ISSN: 2457-0400

Impact Factor: 7.675

WORLD JOURNAL OF ADVANCE HEALTHCARE RESEARCH

www.wjahr.com

Volume: 10, Issue: 8

Page N. 243-251

Year: 2026

Original Article

Coden USA: WJAMA3

BARRIERS OF EFFECTIVE HYPERTENSION MANAGEMENT AMONG PATIENTS ATTENDING PRIMARY HEALTH CARE CENTERS IN MOSUL

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Article Received: 01 July 2026 **Article Revised:** 21 July 2026 **Article Published:** 01 August 2026

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DOI: https://doi.org/10.5281/zenodo.21713555

How to cite this Article: *Nebras Hasan Challoob, Dr. Anmar B. Al-Dewachi. (2026) Barriers Of Effective Hypertension Management Among Patients Attending Primary Health Care Centers In Mosul. World Journal of Advance Healthcare Research, 10(8), 243–251.

ABSTRACT

Hypertension is a major global health problem and one of the leading risk factors for cardiovascular disease; uncontrolled blood pressure remains common in primary care settings despite available treatment. This comparative cross-sectional study aimed to assess the common barriers to effective hypertension management among 300 hypertensive patients aged 18 years and older attending four primary health care centers in Mosul City, Iraq, between February and July 2025. Barriers were classified into three domains — healthcare system, patient-related, and cultural/social — and were compared between patients with controlled (n=218) and uncontrolled (n=82) hypertension using the chi-square test, with odds ratios (OR) and 95% confidence intervals (CI) calculated for each barrier. Cultural and social barriers were the strongest correlate of uncontrolled hypertension (OR=3.87, 95% CI 2.11–7.10, P<0.001), driven mainly by preference for traditional or alternative remedies (OR=5.91, P<0.001) and the belief that hypertension resolves without treatment (OR=3.58, P<0.001). Patient-related barriers, chiefly non-adherence to the treatment plan due to poor motivation, were also significantly associated with poor control (OR=1.72, P=0.043), while healthcare system barriers showed the weakest, non-significant association (OR=1.55, P=0.128). All three barrier domains were more frequent among uncontrolled patients, and the difference was statistically significant overall (OR=2.10, P=0.008). Cultural beliefs and inadequate patient adherence, rather than health system deficiencies, were the principal drivers of poor hypertension control in this population, highlighting the need for culturally sensitive counseling and adherence-focused interventions.

KEYWORDS: Hypertension; Barriers; Primary health care; Blood pressure control; Mosul; Iraq.

1. INTRODUCTION

1.1 Background

Hypertension is a persistent elevation of blood pressure that remains one of the leading modifiable risk factors for cardiovascular disease, stroke, and premature mortality worldwide.[1,2] It is diagnosed when systolic blood pressure is consistently ≥130 mmHg and/or diastolic blood pressure is ≥80 mmHg on two separate occasions.[2] Although effective and affordable pharmacological and lifestyle interventions exist, blood pressure control remains suboptimal in many primary health care (PHC) settings because of overlapping healthcare system, patient-related, and socio-cultural barriers.[3,4]

Globally, hypertension affects an estimated 1.3 billion people and was responsible for about 18 million deaths in 2019, with prevalence varying markedly by region, from 26.4% among men in South Asia to 39.0% in Eastern Europe and Central Asia.[4,5] Regional surveys from Iraq report a similarly high burden, with governorate-level hypertension prevalence estimates ranging from 24% to 54.7%.[6,7,8]

Uncontrolled hypertension is a major driver of preventable complications, including cerebrovascular events, myocardial infarction, chronic kidney disease, hypertensive retinopathy, and peripheral vascular disease, and is a key contributor to the overall burden of

metabolic and cardiovascular disease.[3] Primary healthcare centers play a central role in long-term hypertension management through regular screening, early detection, and ongoing follow-up and are therefore well placed to reduce this burden if the barriers that limit effective care can be identified and addressed.

