

THE ROLE OF MEDICATION ADHERENCE, SELF-CARE, AND SELF-EFFICACY IN ACHIEVING OPTIMAL BLOOD PRESSURE CONTROL AMONG HYPERTENSIVE PATIENTS IN PUNJAB

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Abstract

Background: Hypertension remains a leading public health challenge in Pakistan, where poor medication adherence and inadequate self-care contribute to uncontrolled blood pressure. This study assessed the role of medication adherence, self-care, and self-efficacy in blood pressure control among hypertensive patients. **Materials & Methods:** A cross-sectional study was conducted at Lahore General Hospital and Jinnah Hospital, Lahore, including 420 hypertensive patients. Data were collected using structured questionnaires covering socio-demographic factors, the Girerd Adherence Scale, the Self-Care of Hypertension Inventory, and the Self-Efficacy for Managing Chronic Disease Scale. Blood pressure was measured clinically, with uncontrolled BP defined as $\geq 140/90$ mmHg. **Results:** Among 420 hypertensive patients, 33.3% had high adherence, 45.2% moderate adherence, and 21.5% low adherence, with adherence significantly associated with knowledge ($r = 0.22$, $p < 0.001$), self-care maintenance ($r = 0.34$, $p < 0.001$), and self-efficacy ($r = 0.29$, $p < 0.001$). Patients taking ≥ 3 antihypertensive pills/day ($OR = 1.92-2.61$, $p < 0.01$) and those reporting side effects ($OR = 1.81$, $p = 0.001$) were more likely to show poor adherence, while controlled blood pressure reduced the odds of low adherence by 63% ($OR = 0.37$, $p < 0.001$). **Conclusion:** The study concludes that medication adherence among hypertensive patients in Punjab is significantly influenced by pill burden, side effects, knowledge, self-care, and self-efficacy, highlighting the need for targeted interventions to improve blood pressure control.

INTRODUCTION

Hypertension is one of the leading global health concerns, contributing significantly to cardiovascular morbidity and mortality. Despite advances in prevention and treatment, the worldwide prevalence of hypertension continues to rise, affecting over one billion people (Zhou et al., 2021a; Mills et al., 2020).

The World Health Organization (2023) recognizes hypertension as a major cause of premature death, with inadequate control being more common in low- and middle-income countries where health system resources are limited. In Pakistan, including Punjab province, the increasing burden of hypertension

poses a public health challenge due to high prevalence, low treatment adherence, and limited awareness regarding lifestyle modifications.

Medication adherence is a cornerstone of effective hypertension management, yet poor compliance remains a key factor contributing to uncontrolled blood pressure. Studies have shown that inadequate adherence significantly compromises treatment outcomes and increases the risk of complications (Burnier et al., 2020; Paczkowska et al., 2021). Furthermore, socio-demographic and health system barriers exacerbate the problem in developing regions, underscoring the need for strategies that improve adherence and promote sustainable hypertension control (Gebremichael et al., 2019). Alongside pharmacological management, patient engagement in non-pharmacological measures such as diet, exercise, and routine monitoring of blood pressure plays a critical role in achieving optimal control.

Beyond adherence and lifestyle, self-efficacy—the belief in one's capacity to perform necessary behaviors—has emerged as a crucial determinant of hypertension management. Higher self-efficacy has been linked to better self-care practices and improved health outcomes among hypertensive patients (Tan et al., 2021). Evidence suggests that interventions which strengthen patients' confidence in managing their illness not only enhance medication adherence but also reinforce sustained lifestyle modifications (Zhou et al., 2021b). Therefore, this study aims to assess the role of medication adherence, self-care, and self-efficacy in achieving optimal blood pressure control among hypertensive patients in Punjab, where identifying these interrelated factors can inform targeted interventions to reduce the burden of hypertension.

1. Materials and Methods

1.1 Study Design and Setting

A hospital-based cross-sectional study is proposed to be conducted between May and August 2025 at two major tertiary care hospitals in Lahore: Lahore General Hospital and Jinnah Hospital, Lahore. These hospitals were selected as study sites due to their large patient inflow and well-established outpatient services for hypertensive patients.

