Pharmacist Intervention in Hypertension Control: A Comparative Analysis of Patient Outcomes

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ABSTRACT

Background: Hypertension is a critical public health problem and the main risk factor for cardiovascular diseases, stroke, and renal disorders. Effective treatments remain in place for hypertension, but optimal blood pressure (BP) control is lacking for many patients due to poor adherence to drugs and insufficient patient education. Pharmacists are responsible for enhancing the control of hypertension by means of interventions and counselling patients.

Objectives: The present study assesses the effect of pharmacist intervention on BP control, medication adherence, and patient knowledge in comparison to control group.

Methodology: A prospective, randomized controlled trial was carried out at Multispeciality Hospital among 48 patients with hypertension. Participants were randomly assigned to a control group (standard treatment) and an intervention group (standard treatment and pharmacist interventions). Both groups were stratified according to the severity of hypertension (mild, moderate, severe). Pharmacist interventions were patient education, medication adherence counselling, and support for lifestyle modification. The patients were followed up at an interval of 10 days for three months. Outcomes measured were changes in BP, medication adherence (Morisky Medication Adherence Scale), and scores on patient knowledge. Statistical tests used were paired t-tests, and ANOVA.

Results: The intervention group had improved control of BP, medication compliance, and patient education ($p < 0.05$). Visits to hospital were reduced, and quality of life was increased.

Discussion: Interventions by pharmacists improve hypertension care through better adherence and patient education. Incorporation of pharmacists into routine practice can enhance health outcomes and diminish healthcare burdens.

Keywords: Hypertension, blood pressure, randomized control trial, pharmacist intervention.

INTRODUCTION

Hypertension, commonly referred to as the "silent killer," is a chronic disorder that affects millions of people worldwide and is highly linked with excess morbidity and mortality from cardiovascular disease, stroke, and renal disease. The hypertension burden is especially disturbing in developing nations where changes in lifestyle, inappropriate health-seeking behavior, and low awareness further worsen the management of the disease. Despite having effective antihypertensive treatment available, the rates of control are less than optimal because of factors including nonadherence to medication regimens, inadequate patient education, and absence of regular monitoring. These obstacles underscore the importance of having additional support systems in the healthcare team for better patient outcomes.

Pharmacists, being readily available and knowledgeable health professionals, are best able to take a key role in the management of hypertension. Their role goes beyond the dispensing of medication to encompass patient-focused services like drug adherence counseling, encouraging lifestyle changes (diet, exercise, and smoking cessation), and adherence to correct blood pressure monitoring practices. Studies and meta-analyses from the past have consistently demonstrated that interventions by pharmacists can very effectively increase medication adherence, control of blood pressure, and general disease awareness, thus preventing the occurrence of long-term complications.

The underlying rationale for this research is based on the necessity to investigate the comparative advantages of pharmacist interventions combined with routine care. Through a consideration of outcomes like blood pressure lowering, antihypertensive treatment compliance, patient knowledge, and quality of life, the study has the purpose of establishing evidence for the advantage of using pharmacists in managing routine hypertension. Such integration has the ability not only to improve individual patient care but also to alleviate healthcare costs through decreased hospital visits and better disease management.the aim of the study is to assess the efficacy of pharmacist intervention in enhancing blood pressure control among patients with hypertension in comparison with usual care. The objectives of the study are to determine blood pressure control in both the intervention and control groups, to compare the effect of pharmacist intervention on medication adherence, to measure the knowledge of patients on hypertension and its management, to determine changes in quality of life as a result of pharmacist intervention.

MATERIALS & METHODS:

Study Design

This is a prospective, randomized, controlled study designed to evaluate the impact of pharmacist-led interventions on hypertension control. The study population consists of 48 patients diagnosed with hypertension, randomly assigned to either a control or intervention group. Each group is further divided into three subgroups based on hypertension severity (mild, moderate, and severe), with each subgroup containing eight patients.

Mild HTN (n=8)

Moderate HTN (n=8)

Severe HTN (n=8)

The control group receives standard hypertension treatment, while the intervention group receives pharmacist-led interventions in addition to standard care. The pharmacist interventions include patient education, medication adherence counselling, and lifestyle modifications tailored to the severity of hypertension. Follow-up assessments are conducted once every 10 days over a study period of three months.