1.2 Barriers to Effective Hypertension Management

According to the World Health Organization's health systems framework, countries are advised to strengthen fundamental building blocks — including a well-trained health workforce, robust health information systems, equitable access to essential medicines, sustainable financing, and effective leadership — to improve chronic disease outcomes such as hypertension control.[9] Within this framework, barriers to effective hypertension management are commonly grouped into healthcare system barriers (limited access, medication shortages, and insufficient consultation time), patient-related barriers (poor adherence, low health literacy, comorbidities, and low motivation), and cultural/social barriers (preference for traditional remedies, misconceptions about disease chronicity, and lack of family support).[9,10] Despite an expanding global literature, data describing the relative contribution of these three domains to blood pressure control in the Middle East, and specifically in the the Nineveh Governorate, remain scarce.

1.3 Aim of the Study

This study aimed to assess the common barriers affecting effective hypertension management among hypertensive patients attending primary health care centers in Mosul City and to compare the frequency of these barriers between patients with controlled and uncontrolled hypertension.

2. MATERIALS AND METHODS

2.1 Study Design, Setting, and Period

A comparative cross-sectional study was conducted among hypertensive patients attending four primary health care centers in Mosul city, Nineveh Governorate, northern Iraq. Mosul is divided by the Tigris River into a right sector, served by 22 primary health care and family medicine centers, and a left sector, served by 19 such centers. Four centers were selected at random for data collection, two from the right sector and two from the left sector—one primary health care center and one family medicine center from each side—namely, Al-Quds Family Medicine Training Center, Al-Rashidiya Primary Health Care Center, Tamoz Family Medicine Center, and Al-Haj Saleh Al-Shabqoun Primary Health Care Center. Data were collected over six months (February–July 2025).

2.2 Ethical Considerations

Ethical approval was obtained from the Directorate of Health of Nineveh before data collection. Participants were informed of the purpose and benefits of the study, and written informed consent was obtained from all participants before enrollment. Participation was entirely voluntary, and participants retained the right to withdraw at any time without any negative consequence. All collected data were treated with strict confidentiality, and personal identifiers were removed or anonymized to protect participant privacy.

2.3 Study Population and Sampling

Three hundred patients with hypertension, aged 18 years and older and diagnosed for at least one year, were enrolled using a convenience sampling technique. The required sample size was estimated using Cochran's formula for estimating a proportion in a large population, $n = Z^2 \times P(1-P) / d^2$, where Z is the Z-score corresponding to the desired confidence level (1.96 for 95% confidence), P is the estimated prevalence of the condition in the population, and d is the desired margin of error (precision), set at 0.05. Pregnant women, patients under 18 years, and those newly diagnosed with hypertension (less than one year) were excluded.

2.4 Study Procedures

Data were collected through regular visits to the selected primary health care centers, during which eligible patients were interviewed using a structured checklist questionnaire. Data collection took place over six months, with two visits per week to the participating centers, and each visit lasted approximately three hours.

2.5 Data Collection Tool

Data were collected by direct interview using a structured questionnaire adapted, with minor modifications made by the researcher and supervisor to suit the local context, from an instrument previously used in Nepal.[11] The questionnaire captured socio-demographic characteristics (age, sex, educational level, occupation, duration of hypertension, control status, and comorbidities) and screened for barriers across three domains, with a dichotomous “yes/no” response format: (i) healthcare system barriers—difficulty visiting the PHC (with sub-reasons of distance, lack of transportation, long waiting times, and financial constraints); antihypertensive medication unavailability; insufficient consultation time; irregular blood pressure monitoring; and lack of follow-up appointments; (ii) patient-related barriers—non-adherence to the treatment plan (with sub-reasons of forgetfulness, lack of motivation, medication side effects, and financial difficulties); lack of regular physical activity; smoking or tobacco use, and perceived stress or anxiety; and (iii) cultural and social barriers — use of traditional or alternative remedies, belief that hypertension can be cured without treatment, and lack of family or community support.