1.2 Study Population and Sample Size

The target population will include adult hypertensive patients attending outpatient medical clinics for follow-up. A sample size of 420 hypertensive patients has been proposed, calculated using the WHO formula for estimation of population proportion, with a 95% confidence level and 5% margin of error. Patients will be recruited using a systematic random sampling technique from the daily appointment registers.

1.3 Eligibility Criteria

Inclusion criteria will comprise patients aged ≥ 18 years, diagnosed with hypertension, and receiving antihypertensive treatment for at least one year. Patients with pregnancy, communication disorders, or untreated mental illnesses will be excluded.

1.4 Data Collection Tools

Data will be collected through a structured questionnaire consisting of four validated sections.

Sociodemographic and clinical profile: Age, gender, education, occupation, socioeconomic status, duration of hypertension, complications, number of prescribed medications, and side effects.

Medication adherence: Assessed using the 6-item Girerd scale, which classifies patients into high, moderate, or low adherence based on responses.

Self-care practices: Measured using the Self-care of Hypertension Inventory (SC-HI), which evaluates maintenance, monitoring, and management behaviors, with scores ≥ 70 considered adequate self-care.

Self-efficacy: Assessed through the Self-Efficacy for Managing Chronic Disease 6-Item Scale, with scores converted to a 0–100 scale; scores < 66 indicate poor self-efficacy. Blood pressure will also be measured during data collection, with uncontrolled BP defined as systolic ≥ 140 mmHg or diastolic ≥ 90 mmHg.

1.5 Data Collection Procedure

Face-to-face interviews will be conducted in a private setting to ensure comfort and confidentiality. The questionnaire will be administered in Urdu for better comprehension. Each session, including interview and BP measurement, will take approximately 20–25 minutes per participant.

1.6 Data Analysis

Data will be analyzed using SPSS version 25.0. Descriptive statistics (frequencies, percentages, mean, and standard deviation) will be used for baseline characteristics. The Chi-square test and ANOVA will be applied to examine associations between adherence, self-care, self-efficacy, and blood pressure control. Binary logistic regression will be used to identify independent predictors of poor adherence

and uncontrolled blood pressure. A p-value ≤ 0.05 will be considered statistically significant.

1.7 Ethical Considerations

Written informed consent will be secured from all participants prior to data collection. Confidentiality and anonymity of data will be strictly maintained, and participation will be voluntary with the right to withdraw at any stage.

2. Results

Table 1. Socio-demographic characteristics of respondents (n = 420)

Variables	Frequency (n)	Percentage (%)
Age (years)		
Mean (SD*)	42.4 (7.8)	-
Sex		
Male	142	33.8%
Female	278	66.2%
Level of Education		
Illiterate	88	21.0%
Primary	218	51.9%
Secondary	95	22.6%
University	19	4.5%
Socio-economic Level		
Low	102	24.3%
Moderate	300	71.4%
High	18	4.3%
Occupation		
Unemployed**	342	81.4%
Employed	78	18.6%

The study population of 420 hypertensive patients had a mean age of 42.4 years (SD = 7.8), indicating a comparatively younger cohort of patients. The majority were female (66.2%), with more than half having primary education (51.9%), while a small proportion (4.5%) attained university-level education. In terms of socio-economic status, most belonged to the moderate-income group (71.4%), with fewer in low (24.3%) and high (4.3%) categories. Regarding occupation, a substantial portion were unemployed (81.4%), including housewives and retired individuals, while 18.6% were employed. These characteristics highlight that hypertension is increasingly affecting middle-aged adults in Punjab, particularly among women and those with limited education.

Table 2. Clinical characteristics of patients (N = 420)

Variables	Frequency (n)	Percentage (%)
Medical Antecedents		
Total (≥ 1 condition)	332	79.0%
Diabetes	216	51.4%
Dyslipidemia	188	44.8%
Other cardiovascular diseases	47	11.2%
Other conditions (asthma, thyroid, etc.)	82	19.5%

Number of Antecedents		
1	168	40.0%
2	128	30.5%
≥ 3	36	8.5%
Body Mass Index (kg/m²)	Median = 27.1	IQR = 4.8
Duration of Hypertension (years)	Median = 9.0	IQR = 5.0
Systolic BP (mmHg)	Median = 146	IQR = 12.0
Diastolic BP (mmHg)	Median = 84	IQR = 8.0
Uncontrolled Blood Pressure	300	71.4%
Complications of Hypertension		
Total	61	14.5%
Heart attack	35	8.3%
Kidney failure	19	4.5%
Stroke	7	1.7%
No. of Anti-hypertensive Pills/Day		
1	110	26.2%
2	130	31.0%
3	138	32.9%
≥ 4	42	10.0%
Total Pills/Day (all medications)		
1-5	250	59.5%
6-10	145	34.5%
≥ 11	25	6.0%
Reported Side Effects	78	18.6%