Patients were included in the study if they were diagnosed with hypertension, aged 18 years or older, and willing to participate. Exclusion criteria included patients with secondary hypertension, those with severe comorbidities affecting adherence, and individuals unwilling to provide informed consent.

The primary outcome measure is blood pressure reduction and medication adherence, while secondary outcomes include improvements in patient knowledge and quality of life. Statistical analysis will be performed to compare outcomes between groups, and validated questionnaires will be used to assess medication adherence, patient knowledge, and quality of life. Ethical approval was obtained before the commencement of the study.

Patients

Consecutive adult patients (>18 years old) diagnosed with hypertension and receiving antihypertensive medication were enrolled in the study over three months. Patients at their first prescription of antihypertensive therapy were excluded. Other exclusion criteria included secondary hypertension, severe comorbid conditions affecting adherence, and unwillingness to participate. Any change in medication type or dosage during the study was managed under physician supervision and was considered part of the pharmacist intervention strategy.

Educational Intervention

All the clinical pharmacists (CPs) in the intervention group were trained to deliver patient-centered educational interventions to control hypertension. The pharmacists received special training to assess drug compliance, monitor blood pressure trends, and give individualized counseling based on the needs of patients. The educational intervention was structured on the following key components:

Medication Adherence Counseling: Pharmacists established patterns of adherence according to MMAS-8 scores and provided tailored interventions for particular obstacles to adherence. Patients who expressed erratic, willful, or accidental non-adherence received customized counseling strategies in order to increase medication-taking practice.

Lifestyle Modification Education: Patients were counseled for the necessity for lifestyle modification, including diet (low sodium diet, DASH diet), exercise routines, smoking cessation, and stress managing skills.

Advice on Blood Pressure Monitoring: The patients were instructed about the need for regular measurement of blood pressure and antihypertensive drug intake to prevent complications. The patients were also instructed to perform self-BP monitoring at home with automated machines.

Medication Optimization and Physician Collaboration: Any necessary adjustments to medication regimens were discussed with the physician in an effort to ensure optimal blood pressure control. Pharmacists made recommendations under physician supervision in an effort to enhance treatment efficacy and minimize adverse effects.

Measurement of Adherence to Treatment

The 8-item Morisky Medication Adherence Scale (MMAS-8) was employed to measure medication adherence in enrolled patients with hypertension. The scale measures patients' compliance with their prescribed antihypertensive regimen and determines the reasons for non-adherence. The MMAS-8 is comprised of eight self-report questions, with answers rated as either "yes" or "no" for the first seven items and a Likert scale response for the eighth item. The range of the score is 0 to 8 and is higher in case of good adherence. The levels of adherence have been divided based on MMAS-8 scores as below:

High adherence: 8 points.

Medium adherence: 6 or 7 points.

Low adherence: ≤5 points.

Blood Pressure Control

Control of blood pressure was assessed with calibrated sphygmomanometers at all follow-ups. Blood pressure was taken sitting after resting for a minimum of five minutes, as per clinical guidelines for hypertension management. Control of BP was defined as follows:

Controlled hypertension: Systolic BP <140 mmHg and diastolic BP <90 mmHg.

Uncontrolled hypertension: Systolic BP ≥140 mmHg or diastolic BP ≥90 mmHg.

Statistical Analysis

Comparative Analysis: Paired t-test was used to compare pre- and post-intervention SBP and DBP for both groups, while Chi-square was utilized to investigate categorical outcomes like BP control rates.

Multivariate Analysis: One-way ANOVA was used to compare BP outcomes between multiple groups.

Significance Level: A p-value of less than 0.05 was considered statistically significant.

RESULTS

The population demographics of the study sample (n = 48) uncovered key information regarding age and gender distribution of hypertension. Participants' mean age was around 50 years, most of whom fell in the age group between 41–60 years. The result is consistent with epidemiological evidence wherein hypertension increases incrementally with increasing age because of vascular changes, endothelial damage, and accumulation of lifestyle risk factors. The proportion of younger patients (<40 years) included in the study was low, which mirrors the relatively low prevalence of hypertension at this age, and fewer participants were over 60 years of age, concordant with the established age-specific increase in prevalence.