Before the main study, a pilot study was conducted among 30 hypertensive patients meeting the inclusion criteria at two primary health care centers on the left and right sides of Mosul to assess the clarity, feasibility, and reliability of the questionnaire. The pilot indicated that the tool was generally well accepted, with an average

completion time of approximately 10 minutes; based on participant feedback, minor wording modifications were made to a small number of items to improve clarity, after which the instrument was deemed appropriate for use in the main study without further changes.

2.6 Statistical Analysis

Data were coded and tabulated in Microsoft Excel and analyzed using SPSS version 26. Results were expressed as frequencies and percentages. Differences between controlled and uncontrolled groups were assessed using the chi-square test (Fisher's exact test where appropriate), and the strength of association was quantified using odds ratios (OR) with 95% confidence intervals (CI). A two-tailed P-value <0.05 was considered statistically significant.

3. RESULTS

3.1 Socio-Demographic Characteristics

Three hundred hypertensive patients were included (Table 1). The majority were older than 40 years (92.3%), female (70.3%), and had low educational attainment (73.3% illiterate or primary-educated); 83.6% were unemployed, and 54.0% had been hypertensive for more than five years. Diabetes was the most frequent comorbidity (41.0%), and 43.0% had no comorbidity. Overall, 82 patients (27.3%) had uncontrolled hypertension and 218 (72.7%) had controlled hypertension, indicating that roughly two-thirds of participants had blood pressure within the recommended target range and nearly one-third remained above target despite ongoing treatment.

3.2 Socio-Demographic Profile and Hypertension Control

Table 2 compares socio-demographic characteristics between the uncontrolled (n=82) and controlled (n=218) groups. Nearly half of the uncontrolled group (48.8%) was aged 60 years or older, compared with 41.7% of the controlled group. Female sex (OR=0.18, 95% CI 0.08–0.40, P<0.001), illiteracy (OR=2.39, P=0.002), and unemployment (OR=9.27, P<0.001) were all significantly more frequent among uncontrolled patients, while secondary (OR=0.21, P=0.002) and tertiary education (OR=0.15, P=0.004), active employment (OR=0.20, P=0.019), and retirement (P=0.002) were significantly less common in this group. A disease duration of five years or less was associated with poorer control (OR=1.87, P=0.016), a pattern consistent with the difficulty many patients face in achieving early adherence because of unfamiliarity with new medications, side effects, and treatment cost. Diabetes (OR=1.90, P=0.013) and heart disease (OR=1.79, P=0.037) were significantly more common among uncontrolled patients, whereas having no comorbidity was protective (OR=0.41, P=0.001). Age as a categorical variable was not significantly associated with control status.

3.3 Healthcare System Barriers

Overall, 121 of 300 participants (40.3%) reported difficulty visiting the PHC (Table 3), most often attributed to distance (70.2% of those with access difficulty) and long waiting times (67.8%).

Table 1: Socio-demographic characteristics of study participants (n=300).

Variable	Category	No.	%
Age (years)	<40	23	7.7
	40–59	146	48.7
	≥60	131	43.6
Sex	Male	89	29.7
	Female	211	70.3
Education level	Illiterate	81	27.0
	Primary education	139	46.3
	Secondary education	47	15.7
	Tertiary education	33	11.0
Occupation	Employed	26	8.7
	Unemployed	251	83.6
	Retired	23	7.7
Duration of hypertension	≤ 5 years	138	46.0
	> 5 years	162	54.0
Comorbidities	Diabetes	123	41.0
	Heart disease	80	26.7
	Kidney disease	16	5.3
	Other	45	15.0
	None	129	43.0

Table 2: Comparison of socio-demographic profile between uncontrolled (n=82) and controlled (n=218) hypertensive patients.