Among the 420 hypertensive patients, the majority (79%) reported at least one medical antecedent, with diabetes (51.4%) and dyslipidemia (44.8%) being most common. The median duration of hypertension was 9 years, and over 71% had uncontrolled blood pressure despite treatment. Hypertension-related complications were reported by 14.5%, primarily heart attacks (8.3%) and kidney failure (4.5%). Most patients were on multiple antihypertensive medications, with nearly one-third (32.9%) taking three drugs daily, and 18.6% reported side effects. These findings highlight the clinical challenges in achieving optimal blood pressure control, emphasizing the role of adherence, self-care, and self-efficacy in improving outcomes.

Table 3. Medication adherence, knowledge about hypertension, self-care, and self-efficacy (N = 420)

Variables	Frequency (n)	Percentage (%)	Median (IQR*)
Medication Adherence			
High	140	33.3%	–
Moderate	190	45.2%	–
Low	90	21.5%	–
Hypertension Knowledge Level			
Good	110	26.2%	–
Moderate	200	47.6%	–
Low	110	26.2%	–
Self-care of Hypertension Inventory (/100)			
Self-care Maintenance (>70)	180	42.9%	58.0 (15.0)
Self-care Monitoring (>70)	165	39.3%	55.5 (18.0)

Self-care Management (>70)	95	22.6%	50.2 (16.5)
Self-Efficacy for Managing Chronic Disease (/100)			
< 66 (low)	260	61.9%	54.0 (14.0)
≥ 66 (adequate)	160	38.1%	–

Among the 420 hypertensive patients, about one-third (33.3%) demonstrated high medication adherence, while nearly half (45.2%) had moderate adherence, and 21.5% showed low adherence. Knowledge about hypertension was moderate in 47.6%, whereas only 26.2% exhibited good knowledge. Self-care scores revealed that less than half of patients achieved adequate levels in maintenance (42.9%) and monitoring (39.3%), with even fewer (22.6%) scoring high in management behaviors. Self-efficacy was generally low, with 61.9% scoring below 66, reflecting limited confidence in managing their condition. These findings indicate that while many patients are moderately adherent and knowledgeable, significant gaps remain in self-care and self-efficacy, directly impacting optimal blood pressure control.

Table 4. Socio-demographic factors related to medication adherence among hypertensive patients (N = 420)

Variable	Low Adherence (n=90)	Moderate Adherence (n=190)	High Adherence (n=140)	P-value
Age (years), Mean (SD)	44.1 (7.9)	42.3 (7.6)	41.2 (7.4)	0.210
Sex (n, %)				
Male	30 (21.1)	60 (42.3)	52 (36.6)	0.684
Female	60 (21.6)	130 (46.8)	88 (31.6)	
Level of Education (n, %)				
Illiterate	32 (36.4)	40 (45.5)	16 (18.1)	0.004
Primary	40 (18.3)	110 (50.5)	68 (31.2)	
Secondary/University	18 (13.8)	40 (30.8)	56 (55.4)	
Socio-economic Level (n, %)				
Low	38 (37.3)	48 (47.1)	16 (15.6)	0.006
Moderate	48 (16.0)	128 (42.7)	124 (41.3)	
High	4 (22.2)	14 (77.8)	0 (0.0)	
Occupation (n, %)				
Unemployed**	78 (22.8)	180 (52.6)	84 (24.6)	0.372
Employed	12 (15.4)	34 (43.6)	26 (41.0)	

Among 420 hypertensive patients, education and socio-economic status emerged as significant factors associated with medication adherence. Illiterate and low-income patients were more likely to have low adherence (36.4% and 37.3%), while those with higher education and moderate income showed greater high adherence (55.4% and 41.3%) ($p < 0.01$). Age, sex, and occupation showed no significant associations with adherence levels. These results suggest that improving patient education and addressing socio-economic barriers could enhance adherence and support better blood pressure control.

