension management, and the choice of intervention may be tailored according to resource availability, clinical workflow, and patient needs.

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this manuscript. This study was conducted independently and did not receive any financial support from commercial entities, pharmaceutical companies, or other organizations that could potentially influence the research outcomes.

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