Variable / Category	Unc. No.	Unc. %	Cont. No.	Cont. %	95% CI (OR)	OR	P-value
Age (years)—<40	7	8.5	16	7.4	0.47–2.98	1.18	0.728
Age (years) – 40–59	35	42.7	111	50.9	0.43–1.20	0.72	0.203
Age (years)—≥60	40	48.8	91	41.7	0.80–2.21	1.33	0.273
Sex – Male	8	9.8	81	37.2	0.08–0.40	0.18	<0.001
Sex – Female	74	90.2	137	62.8	–	–	–
Education – Illiterate	33	40.2	48	22.0	1.38–4.12	2.39	0.002
Education – Primary	43	52.4	96	44.0	0.84–2.33	1.40	0.193
Education – Secondary	4	4.9	43	19.7	0.07–0.60	0.21	0.002
Education – Tertiary	2	2.4	31	14.2	0.04–0.65	0.15	0.004
Occupation – Employed	2	2.4	24	11.0	0.05–0.88	0.20	0.019
Occupation – Unemployed	80	97.6	171	78.4	2.19–39.3	9.27	<0.001
Occupation – Retired	0	0.0	23	10.6	–	0.00	0.002
Duration – ≤ 5 years	47	57.3	91	41.7	1.12–3.13	1.87	0.016
Duration – > 5 years	35	42.7	127	58.3	–	–	–
Comorbidity – Diabetes	43	52.4	80	36.7	1.14–3.18	1.90	0.013
Comorbidity – Heart disease	29	35.4	51	23.4	1.03–3.11	1.79	0.037
Comorbidity – Kidney disease	7	8.5	9	4.1	0.78–6.03	2.17	0.130
Comorbidity – Other	13	15.9	32	14.7	0.54–2.21	1.10	0.800
Comorbidity – None	23	28.0	106	48.6	0.24–0.71	0.41	0.001

While lack of transportation and financial constraints were each reported by 30.6%. Antihypertensive medication unavailability was the most prevalent healthcare barrier overall, affecting 70.3% of participants, whereas insufficient consultation time (16.0%), irregular blood pressure monitoring (5.3%), and lack of follow-up appointments (5.7%) were less common. When compared between groups (Table 4), uncontrolled patients were more than three times as likely to report difficulty visiting the PHC (OR=3.24, 95% CI 1.91–5.48, P<0.001). Distance was reported slightly more often among uncontrolled patients, but the difference was not statistically significant (OR=1.36, P=0.449), and no significant between-group difference was found for transportation, waiting times, or financial constraints as specific reasons for access difficulty. Medication unavailability was common in both groups but was slightly, though not significantly, less frequent among uncontrolled patients (OR=0.60, P=0.058), a borderline finding. Insufficient consultation time, irregular monitoring, and lack of follow-up did not differ significantly between groups.

3.4 Patient-Related Barriers

Overall, 153 of 300 patients (51.0%) did not follow their treatment plan (Table 5), most commonly because of financial difficulty (64.1% of non-adherent patients) or fear of medication side effects (47.1%), while forgetfulness (36.6%) and lack of motivation (17.6%) were less frequently cited. Around one-third of participants (36.7%) did not engage in regular physical activity, 18.3% were current smokers or tobacco users, and the large majority (84.0%) reported feeling stressed or anxious.

Uncontrolled patients were nearly four times more likely to be non-adherent to their treatment plan than controlled patients (OR=3.98, 95% CI 2.26–6.99, P<0.001) (Table 6) and nearly six times more likely to cite lack of motivation as the reason (OR=5.92, P<0.001). Financial difficulty as a specific reason for non-adherence was more frequent among uncontrolled patients but only reached borderline significance (OR=1.82, P=0.090). Smoking was, unexpectedly, significantly less common among uncontrolled patients (OR=0.39, P=0.019), a finding that may partly reflect the female predominance of the uncontrolled group. Forgetfulness, medication side effects, physical inactivity, and perceived stress or anxiety showed no significant between-group difference. Chi-square test.

Table 3: Healthcare system barriers reported by study participants (n=300).

