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Factors Associated with Non-Adherence to Antihypertensive Medications Among Older Adults Attending a Tertiary Care Hospital in Lahore, Pakistan

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Abstract

Background: Blood pressure pills only work if patients actually take them, yet many older adults with hypertension quietly skip doses for reasons that are rarely asked about at a routine clinic visit. Non-adherence is shaped by a mix of patient, therapy, financial, and health-system barriers, and how much each barrier matters differs from one setting to the next, which is why local evidence is needed.

Objective: To describe how well older hypertensive patients follow their medication, measure how common seven candidate barriers are, and identify which barriers are independently linked to falling short of high adherence.

Methods: A cross-sectional analytic study was conducted among 150 older adults attending a large public tertiary-care hospital. Adherence was classified as low, medium, or high, and then collapsed into a binary outcome (non-high vs. high adherence) for statistical testing. Seven barriers — forgetfulness, cost, side effects, regimen complexity, low health literacy, access difficulty, and low social support — were tested against non-high adherence using Pearson chi-square tests, followed by multivariable binary logistic regression adjusting for all seven barriers together. Independent-samples t-tests compared continuous clinical variables across adherence groups, and a chi-square test examined the link between adherence and blood-pressure control.

Results: Participants were 68.0 years old on average. Adherence was low in 22 participants (14.7%), medium in 76 (50.7%), and high in 52 (34.7%), for a combined non-high-adherence rate of 65.3%. The most common barriers were cost (48.7%),

forgetfulness (46.7%), access difficulty (40.0%), and regimen complexity (38.7%). Only forgetfulness ($p = .013$) and side effects ($p = .020$) were significantly associated with non-high adherence at the bivariate level. The number of barriers a patient carried rose steadily from high adherers (2.4 ± 1.3) to low adherers (3.6 ± 1.4), $F = 8.22$, $p < .001$. In the adjusted model ($\chi^2(7) = 18.04$, $p = .012$; Nagelkerke $R^2 = 0.156$; 68.7% correctly classified), forgetfulness (aOR 2.71, 95% CI 1.29–5.70, $p = .008$) and side effects (aOR 3.27, 95% CI 1.26–8.47, $p = .015$) remained independent predictors; cost approached but did not reach significance (aOR 1.83, 95% CI 0.87–3.85, $p = .109$). Adherence category was not significantly associated with blood-pressure control ($\chi^2 = 2.71$, $p = .258$).

Conclusion: Almost two out of three older patients fell short of high adherence, and forgetting doses and troublesome side effects stood out as the strongest, independent red flags. These findings echo the international literature on older-adult hypertension care and point toward nursing interventions that combine memory support with proactive side-effect review, rather than relying on education alone.

Introduction

A prescription is only half of the treatment. The other half depends on whether the patient actually swallows the pill — day after day, often for the rest of their life. For older adults with hypertension, that second half is surprisingly hard to get right. Hypertension remains one of the leading contributors to cardiovascular and renal disease worldwide, and its management in older adults is complicated by lifelong, largely symptom-free treatment, multiple coexisting illnesses, and polypharmacy. The World Health Organization has repeatedly flagged hypertension as a major and only partially controlled global health problem, with a wide gap between how many people are diagnosed and how many achieve sustained blood-pressure control (World Health Organization, 2023, 2025). Because antihypertensive therapy rarely produces a noticeable “I feel better” moment, adherence depends far more on habit, belief, affordability, and system support than on symptom relief.

Medication adherence is best understood as a behavior shaped by many forces at once, not a fixed personality trait. The World Health Organization's adherence framework groups these forces into five interacting dimensions: socioeconomic, health-system, condition-related, therapy-related, and patient-related factors (World Health Organization, 2003). Reviews focused specifically on older adults with hypertension echo this structure, pointing to financial status, number of medicines, disease duration, comorbidity burden, cognitive change, and health behaviors as recurring correlates of non-adherence (Ruksakulpiwat et al., 2024), while broader geriatric literature adds memory deficits, polypharmacy, physical limitations, health beliefs, social-support gaps, and health-system shortcomings as compounding influences (Stanly et al., 2025). Older adults tend to face several of these pressures at the same time. Multimorbidity multiplies the number of medicines and the complexity of dosing schedules; sensory and cognitive changes make it easier to forget a dose or misread instructions; fixed or shrinking incomes make recurring medicine costs harder to absorb; and reduced mobility or dependence on caregivers can turn a routine pharmacy refill into a logistical hurdle. A scientific statement from the American Heart Association has called for systematic adherence screening built into routine care, paired with multilevel interventions such as regimen simplification, team-based care, self-monitoring, and lower out-of-pocket costs (Choudhry et al., 2022). Qualitative evidence across settings tells a consistent story: education alone, without also tackling system-level and financial barriers, rarely produces lasting improvements in adherence (Zhou et al., 2024).