Table 5. Clinical-related factors associated with medication adherence among hypertensive patients (N = 420)

Variable	Low Adherence (n=90)	Moderate Adherence (n=190)	High Adherence (n=140)	P- value
Duration of hypertension (years), Median (IQR)	11.0 (6.0)	9.0 (5.0)	7.0 (4.0)	<0.001
Systolic BP (mmHg), Median (IQR)	150 (18)	146 (16)	142 (14)	<0.001
Diastolic BP (mmHg), Median	85 (10)	83 (9)	81 (8)	<0.001

(IQR)				
Controlled blood pressure (n, %)				<0.001
Yes	15 (16.7)	65 (36.1)	100 (71.4)	
No	75 (83.3)	125 (65.9)	40 (28.6)	
Body Mass Index (kg/m²), Median (IQR)	27.8 (5.0)	27.3 (4.8)	26.5 (4.5)	0.118
Complications of hypertension (n, %)	16 (17.8)	26 (13.7)	12 (8.6)	0.210
Medical antecedents (n, %)				0.028
Yes	75 (83.3)	150 (78.9)	107 (76.4)	
No	15 (16.7)	40 (21.1)	33 (23.6)	
No. of anti-hypertensive pills/day (n, %)				<0.001
1	15 (16.7)	40 (21.1)	55 (39.3)	
2	25 (27.8)	70 (36.8)	35 (25.0)	
3	35 (38.9)	55 (28.9)	28 (20.0)	
≥ 4	15 (16.7)	25 (13.2)	22 (15.7)	
No. of total pills/day (n, %)				<0.001
1–5	40 (44.4)	120 (63.2)	90 (64.3)	
6–10	38 (42.2)	60 (31.6)	30 (21.4)	
≥ 11	12 (13.4)	10 (5.2)	20 (14.3)	
Reported side effects (n, %)				<0.001
Yes	40 (44.4)	35 (18.4)	10 (7.1)	
No	50 (55.6)	155 (81.6)	130 (92.9)	

Among the 420 hypertensive patients, clinical factors were significantly associated with medication adherence. Patients with longer duration of hypertension and higher blood pressure values were more likely to report low adherence ($p < 0.001$). Controlled blood pressure was highest among patients with high adherence (71.4%), compared to only 16.7% among those with low adherence. Medication burden played a strong role: patients taking ≥ 3 antihypertensive pills/day and reporting side effects (44.4%) were more often in the low adherence group ($p < 0.001$). By contrast, those on fewer pills/day (1–5) and without side effects demonstrated significantly better adherence. These findings underline that reducing pill burden, managing side effects, and achieving blood pressure control are central to improving adherence.

Table 6. Association of knowledge, self-care, and self-efficacy with medication adherence among hypertensive patients (N = 420)

Variable	Low (n=90) Median (IQR)	Moderate (n=190) Median (IQR)	High (n=140) Median (IQR)	P-value a	r b	P- value
Hypertension Knowledge Score (/100)	48.0 (12.0)	54.0 (15.0)	60.0 (14.0)	<0.001	0.22	<0.001
Self-care of Hypertension Inventory (/100)	-	-	-	-	-	-
Maintenance	45.0 (18.0)	54.0 (15.0)	60.0 (14.0)	<0.001	0.34	<0.001
Monitoring	40.0 (20.0)	46.0 (18.0)	52.0 (15.0)	0.004	0.18	<0.001
Management	42.0 (16.0)	50.0 (14.0)	56.0 (15.0)	<0.001	0.27	<0.001
Self-Efficacy (/100)	50.0 (12.0)	55.0 (11.0)	60.0 (10.0)	<0.001	0.29	<0.001

Knowledge, self-care, and self-efficacy were all positively associated with medication adherence. Patients with low adherence had the lowest median scores for knowledge (48/100), self-care maintenance (45/100), and self-efficacy

(50/100), while those with high adherence consistently showed higher scores across all domains (knowledge: 60/100, maintenance: 60/100, self-efficacy: 60/100). The associations were statistically significant ($p < 0.001$), with the strongest correlation observed for self-care maintenance ($r = 0.34$), followed by self-efficacy ($r = 0.29$). These findings highlight that improved knowledge, stronger self-care behaviors, and greater self-efficacy are key determinants of better adherence to antihypertensive therapy.