Healthcare System Barrier	Yes/No.	Yes %	No, no.	No %
Difficulty visiting the PHC	121	40.3	179	59.7
– Distance*	85	70.2	36	29.8
– Lack of transportation*	37	30.6	84	69.4
– Long waiting times*	82	67.8	39	32.2
– Financial constraints*	37	30.6	84	69.4
Antihypertensive medication not available	211	70.3	89	29.7
Insufficient consultation time	48	16.0	252	84.0

Blood pressure not monitored regularly	16	5.3	284	94.7
No follow-up appointments	17	5.7	283	94.3

*Percentages for sub-reasons are calculated among the 121 participants reporting difficulty visiting the PHC.

Table 4: Comparison of healthcare system barriers between uncontrolled and controlled hypertensive patients.

Variable / Category		Un c. No.	Unc. %	Cont. No.	Cont. %	95% CI (OR)	OR	P-value
Difficulty visiting the PHC		50	61.0	71	32.6	1.91–5.48	3.24	<0.001
If yes, the reason?	– Distance	37	74.0	48	67.6	0.61–3.05	1.36	0.449
	– Lack of transportation	12	24.0	25	35.2	0.26–1.31	0.58	0.187
	– Long waiting times	35	70.0	47	66.2	0.55–2.60	1.19	0.659
	– Financial constraints	17	34.0	20	28.2	0.60–2.87	1.31	0.493
Antihypertensive medication not available		51	62.2	160	73.4	0.35–1.02	0.60	0.058
Insufficient consultation time		16	19.5	32	14.7	0.73–2.73	1.41	0.309
Blood pressure not monitored regularly*		4	4.9	12	5.5	0.28–2.81	0.88	0.830
No follow-up appointments*		3	3.7	14	6.4	0.16–1.98	0.55	0.356

Chi-square test; *Fisher's exact test.

Table 5: Patient-related barriers reported by study participants (n=300).

Healthcare System Barrier	Yes/No.	Yes %	No No.	No %
Not following the treatment plan	153	51.0	147	49.0
– Forgetfulness*	56	36.6	97	63.4
– Lack of motivation*	27	17.6	126	82.4
– Side effects of medications*	72	47.1	81	52.9
– Financial difficulties*	98	64.1	55	35.9
No regular physical activity	110	36.7	190	63.3
Smoking or tobacco use	55	18.3	245	81.7
Stressed or anxious	252	84.0	48	16.0

*Percentages for sub-reasons are calculated among the 153 participants reporting non-adherence to the treatment plan.

Table 6: Comparison of patient-related barriers between uncontrolled and controlled hypertensive patients.

Variable / Category		Unc. No.	Unc. %	Cont. No.	Cont. %	95% CI (OR)	OR	P-value
Not following the treatment plan		61	74.4	92	42.2	2.26–6.99	3.98	<0.001
If yes,	– Forgetfulness	25	41.0	31	33.7	0.70–2.67	1.37	0.360
the reason?	– Lack of motivation	20	32.8	7	7.6	2.32–15.13	5.92	<0.001
	– Side effects of medications	26	42.6	46	50.0	0.39–1.43	0.74	0.371
	– Financial difficulties	44	72.1	54	58.7	0.91–3.66	1.82	0.090
No regular physical activity		25	30.5	85	39.0	0.40–1.18	0.69	0.173
Smoking or tobacco use		8	9.8	47	21.6	0.18–0.87	0.39	0.019
Stressed or anxious		72	87.8	180	82.6	0.72–3.21	1.52	0.270

*Chi-square test.

3.5 Cultural and Social Barriers

Across the whole sample, 22.7% of participants reported using traditional or alternative remedies, 17.0% believed hypertension could be cured without treatment, and 16.7% reported a lack of family support (Table 7).