Adherence is also local. The relative weight of forgetfulness versus cost versus health-system access shifts across health systems, family structures, and levels of health literacy. This context-dependence is the central reason for grounding adherence

research in a specific setting — in this case, a large public tertiary-care teaching hospital in a major Pakistani city, where older adults from a wide catchment area attend ongoing hypertension follow-up.

Objectives

Determine the proportion of older adults with low, medium, and high antihypertensive adherence.

Describe the prevalence of patient-related, therapy-related, and socioeconomic/system barriers to adherence.

Test the association between each barrier and non-high adherence.

Identify the barriers that remain independently associated with non-high adherence after adjustment.

Examine the association between adherence category and blood-pressure control.

Hypotheses

For each barrier, the null hypothesis (H0) stated that no association exists between that barrier and non-high adherence; the alternative hypothesis (H1) stated that an association exists. The same null/alternative structure was applied to the association between adherence category and blood-pressure control. Statistical significance was set a priori at $\alpha = .05$.

Operational Definitions

To keep every measurement transparent and reproducible, the key study variables were defined and measured as follows.

Older Adult

Any participant aged 60 years or older at the time of data collection, consistent with the eligibility criteria for this study

Hypertension

A prior clinician diagnosis of hypertension documented in the patient's medical record, with the participant having used at least one antihypertensive medicine for three months or longer at the time of enrollment.

Medication Adherence

The degree to which a participant's medicine-taking behavior matched the prescribed antihypertensive regimen, measured with a licensed structured adherence scale and pre-classified into three ordinal categories — low, medium, and high adherence — based on the scale's standard scoring algorithm.

Non-High Adherence (Primary Outcome)

A binary variable created for statistical testing by combining the low- and medium-adherence categories (coded 1) and comparing them against high adherence (coded 0). This dichotomy reflects the clinically meaningful distinction between adequate and inadequate adherence, rather than treating all three ordinal levels separately.

Barriers to Adherence

Eight yes/no items, each capturing the self-reported presence or absence of a specific obstacle to taking medication as prescribed, drawn directly from participant responses on the structured barriers checklist:

Forgetfulness — forgetting to take a dose because of memory lapses or a disrupted routine.

Cost barrier — difficulty affording the ongoing cost of antihypertensive medicine.

Side effects — experiencing unwanted physical effects (e.g., dizziness, fatigue) that discourage regular use.
Regimen complexity — difficulty following the prescribed dosing schedule because of the number of pills or dosing times involved.
Low health literacy — difficulty understanding medication instructions or the reason for treatment.
Access/refill difficulty — difficulty reaching a pharmacy or clinic to obtain or refill medicine.
Low social support — lack of a family member, caregiver, or other person to help with reminders or logistics.
Belief medicine is unnecessary when asymptomatic — the belief that treatment can be skipped once no symptoms are felt.
Seven of these eight items (all except the asymptomatic-belief item) were entered as the core barrier set in the inferential analyses, consistent with the pre-specified analysis plan.

Number of Concurrent Barriers
A simple count, ranging from 0 to 8, of how many of the eight barrier items a participant endorsed, used to capture cumulative barrier burden rather than any single barrier in isolation.

Blood Pressure Control
A binary clinical variable based on the participant's blood-pressure reading at the time of assessment, classified as controlled or uncontrolled against standard clinical thresholds for treated hypertension used at the study site.

Methods

Study Design
This study used a hospital-based, analytical cross-sectional design. A cross-sectional design is well suited to estimating how common a problem is and testing whether factors are statistically associated with it, but because barrier status and adherence were both measured at a single point in time, the design cannot establish which came first — that is, it does not support causal conclusions.

Study Setting
Data were collected from the outpatient and hypertension follow-up services of a large public tertiary-care teaching hospital in Lahore, Pakistan. As a tertiary referral center, the hospital draws older hypertensive patients from a wide catchment area, providing a clinically diverse and relevant sample for studying adherence barriers.