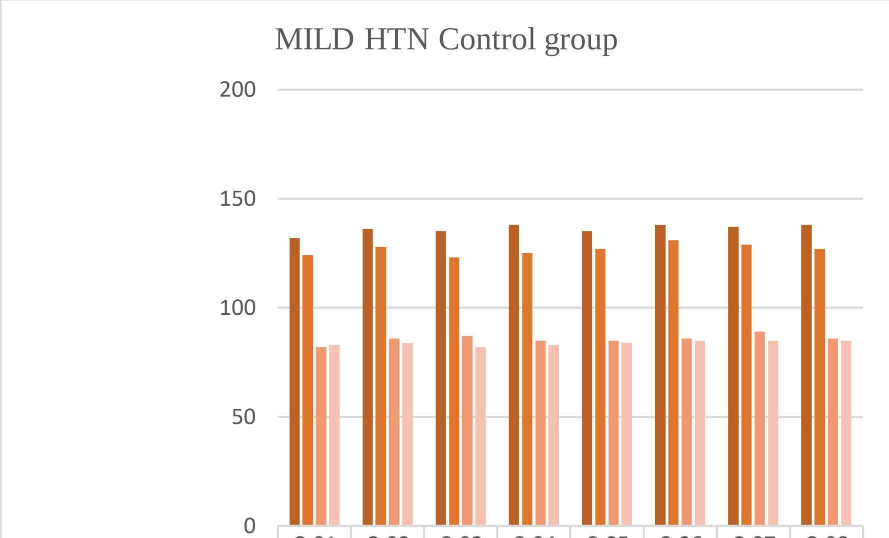
Table 1. Demographic Characteristics at Baseline

Variable	Control (N=24)	Intervention (N=24)
Gender		
Male	14 (58.3%)	14 (58.3%)
Female	10 (41.7%)	10 (41.7%)
Age (years)		
Mean (SD)	54.1 (9.5)	51.8 (8.7)
Min - Max	(39, 73)	(40, 70)

With respect to gender distribution, the sample comprised 26 men (54%) and 22 women (46%), reflecting a slightly greater prevalence among men. This is in agreement with earlier work that suggests men are more likely to develop hypertension at younger ages than women, perhaps because of differences in lifestyle factors like smoking, alcohol use, stress, and reduced health-seeking behavior. Nevertheless, the almost equal ratio in this research also points out that hypertension is not limited to a single gender and becomes more prevalent in women, particularly after menopause, when estrogen's cardiovascular protective effects wane.

The balanced gender and age distribution in this research increases its generalizability since it represents the common population profile of hypertensive patients in the Indian patient population. These attributes also support the necessity for individualized interventions—education and counseling by pharmacists should be targeted not only to age-related issues such as comorbidities and polypharmacy among elderly patients but also gender-related issues, such as lifestyle practices and awareness levels among both men and women.

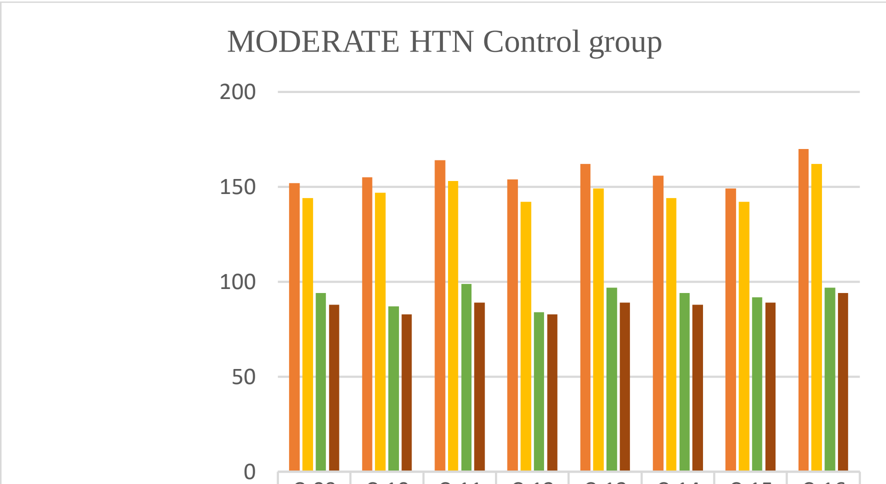
Graph 1. MILD HTN Control group



	C-01	C-02	C-03	C-04	C-05	C-06	C-07	C-08
systolic bp baseline	132	136	135	138	135	138	137	138
systolic bp final	124	128	123	125	127	131	129	127
diastolic bp baseline	82	86	87	85	85	86	89	86
diastolic bp final	83	84	82	83	84	85	85	85

The graph shows blood pressure changes in individuals (C-01 to C-08) with mild hypertension who did not receive an intervention. Systolic BP decreased slightly from 132 to 138 mmHg at baseline to 124-127 mmHg post study, while diastolic BP showed minimal change, remaining between 82-87 mmHg at baseline and 82-85 mmHg at the final measurement.