Cultural and social barriers were strongly associated with poor control (Table 8). Uncontrolled patients were nearly six times more likely to use traditional or alternative remedies (OR=5.91, 95% CI 3.30–10.60, P<0.001), with almost half of the uncontrolled group (47.6%) reporting such use compared with only 13.3% of controlled patients. Uncontrolled patients were also more than three times more likely to believe hypertension resolves without treatment (OR=3.58, P<0.001) and about 2.5 times more likely to lack family support (OR=2.49, P=0.004).

3.6 Relative Impact of the Three Barrier Domains

When the three domains were compared directly (Table 9), cultural and social barriers showed the strongest association with uncontrolled hypertension (OR=3.87, 95% CI 2.11–7.10, P<0.001), followed by patient-related barriers, which showed a moderate association (OR=1.72, 95% CI 1.02–2.90, P=0.043); healthcare system barriers showed the weakest, non-significant

association (OR=1.55, 95% CI 0.88–2.74, P=0.128). Overall, all three domains were more frequent among uncontrolled patients, and this overall difference was statistically significant (OR=2.10, 95% CI 1.21–3.65, P=0.008).

Table 7: Cultural and social barriers reported by study participants (n=300).

Healthcare System Barrier	Yes/No.	Yes %	No, no.	No %
Use of traditional or alternative remedies	68	22.7	232	77.3
Belief that hypertension is cured without treatment	51	17.0	249	83.0
No support from family	50	16.7	250	83.3

Table 8: Comparison of cultural and social barriers between uncontrolled and controlled hypertensive patients.

Variable / Category	Unc. No.	Unc. %	Cont. No.	Cont. %	95% CI (OR)	OR	P-value
Use of traditional or alternative remedies	39	47.6	29	13.3	3.30–10.60	5.91	<0.001
Belief that hypertension is cured without treatment	26	31.7	25	11.5	1.92–6.69	3.58	<0.001
No support from family	22	26.8	28	12.8	1.33–4.67	2.49	0.004

*Chi-square test.

Table 9: Impact of the three domains of barriers on control of hypertension.

Variable / Category	Un c. No.	Unc. %	Cont. No.	Cont. %	95% CI (OR)	OR	P-value
Healthcare system barriers	25	30.5	48	22.02	0.88–2.74	1.55	0.128
Patient-related barriers	35	42.7	66	30.3	1.02–2.90	1.72	0.043
Culture and social barriers	29	35.4	27	12.4	2.11–7.10	3.87	<0.001
Total	30	36.6	47	21.6	1.21–3.65	2.10	0.008

Chi-square test.

4. DISCUSSION

This study found that nearly one-third of hypertensive patients attending primary health care centers in Mosul had uncontrolled blood pressure and that cultural/social and patient-related barriers, rather than healthcare system deficiencies, were the strongest correlates of poor control.

4.1 Socio-Demographic Characteristics of Study Participants

The predominance of patients older than 40 years is consistent with a large Thai primary-care study reporting a median age of 66 years.[12] and with a Sudanese study in which most hypertensive patients were older than 60 years.[13] The female predominance observed here mirrors findings from Thailand and Saudi Arabia, where 77.7% and 65.9% of hypertensive PHC attendees, respectively, are women.[12,14] The high proportion of patients with low educational attainment in this study differs from a Sudanese study in which only 19.8% of hypertensive patients were illiterate, and 32.6% had attained only primary education, with higher education considerably less common.[13]

The high proportion of unemployed participants (83.6%) is consistent with a European study reporting that prolonged unemployment carried a 1.3-fold higher risk of hypertension compared with employed men,[15] although it contrasts with a Saudi Arabian study in which 61.3% of participants were employed.[14] This difference may partly reflect the age structure of the present sample, in which fewer than half of participants were of middle working age, together with limited job opportunities among those with only primary or secondary education, a large proportion of older or chronically ill participants who were not working, and a subgroup engaged in unpaid household work. The most frequent comorbidity, diabetes (41.0%), is broadly consistent with a Sudanese study in which 39.3% of hypertensive patients had diabetes.[13]