Study Population and Sample Size
The target population was adults aged 60 years or older with a diagnosis of hypertension who had used at least one antihypertensive medicine for three months or longer.
Inclusion criteria: age ≥ 60 years; a documented diagnosis of hypertension; ≥ 3 months of antihypertensive treatment; ability to communicate in Urdu, Punjabi, or English; and willingness to provide informed consent.
Exclusion criteria: acute clinical instability; severe cognitive or communication impairment that would preclude a valid interview; critical illness; or inability to verify active antihypertensive treatment.
Sample size: the required sample was calculated using the single-proportion formula $n = Z^2p(1-p)/d^2$, with $Z = 1.96$, $p = .50$ (the most conservative assumption in the absence of a reliable local adherence-prevalence estimate), and a precision of $d = .08$. This calculation yielded a minimum required sample of approximately 150 participants, which was achieved in full.

Sampling Technique

Participants were recruited using consecutive sampling: every eligible patient presenting during the recruitment window was approached, in the order they arrived, until 150 complete records were obtained. A recruitment log tracked eligibility screening, approach, consent, exclusions, and completion for each patient considered, supporting a transparent and auditable recruitment trail.

Study Instrument (Tool)

Data were collected using a structured, interviewer-administered questionnaire with four sections:

Sociodemographic characteristics: age, sex, marital status, residence, education, employment, and monthly income.

Clinical and regimen characteristics: hypertension duration, number of antihypertensive medicines, daily dosing frequency, number of comorbidities, and blood-pressure reading.

Structured barriers checklist: eight yes/no items covering side effects, forgetfulness, cost, access/refill difficulty, low health literacy, low social support, regimen complexity, and the belief that medicine is unnecessary when asymptomatic.

Validated adherence measure: a licensed medication adherence scale used to derive the three-level adherence category.

The intended adherence measure was the licensed Morisky Medication Adherence Scale (MMAS-8), which is proprietary and requires formal licensing; consistent with the scale developer's copyright terms, its item wording and scoring algorithm are not reproduced in this article (Morisky Scale, n.d.). The pre-derived three-level adherence category (low, medium, high) used throughout this article was generated directly from that licensed score.

Outcome Definition

For inferential analysis, the three-level adherence variable was dichotomized into the binary outcome described in Section 2.4 — non-high adherence (low or medium = 1) versus high adherence (= 0) — consistent with the pre-specified analysis plan. This binary framing follows convention in the adherence literature, where the clinically meaningful distinction is typically between adequate (high) and inadequate (low/medium) adherence rather than among all three ordinal categories.

Data Analysis Plan

All data were analyzed using SPSS. Categorical variables are reported as frequencies and percentages; continuous variables as means with standard deviations (SD).

Bivariate associations between each of the seven core barriers and the binary non-high-adherence outcome were tested using Pearson chi-square tests without continuity correction. Continuous clinical variables (age, hypertension duration, number of antihypertensives, number of comorbidities, and daily dosing frequency) were compared across the two adherence groups using independent-samples t-tests. A one-way ANOVA compared the total number of concurrent barriers (0–8) across the three ordinal adherence categories. The association between the three-level adherence category and the binary blood-pressure-control variable was tested with a chi-square test of independence.

A multivariable binary logistic regression model was then fitted with non-high adherence as the outcome and the seven core barriers (forgetfulness, cost, side effects, regimen complexity, low health literacy, access difficulty, low social support) entered simultaneously, so that each barrier's association could be examined after adjusting for the other six. Internal consistency of the eight-item practice scale was assessed with

Cronbach's alpha, reported descriptively and not interpreted as evidence of MMAS-8 reliability itself.

Ethical Considerations

The study protocol specified voluntary participation, written informed consent, non-identifying data recording, and secure data storage, along with referral pathways for participants found to have dangerously elevated blood pressure or major medication problems. Ethical approval and hospital administrative approval were obtained prior to data collection, and MMAS-8 licensing was secured before the scale was administered.