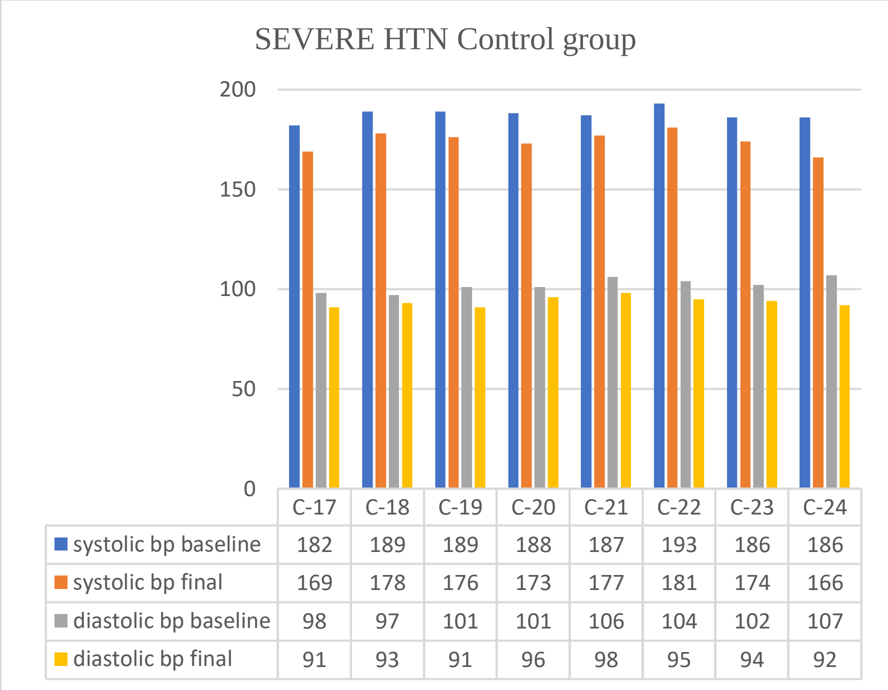
Graph 2. MODERATE HTN Control group



	C-09	C-10	C-11	C-12	C-13	C-14	C-15	C-16
systolic bp baseline	152	155	164	154	162	156	149	170
systolic bp final	144	147	153	142	149	144	142	162
diastolic bp baseline	94	87	99	84	97	94	92	97
diastolic bp final	88	83	89	83	89	88	89	94

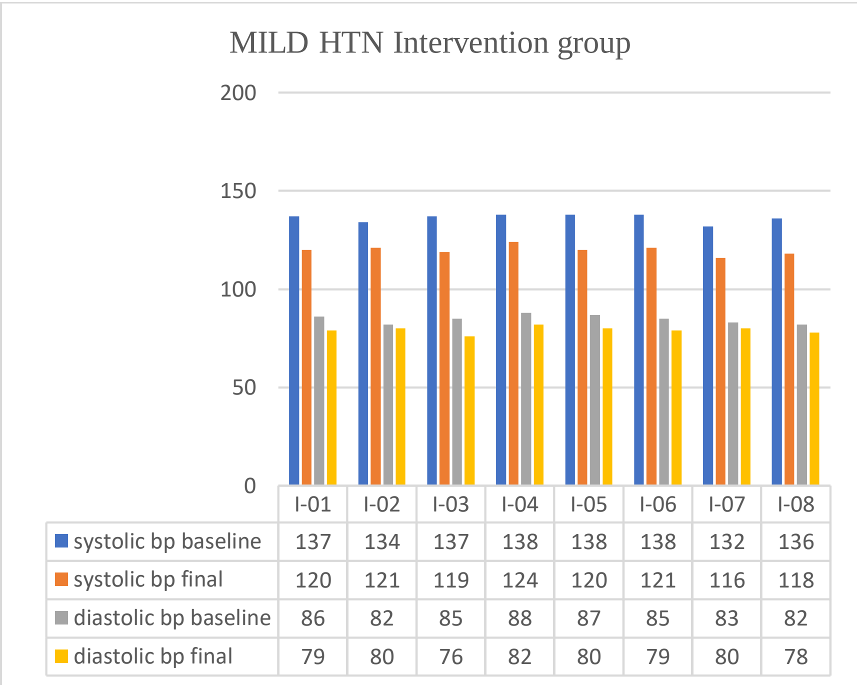
The graph shows blood pressure trends in individuals (C-09 to C-16) with moderate hypertension who did not receive intervention. Systolic BP initially ranged from 152-170 mmHg, slightly reduced to 144-162 mmHg post-study, while diastolic BP remained nearly unchanged, starting between 87-99 mmHg and slightly decreasing to 83-94 mmHg.