4.2 Socio-Demographic Profile and Hypertension Control

Female sex was strongly associated with uncontrolled hypertension in this study (OR=0.18, P<0.001), in agreement with a European study reporting a higher prevalence of uncontrolled hypertension among women, particularly at older age,[16] and with a United States study in which women accounted for more than two-thirds of patients with uncontrolled hypertension.[17]

Illiteracy was strongly linked to poor control in the present study (OR=2.39, P=0.002), which contrasts with a United States study reporting that a higher percentage of people without a high school diploma was associated with 29% lower odds of uncontrolled versus controlled hypertension (OR=0.71, 95% CI 0.08–6.68), a discrepancy the authors attributed to reliance on a single measurement and self-reported data.[17]

Unemployment was strongly associated with uncontrolled hypertension in this study (OR=9.27, P<0.001), consistent with the same United States study, which identified unemployment and low socioeconomic

status as powerful determinants of poor control, particularly among populations below the poverty line.[17] A duration of hypertension of five years or less was also associated with poorer control in the present study (OR=1.87, P=0.016), likely reflecting delayed treatment initiation and the difficulty of achieving early adherence when new medications, side effects, and treatment costs are still unfamiliar; this finding disagrees with a Sudanese study in which patients with a shorter duration of hypertension (<5 years) were more likely to have controlled blood pressure.[13]

Diabetes (OR=1.90, P=0.013) and heart disease (OR=1.79, P=0.037) were significantly more frequent among uncontrolled patients in this study, in agreement with a Tehran-based study reporting that diabetes and heart disease are more prevalent among patients with uncontrolled hypertension.[18] A European study similarly found that patients with uncontrolled blood pressure had a lower prevalence of most major cardiovascular comorbidities, with diabetes as a notable exception, supporting a consistent link between diabetes specifically and poor blood pressure control.[16]

4.3 Healthcare System Barriers

Uncontrolled patients in this study were more than three times as likely to report difficulty visiting the PHC (OR=3.24, P<0.001), comparable to a study reporting that patients with frequent, unimpeded visits to primary care were less likely to remain continuously uncontrolled.[19] and to an Australian study showing that patients who saw the same general practitioner frequently were more likely to have controlled blood pressure and to receive guideline-recommended antihypertensive therapy.[20] Medication unavailability was slightly, though not significantly, more common among controlled patients in this study (OR=0.60, P=0.058, borderline), which is nonetheless consistent with the broader concern raised by a study in eastern Zimbabwe, where six-month medication stock-outs increased the odds of uncontrolled blood pressure,[21] underscoring that medication supply continuity remains clinically relevant even when the association falls short of significance in a single sample.

4.4 Patient-Related Barriers

Uncontrolled patients in this study had a nearly fourfold higher likelihood of departing from their treatment plan (OR=3.98, P<0.001), consistent with a Bangladeshi study reporting that poor medication adherence is strongly linked to uncontrolled blood pressure.[22] and with a further study reporting intermediate adherence in 36.9% of participants and low adherence in 47.6%.[23] Lack of motivation was markedly more common among uncontrolled patients (OR=5.92, P<0.001), consistent with evidence that a targeted three-month nursing intervention combining education on blood pressure targets, hypertension complications, and appropriate therapy can improve medication adherence.[24]

Smoking was significantly less common among uncontrolled patients in this study (OR=0.39, P=0.019), which may partly reflect the fact that most participants were women. This finding aligns with a Korean study reporting a null association between smoking and hypertension.[25] and with a South Chinese study finding no significant link between overall tobacco use and hypertension risk,[26] but it contrasts with an Ethiopian study in which smokers were twice as likely to develop hypertension as non-smokers, with a significant association between smoking severity and hypertension severity.[27]

4.5 Cultural and Social Barriers

The strong preference for traditional or alternative remedies among uncontrolled patients (OR=5.91, P<0.001), likely reflecting lower cost and beliefs about their effectiveness, is consistent with a Nepalese study reporting that hypertension often remains poorly controlled after diagnosis because many patients prefer alternative medicine despite the availability of effective treatment.[28] and with a Nigerian study in which most uncontrolled hypertensive participants used herbs (63%) or garlic (21%).[29]