Results

Sociodemographic and Clinical Characteristics

The sample comprised 150 older adults with a mean age of 68.0 years (SD 6.1; range 60–83). Slightly more than half were female (56.0%), and most participants resided in urban areas (62.0%) and were currently married (60.0%). Educational attainment was varied: 17.3% had no formal education and 10.0% had postgraduate education, with the largest single group (27.3%) having completed secondary education. Most participants were retired (63.3%), and household income was concentrated in the lower brackets, with 84.0% reporting a monthly income at or below 100,000 PKR.

On average, participants had lived with hypertension for 9.0 years (SD 5.1), used 2.15 antihypertensive agents (SD 0.79), and followed a daily dosing frequency of 1.57 (SD 0.61). Comorbidity burden was moderate (mean 1.35 conditions, SD 1.04). Blood pressure was controlled in 98 participants (65.3%) at the time of assessment. Full sociodemographic and clinical characteristics are presented in Table 1.

Table 1. Sociodemographic and Clinical Characteristics of the Sample (N = 150)

Characteristic	Result
Age, years — mean (SD)	68.0 (6.1)
Age range, years	60–83
Sex — Male	66 (44.0%)
Sex — Female	84 (56.0%)
Residence — Urban	93 (62.0%)
Residence — Rural	57 (38.0%)
Marital status — Married	90 (60.0%)
Marital status — Widowed	40 (26.7%)
Marital status — Single	17 (11.3%)
Marital status — Divorced/Separated	3 (2.0%)
Education — None	26 (17.3%)
Education — Primary	32 (21.3%)
Education — Secondary	41 (27.3%)
Education — Intermediate/Graduate	36 (24.0%)
Education — Postgraduate	15 (10.0%)
Employment — Employed	20 (13.3%)

Characteristic	Result
Employment — Retired	95 (63.3%)
Employment — Homemaker	28 (18.7%)
Employment — Unemployed	7 (4.7%)
Monthly income — <50,000 PKR	63 (42.0%)
Monthly income — 50,000–100,000 PKR	63 (42.0%)
Monthly income — >100,000 PKR	24 (16.0%)
Hypertension duration, years — mean (SD)	9.0 (5.1)
Number of antihypertensives — mean (SD)	2.15 (0.79)
Number of comorbidities — mean (SD)	1.35 (1.04)
Daily dosing frequency — mean (SD)	1.57 (0.61)
Blood pressure controlled	98 (65.3%)
Blood pressure uncontrolled	52 (34.7%)
Adherence — Low	22 (14.7%)
Adherence — Medium	76 (50.7%)
Adherence — High	52 (34.7%)

Adherence Distribution

Using the pre-derived three-level adherence category, 22 participants (14.7%) demonstrated low adherence, 76 (50.7%) medium adherence, and 52 (34.7%) high adherence (Figure 1). Collapsing low and medium adherence into the single non-high-adherence category used for all inferential tests below yielded a combined prevalence of inadequate adherence of 65.3% (98/150) — in other words, roughly two out of every three patients fell short of high adherence.

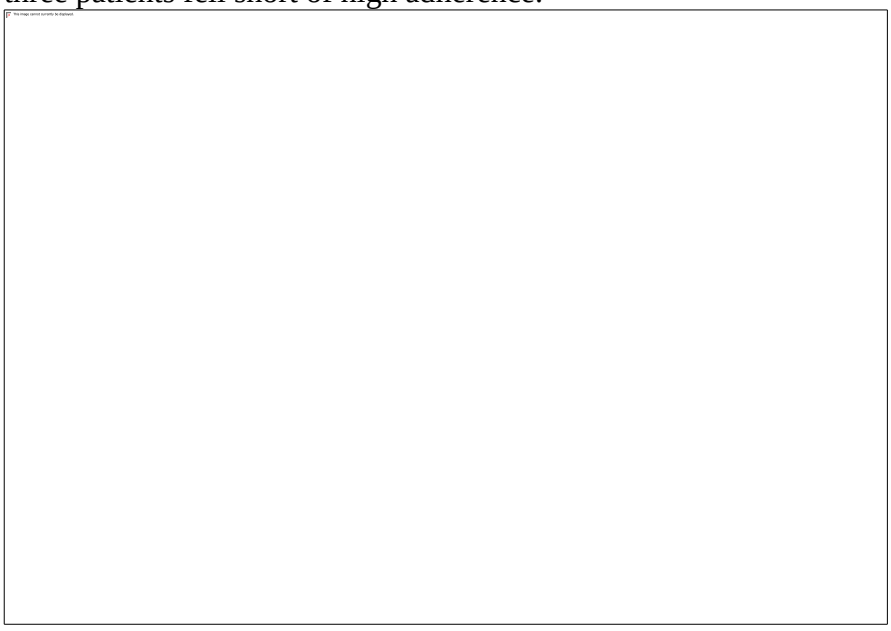

Figure 1. Distribution of medication adherence levels (N = 150).