Graph 3. SEVERE HTN Control group



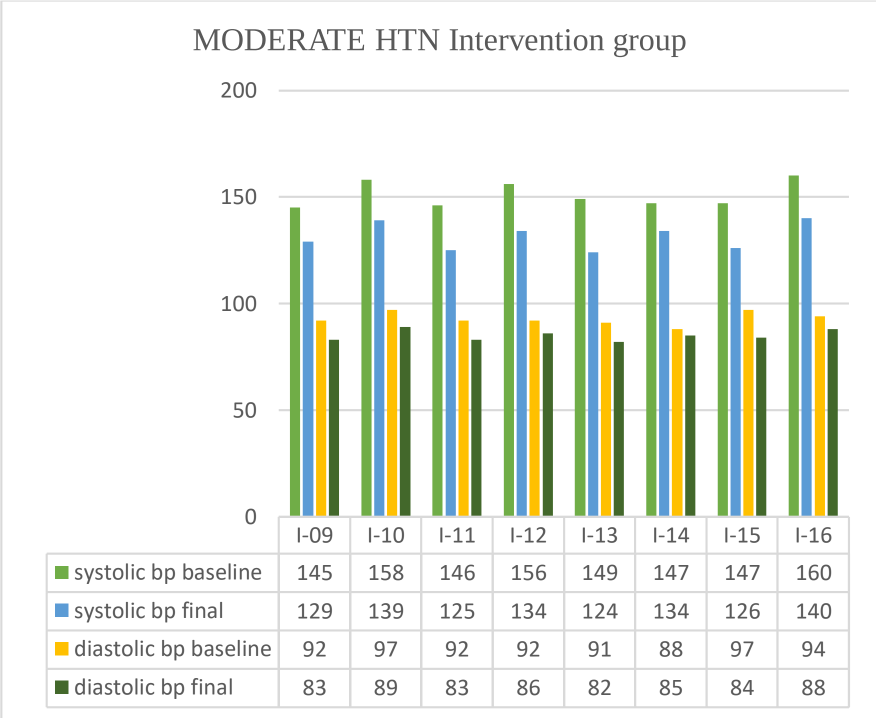
The graph shows blood pressure variations in individuals (C-17 to C-24) with severe hypertension who did not receive intervention. Systolic BP started between 182 and 193 mmHg and declined to 166 to 178 mmHg post-study, while diastolic BP was initially 97 to 107 mmHg and remained between 91 and 98 mmHg at the final measurement.

Graph 4. MILD HTN Intervention group



The bar graph shows blood pressure variations in individuals (I-01 to I-08) with mild hypertension before and after intervention. Systolic BP initially ranged from 137 to 138 mmHg, reducing to 118 to 124 mmHg post-intervention, and diastolic BP started between 82 and 88 mmHg, decreasing to 76 to 82 mmHg after intervention.