The belief that hypertension is a temporary condition that resolves with time or lifestyle change rather than a chronic disease was strongly associated with poor control in this study (OR=3.58, P<0.001), consistent with a Chicago-based study identifying poor disease knowledge, low illness awareness, and negative experiences in primary care as principal barriers to hypertension control.[30] Uncontrolled patients were also twice as likely to feel unsupported by family (OR=2.49, P=0.004), in agreement with the same study, which identified family and social support as the chief facilitator of blood pressure control.[30]

4.6 Impact of the Three Domains of Barriers

The frequency of all three barrier domains was higher among patients with uncontrolled hypertension than among those with controlled hypertension, and this overall difference was statistically significant. Cultural and social barriers showed the strongest association with poor control (OR=3.87, P<0.001), followed by patient-related barriers, which showed a moderate association (OR=1.72, P=0.043), while healthcare system barriers showed the weakest association (OR=1.55, P=0.128). This gradient agrees with a qualitative Nepalese study concluding that much uncontrolled hypertension occurs despite ongoing contact with the healthcare system, suggesting that patient- and clinician-level barriers outweigh system-level or access limitations.[11]

4.7 Clinical and Public Health Implications

Difficulty visiting the primary health care center and inconsistent antihypertensive medication supply were the most significant healthcare system barriers identified, and such access-related constraints can contribute to suboptimal hypertension control and, in turn, to a higher

risk of complications such as cardiovascular events and diabetes. Because cultural beliefs and low patient motivation, rather than health system deficiencies, were the principal drivers of poor control in this population, interventions that combine culturally sensitive counseling with adherence-focused support are likely to have greater impact than measures directed at healthcare access alone.

4.8 Strengths and Limitations

This study benefited from a structured, previously used data collection tool, direct interviewer administration, which minimized missing data, and simultaneous assessment of three distinct barrier domains with quantification of their relative strength of association through odds ratios and confidence intervals, allowing the domains to be ranked by clinical importance rather than considered in isolation. Limitations of this study include its relatively modest sample size and the potential for social desirability and recall bias, along with linguistic bias, inherent to self-reported, interview-based data collection.

5. CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

Uncontrolled hypertension in this population clustered among women (mainly older women), patients with no formal education, the unemployed, and those within five years of diagnosis and was more frequent among patients with diabetes or ischemic heart disease. Cultural and social barriers—particularly a preference for traditional remedies—were the strongest correlates of poor control, followed by patient-related non-adherence driven mainly by low motivation rather than lifestyle factors such as smoking; healthcare system barriers, chiefly difficulty visiting the PHC and inconsistent medication supply, contributed least but carry clinical relevance for long-term complication risk. All three barrier domains were significantly more frequent among uncontrolled patients, with cultural and social barriers showing the strongest association and healthcare system barriers the weakest.

5.2 Recommendations

Because a strong preference for traditional or alternative remedies was identified, healthcare providers should offer culturally sensitive counseling that corrects misconceptions about the superiority of herbal remedies and reinforces the importance of continuous antihypertensive therapy, supported by community awareness campaigns that use local influencers to address the belief that hypertension is a temporary condition requiring only herbal rather than pharmacological treatment.

Healthcare providers should use motivational interviewing to strengthen patients' intrinsic motivation to adhere to treatment and should integrate mental health support for patients with depression or anxiety that may be reducing motivation. Prescribing once-daily combination antihypertensive regimens rather than multiple separate pills, or introducing mobile reminder tools, may further support adherence.

Expanding the use of mobile clinics or community health workers in medically underserved areas could improve access to consultation, blood pressure monitoring, medication refills, and patient education. Policies that expand coverage of primary care visits and antihypertensive medications, and that reduce cost barriers through sliding-scale fees or subsidies for low-income patients, could further improve blood pressure control in underserved populations.

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