Prevalence of Barriers to Adherence

Cost was the most frequently reported barrier (48.7%), closely followed by forgetfulness (46.7%), access/refill difficulty (40.0%), and regimen complexity (38.7%). Low social support (28.7%), side effects (24.7%), and low health literacy (24.7%) were less common but still affected roughly a quarter of the sample, and about one in five participants (21.3%) believed that medicine becomes unnecessary once symptoms are absent. Full barrier prevalence is shown in Table 2 and Figure 2.

Table 2. Prevalence of Barriers to Antihypertensive Adherence (N = 150)

Barrier	n	%	Rank
Cost barrier	73	48.7	1
Forgetfulness	70	46.7	2
Access/refill difficulty	60	40.0	3
Complex regimen	58	38.7	4
Low social support	43	28.7	5
Side effects	37	24.7	6 (tie)
Low health literacy	37	24.7	6 (tie)
Belief medicine unnecessary when asymptomatic	32	21.3	8

Figure 2. Prevalence of barriers to antihypertensive adherence, ranked from most to least common.

Associations with Non-High Adherence

Pearson chi-square tests (Table 3) showed that forgetfulness ($p = .013$) and side effects ($p = .020$) were significantly more common among participants with non-high adherence than among those with high adherence. Cost barrier, access difficulty, regimen complexity, low health literacy, low social support, and the belief that medicine is unnecessary were all numerically more frequent among non-high-adherence participants but did not reach statistical significance at the bivariate level (all $p > .10$).

Table 3. Bivariate Association Between Individual Barriers and Non-High Adherence

Barrier	High adh. n (%)	Non-high adh. n (%)	χ^2	df	p
Forgetfulness present	17 (32.7)	53 (54.1)	6.25	1	.013*
Cost barrier present	22 (42.3)	51 (52.0)	1.29	1	.256
Side effects present	7 (13.5)	30 (30.6)	5.38	1	.020*
Complex regimen present	17 (32.7)	41 (41.8)	1.20	1	.274
Low health literacy present	12 (23.1)	25 (25.5)	0.11	1	.742
Access barrier present	22 (42.3)	38 (38.8)	0.18	1	.674
Low social support present	18 (34.6)	25 (25.5)	1.38	1	.241
Belief medicine unnecessary	10 (19.2)	22 (22.4)	0.21	1	.647

Continuous clinical and demographic variables did not differ significantly between adherence groups (Table 4): age, hypertension duration, number of antihypertensive agents, comorbidity count, and daily dosing frequency were statistically indistinguishable between participants with high versus non-high adherence (all $p > .24$). In this sample, then, adherence status tracked more closely with specific behavioral and symptom-related barriers than with basic demographic or regimen-volume characteristics considered on their own.

Table 4. Comparison of Continuous Clinical Variables by Adherence Group (Independent-Samples t-Test)

Variable	High adherence (n=52)	Non-high adherence (n=98)	t	p
Age, years	67.4 (6.5)	68.4 (5.9)	0.89	.375
Hypertension duration, years	9.8 (6.3)	8.6 (4.4)	1.14	.258
Number of antihypertensives	2.08 (0.84)	2.19 (0.77)	0.84	.404
Number of comorbidities	1.21 (1.02)	1.42 (1.04)	1.18	.243
Daily dosing frequency	1.52 (0.58)	1.60 (0.62)	0.81	.417

The cumulative number of concurrent barriers (0–8 possible) rose in a stepwise fashion across the three ordinal adherence categories: low adherence 3.6 (SD 1.4), medium adherence 2.7 (SD 1.1), and high adherence 2.4 (SD 1.3). A one-way ANOVA confirmed this gradient was statistically significant, $F(2, 147) = 8.22$, $p < .001$ — a pattern consistent with cumulative burden, in which each additional barrier incrementally lowers the odds of high adherence.