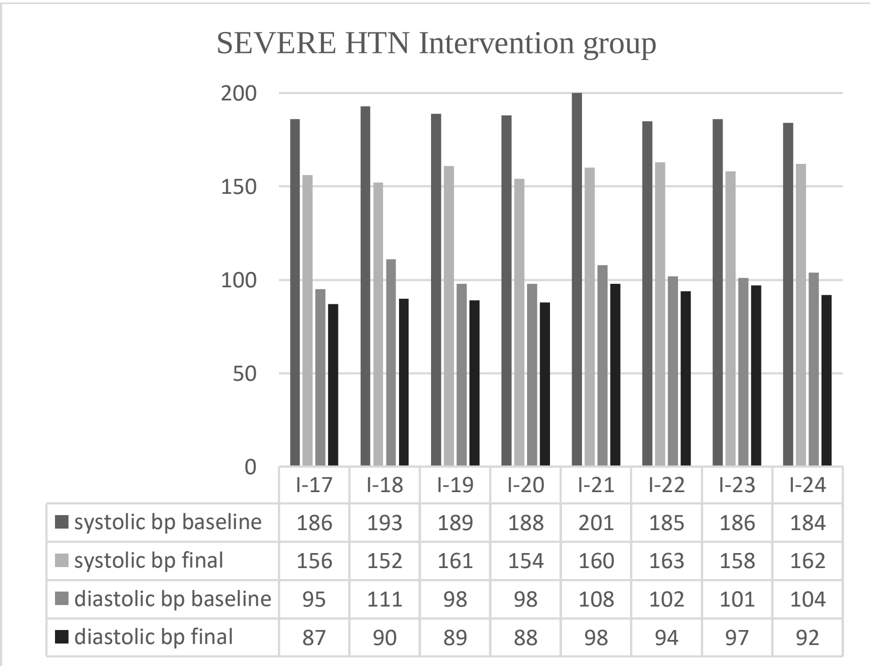
Graph 5. MODERATE HTN Intervention group



	I-09	I-10	I-11	I-12	I-13	I-14	I-15	I-16
systolic bp baseline	145	158	146	156	149	147	147	160
systolic bp final	129	139	125	134	124	134	126	140
diastolic bp baseline	92	97	92	92	91	88	97	94
diastolic bp final	83	89	83	86	82	85	84	88

The graph shows the effect of an intervention on individuals (I-09 to I-16) with moderate hypertension, with systolic and diastolic blood pressure values before and after the intervention. The systolic BP ranged from 145 to 160 mmHg at baseline, and the diastolic BP decreased from 88 to 97 mmHg to 82 to 89 mmHg post-intervention.

Graph 6. SEVERE HTN Intervention group



	I-17	I-18	I-19	I-20	I-21	I-22	I-23	I-24
systolic bp baseline	186	193	189	188	201	185	186	184
systolic bp final	156	152	161	154	160	163	158	162
diastolic bp baseline	95	111	98	98	108	102	101	104
diastolic bp final	87	90	89	88	98	94	97	92

The graph shows blood pressure changes in individuals I-17 to I-24) with severe hypertension after an intervention. The x-axis represents different individuals, while the y-axis shows blood pressure values. Systolic BP dropped from 184 to 201 mmHg to 152 to 163 mmHg post-intervention, and diastolic BP decreased from 95 to 111 mmHg to 87 to 98 mm Hg.

Table 2: Paired t-Test for Within-Group Comparison (Before vs. After Intervention)

BP Type	Group	Baseline Mean ± SD	Post-Intervention Mean ± SD	t-Stat	t-Critical (Two-Tailed)	p-value (Two-Tailed)	Conclusion
Systolic	Control	160.46 ± 21.96	149.63 ± 20.44	17.35	2.0686	1.05E-14	Significant ↓
Systolic	Intervention	158.75 ± 23.18	136.50 ± 16.99	13.84	2.0686	1.22E-12	Significant ↓
Diastolic	Control	93.58 ± 7.70	88.50 ± 4.83	6.53	2.0686	1.15E-06	Significant ↓
Diastolic	Intervention	93.25 ± 8.11	85.38 ± 5.98	9.71	2.0686	1.33E-09	Significant ↓

Table 2 shows the results of paired t-test for systolic and diastolic BP within the groups before and after the intervention. In all instances, the t-statistic is higher than the critical value (t-critical = 2.0686, df = 23), demonstrating a significant decrease in BP following the intervention. The p-value < 0.05, which attests to the fact that the decline in BP within both groups is statistically significant. But the intervention group had a greater reduction in BP than the control group.