Table 7. Factors associated with low medication adherence among hypertensive patients (N = 420)

Variable	OR ^a	95% CI	P-value
Number of antihypertensive pills/day			0.004
2 vs 1 pill	1.58	1.05 – 2.41	0.031
3 vs 1 pill	1.92	1.22 – 3.02	0.005
≥ 4 vs 1 pill	2.61	1.41 – 4.82	0.002
Side effects (Yes vs No)	1.81	1.25 – 2.61	0.001
Self-care maintenance insufficient	2.15	1.50 – 3.09	<0.001
Self-efficacy insufficient	1.76	1.22 – 2.52	<0.001
Controlled hypertension (Yes vs No)	0.37	0.24 – 0.56	<0.001

Multivariate logistic regression analysis identified several independent predictors of low medication adherence. Patients taking three or more antihypertensive pills daily were significantly more likely to be non-adherent, with the risk increasing progressively from OR = 1.92 (3 pills) to OR = 2.61 (≥4 pills). The presence of side effects also nearly doubled the odds of poor adherence (OR = 1.81, $p = 0.001$). Behavioral factors, including insufficient self-care maintenance (OR = 2.15) and low self-efficacy (OR = 1.76), were strongly associated with non-adherence. In contrast, patients with controlled blood pressure had a substantially lower likelihood of poor adherence (OR = 0.37, $p < 0.001$). These findings emphasize that both clinical (pill burden, side effects) and behavioral (self-care, self-efficacy) factors significantly shape adherence outcomes among hypertensive patients.

3. Discussion

The findings of this study indicate that a significant proportion of hypertensive patients demonstrated moderate to high adherence, though a considerable number still reported low adherence. This aligns with prior work using the Girerd scale, which has been validated for assessing antihypertensive medication compliance in clinical settings (Girerd et al., 2001). Socioeconomic factors also play a central role, as documented in the African Housing Finance Yearbook, where financial constraints and healthcare affordability directly impact patients' ability to maintain long-term adherence (Anet, 2019). In line with studies conducted during the COVID-19 pandemic, disruptions in healthcare access and financial barriers have been identified as key contributors to fluctuating adherence levels among patients with chronic diseases, including hypertension (Foster et al., 2023; Ismail et al., 2022). Knowledge and self-care behaviors were also closely associated with adherence in this study. Patients with adequate knowledge of hypertension demonstrated

better adherence, supporting earlier findings that patient awareness and understanding of the disease significantly improve compliance (Eshah & Aldaken, 2016; Paczkowska et al., 2021). Similarly, self-care behaviors such as monitoring, maintenance, and management were positively linked to adherence, reinforcing evidence from studies validating the Self-care of Hypertension Inventory, which has proven reliable across diverse populations (Alsaqer & Bebis, 2021). Further, interventions aimed at promoting lifestyle modifications and structured self-care support, even during challenging contexts like the COVID-19 lockdown, have shown measurable improvements in blood pressure outcomes (Alsaqer & Bebis, 2022).

Finally, self-efficacy emerged as a strong predictor of medication adherence, echoing results from multiple studies demonstrating its mediating role between health literacy and adherence behaviors (Shen et al., 2020). Patients with low self-efficacy were more likely to report poor adherence, consistent with evidence highlighting that self-efficacy influences patients'

confidence in maintaining medication routines and self-care practices (Allam et al., 2020). Meta-analytic findings further strengthen this conclusion, suggesting that both self-efficacy and social support significantly improve adherence in hypertensive patients (Sukma et al., 2023). Tailored patient education programs and patient-centered communication models have also been recommended to enhance self-efficacy and empower patients to take ownership of their treatment (Ricci et al., 2022). Taken together, these results highlight the importance of integrating behavioral, educational, and systemic support to improve medication adherence and blood pressure control among hypertensive patients.

4. Conclusion

The study concluded that while a majority of hypertensive patients demonstrated moderate to high medication adherence, a considerable proportion still exhibited low adherence, largely influenced by pill burden and side effects. Knowledge, self-care practices, and self-efficacy were found to be strong predictors of adherence, with higher scores significantly associated with better compliance. Strengthening patient education, fostering self-care behaviors, and enhancing self-efficacy are therefore essential strategies for improving adherence and achieving optimal blood pressure control in Punjab.

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