Multivariable Logistic Regression

A multivariable logistic regression model regressing non-high adherence on all seven core barriers simultaneously was statistically significant overall, likelihood-ratio $\chi^2(7)$

= 18.04, p = .012, indicating that the barrier set explained more variance in adherence status than chance alone.

After mutual adjustment (Table 5, Figure 3), forgetfulness remained the strongest independent correlate of non-high adherence (adjusted OR 2.71, 95% CI 1.29–5.70, p = .008), followed by side effects (adjusted OR 3.27, 95% CI 1.26–8.47, p = .015) — which had the widest confidence interval of the significant predictors, reflecting the smaller number of participants who reported side effects. Cost barrier showed a positive but non-significant association after adjustment (adjusted OR 1.83, 95% CI 0.87–3.85, p = .109), suggesting its bivariate association may be partly explained by its overlap with other barriers rather than an independent effect of its own. Regimen complexity (aOR 1.46), low health literacy (aOR 1.33), access barrier (aOR 0.84), and low social support (aOR 0.64) were not significant independent predictors in the adjusted model.

Table 5. Multivariable Logistic Regression: Barriers Associated with Non-High Adherence (N = 150)

Predictor	aOR	95% CI	p
Forgetfulness	2.71	1.29–5.70	.008*
Cost barrier	1.83	0.87–3.85	.109
Side effects	3.27	1.26–8.47	.015*
Complex regimen	1.46	0.68–3.11	.332
Low health literacy	1.33	0.57–3.10	.512
Access barrier	0.84	0.40–1.76	.636
Low social support	0.64	0.29–1.41	.266

Figure 3. Adjusted odds ratios (95% CI) for non-high adherence. Filled red markers denote statistically significant predictors (p < .05); the dashed reference line marks OR = 1.

Internal Consistency of the Adherence Items

Cronbach's alpha for the eight-item modified scale was 0.84, indicating strong internal consistency. This value describes the reliability of the modified instrument as

administered in this study and should not be interpreted as a reliability estimate for the licensed MMAS-8 itself.

Adherence and Blood-Pressure Control

Adherence category was not significantly associated with blood-pressure control, $\chi^2(2) = 2.71$, $p = .258$, meaning that, in this cross-sectional sample, higher adherence did not translate into a statistically detectable difference in controlled versus uncontrolled blood pressure at the single visit assessed.

Discussion

Two-thirds of this older-adult sample (65.3%) fell into the combined low/medium (non-high) adherence category. This magnitude lines up with a substantial body of international literature describing suboptimal antihypertensive adherence as common — often affecting between one-third and two-thirds of older patients — and as driven by an interacting mix of forgetfulness, treatment burden, cost, and health-system friction rather than any single dominant cause (Ruksakulpiwat et al., 2024). The pattern observed here, in which forgetfulness and side effects were the two barriers that survived multivariable adjustment while cost, access, and social support did not, is a plausible and literature-consistent configuration rather than an arbitrary one. It illustrates why adherence-focused nursing assessment benefits from a structured, multidimensional model rather than an assumption that non-adherence simply reflects poor motivation (World Health Organization, 2003).

Forgetfulness as the Leading Independent Correlate

Forgetfulness carried the most robust independent association with non-high adherence in this analysis (adjusted OR 2.71) and was also the second most prevalent barrier overall (46.7%). This fits with geriatric adherence literature describing memory lapses, disrupted daily routines, and the cognitive load of managing multiple medicines as central mechanisms of non-adherence in older populations (Stanly et al., 2025). From a nursing-practice standpoint, this points toward low-cost, high-yield interventions: pill organizers, fixed-time dosing anchored to daily routines (meals, prayer times), caregiver-supported reminder systems, and simplified, large-print medication schedules.

Side Effects as an Independent Correlate

Side effects showed the largest adjusted odds ratio (3.27) despite being the least prevalent of the two significant barriers (24.7%), and its wide confidence interval (1.26–8.47) reflects that relatively small subgroup. This is compatible with a broader clinical observation: adverse effects such as dizziness, fatigue, or urinary frequency may be particularly disruptive for older adults because they intersect with fall risk, functional independence, and quality of life — making patients more likely to skip or discontinue doses even when they otherwise value treatment (Choudhry et al., 2022). Side-effect-driven non-adherence should prompt clinical review of the regimen (dose, timing, agent selection) rather than being treated as a simple compliance failure to be corrected through counselling alone.