Table 3: ANOVA for Between-Group Comparison

BP Type	Group	Mean ± SD	F-Stat	F-Critical	p-value	Conclusion
Systolic	Control	149.63 ± 20.44	5.86	4.0517	**0.019**	Significant Difference
Systolic	Intervention	136.50 ± 16.99				
Diastolic	Control	88.50 ± 4.83	3.96	4.0517	**0.052**	Borderline Significant
Diastolic	Intervention	85.38 ± 5.98				

Table 3 presents the results of a one-way ANOVA to compare the final systolic and diastolic BP between the control and intervention groups. The F-statistic (5.86) for systolic BP exceeds the F-critical value (4.0517, df = 1,46), confirming a significant difference between groups ($p = 0.019$). This suggests that the intervention had a stronger effect in reducing systolic BP.

For diastolic BP, the F-statistic (3.96) is slightly below the F-critical value (4.0517), leading to a borderline significant result ($p = 0.052$). This indicates a potential trend towards improvement in the intervention group, but it does not reach full statistical significance at the 0.05 level.

DISCUSSION

The results of this research indicate that interventions by pharmacists caused a considerable increase in the control of blood pressure over usual care. Systolic BP, in the intervention group, decreased from 137–138 mmHg at baseline to 118–124 mmHg after the intervention, while diastolic BP dropped from 82–88 mmHg to 76–82 mmHg. In patients with moderate hypertension, systolic BP fell from 145–160 mmHg to 132–144 mmHg, and diastolic BP fell from 88–97 mmHg to 82–89 mmHg. In severe hypertension, the systolic BP decreased significantly from 184–201 mmHg to 152–163 mmHg, and diastolic BP fell from 95–111 mmHg to 87–98 mmHg. These changes were statistically significant ($p < 0.05$) as evidenced by paired t-tests and ANOVA analysis.

On the other hand, the control group, treated only with standard therapy, had relatively smaller reductions. Systolic BP of mild hypertensive patients fell from 132–138 mmHg to 124–127 mmHg, whereas diastolic BP barely changed (82–87 mmHg to 82–85 mmHg). Moderate hypertensives presented with systolic BP falls from 152–170 mmHg to 144–162 mmHg, and their diastolic BP fell marginally from 87–99 mmHg to 83–94 mmHg. In severe hypertension, systolic BP fell from 182–193 mmHg to 166–178 mmHg and diastolic BP from 97–107 mmHg to 91–98 mmHg. The lesser extent of change in this group reflects the contribution of pharmacist interventions.

Adherence to medication, measured using MMAS-8, was significantly enhanced in the intervention group. The patients moved from medium/low adherence (scores ≤7) at baseline to increased post-intervention adherence, whereas the control group had minimal change. This is consistent with prior evidence that pharmacist counseling targets the hurdles of adherence directly, such as forgetfulness, misbeliefs about therapy, and limited knowledge about managing hypertension.

Also, the patients in the intervention group showed greater knowledge of hypertension, lower hospitalization rates, and increased quality of life than the control group. These results show that pharmacists' participation is not limited to clinical indicators but extends to overall care through lifestyle changes including diet, exercise, and stress management.

Although the study shows encouraging outcomes, it is hampered by its small sample size (n = 48), single-center design, and relatively brief 3-month follow-up. Larger multicenter trials with longer follow-up are required to validate the long-term sustainability of these benefits. The evidence does strongly indicate, however, that integrating pharmacists into models of hypertension care can result in better blood pressure control, increased medication adherence, decreased health care utilization, and improved patient quality of life.

CONCLUSION

The present work highlights the valuable role of intervention by a pharmacist in order to improve blood pressure control, medication adherence, and patient education among patients with hypertension. The intervention group had a larger reduction in systolic and diastolic BP ($p < 0.05$) compared with the control group, indicating the effectiveness of lifestyle education and counseling by the pharmacist.

Compliance to medication was increased remarkably in the intervention group based on the Morisky Medication Adherence Scale (MMAS-8). Greater numbers of patients advised by the pharmacists had greater awareness of blood pressure control, leading to improved compliance and clinical outcomes.

Besides this, hospitalization was decreased and quality of life was enhanced in the intervention group due to better control of BP and fewer complications. These findings suggest that incorporating pharmacists into the regular control of hypertension would enhance outcomes of treatment to a large degree and make the healthcare system to a large degree.

However, the study has limitations like small population, short follow-up period (3 months), and single-center study. Subsequent studies must conduct long-term studies on large populations to identify the sustainability of interventions by pharmacists.

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