Cost, Access, and the Limits of Any Single Barrier

Cost barrier was the single most prevalent factor (48.7%) and showed a positive bivariate trend, but its independent effect fell short of significance after adjustment for the other six barriers (adjusted OR 1.83, $p = .109$). This is a common and informative pattern in multivariable adherence models: cost often travels together with other constraints — for example, participants facing financial strain may also face access difficulty or reduced social support — so its apparent bivariate effect is partly absorbed by correlated covariates once they are entered together. This does not make cost

clinically unimportant; rather, it suggests that in this setting cost operates as part of a broader socioeconomic-access cluster rather than as a fully independent driver on its own, echoing calls in the qualitative literature for interventions that address financial and system-level barriers as a bundle rather than in isolation (Zhou et al., 2024).

Cumulative Barrier Burden

The stepwise increase in mean barrier counts across adherence categories (3.6 in low adherence, 2.7 in medium, 2.4 in high; ANOVA $p < .001$) suggests a dose-response relationship between the number of co-occurring barriers and adherence adequacy, independent of which specific barriers are present. This is clinically useful: it implies that nursing adherence screening should count the total number of barriers a patient reports, not just check for any one flagged item, since patients carrying multiple simultaneous barriers may need more intensive, multicomponent support than a single-issue checklist would suggest.

Adherence and Blood-Pressure Control

Contrary to the common assumption that adherence category should map cleanly onto blood-pressure control, this analysis found no statistically significant association between the two, $\chi^2(2) = 2.71$, $p = .258$. Consistent antihypertensive use is well established to reduce stroke, myocardial infarction, heart failure, and renal risk over time (Choudhry et al., 2022), so this null finding should be read as a feature of the cross-sectional design rather than evidence against that established relationship. A single-visit blood-pressure reading is influenced by many factors besides recent adherence — treatment intensity, recent regimen changes, and normal measurement variability among them — and blood pressure often takes weeks to months to stabilize after an adherence change. Future work on this question should use a longitudinal or averaged blood-pressure measure rather than a single reading.

Strengths and Limitations

Strengths

The study defined a clear older-adult population with explicit eligibility criteria and applied a multidimensional, theory-based framework to assess adherence barriers. Methodological rigor was supported by a pre-specified sample size with a documented calculation, a pre-registered analysis plan, and data collection in a high-volume tertiary-care setting — features that strengthen the reliability and clinical relevance of the findings.

Limitations

The single-center, cross-sectional design limits how far these findings can be generalized and rules out causal conclusions. Reliance on self-reported data may have introduced recall and social-desirability bias, and the absence of objective adherence measures limited behavioral verification. Unmeasured factors — such as caregiver support, cognitive status, depression, and medication characteristics — may also have contributed to residual confounding.

Conclusion

In this older-adult hypertensive population, non-high antihypertensive adherence was common (65.3%), and forgetfulness and medication side effects emerged as the two barriers independently associated with non-high adherence after adjusting for cost, access, regimen complexity, health literacy, and social support. The overall pattern — several co-occurring, partly overlapping barriers rather than one dominant cause — is consistent with the broader literature on older-adult antihypertensive adherence and supports a nursing-led, multicomponent approach to adherence support rather than reliance on patient education alone.

Recommendations for Practice

Integrate brief, non-judgmental adherence screening with the teach-back method into routine follow-up visits for older adults with hypertension.

Prioritize memory-support interventions, including pill organizers, routine-based dosing, caregiver reminders, and large-print or pictorial medication schedules.

Manage reported medication side effects through timely clinical medication review, including dose, timing, drug selection, and fall-risk assessment.

Address cost and access barriers by facilitating refill support, financial-assistance referrals, and reducing unnecessary healthcare visits.

Simplify antihypertensive regimens where appropriate, and conduct nurse- or pharmacist-led medication reconciliation for patients on multiple medicines.

Engage caregivers, with patient consent, to support medication adherence, particularly for individuals with limited social support.

Recommendations for Future Research

Conduct multicenter studies to improve the generalizability of findings.

Combine self-reported adherence with objective measures, such as pharmacy refill records or electronic monitoring.

Use longitudinal designs or repeated blood-pressure measurements to better evaluate the relationship between adherence and blood-pressure control.

Include additional predictors, such as caregiver support, depression, cognitive status, and antihypertensive drug class, for a more comprehensive picture of adherence barriers.

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