ORIGINAL ARTICLE

Determinants of Nonadherence to Antihypertensive Medications Among Adults in Bharatpur Metropolitan City, Nepal

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ABSTRACT

Background: Elevated blood pressure is a critical risk factor for cardiovascular diseases, this can be managed effectively with antihypertensive medications. However, nonadherence to prescribed medications and unhealthy lifestyle choices exacerbate cardiovascular complications and increase mortality. **Aim & Objective:** To identify the factors associated with nonadherence to antihypertensive medications among the adult population. **Methods and Materials:** This cross-sectional study was conducted in Bharatpur, Chitwan, among 238 patients who had been taking antihypertensive medicine for at least three months. Data were collected using structured interviews, and BP was measured using standardized equipment. Study sites and participants were randomly selected. Descriptive statistics and bivariate logistic regression methods were used to analyse the collected data. **Results:** 47.1% of participants had elevated BP despite taking antihypertensive medication, and 32.8% nonadherence. Nonadherence was significantly associated with sociodemographic and behavioral factors. In 95% CI, those who did not consume fruits ($p < 0.001$) or green vegetables ($p = 0.014$) were less likely to adhere, avoiding extra salt were more likely to adhere ($p < 0.001$) and those not engaging in vigorous physical activity had lower odds of adherence ($p = 0.007$). **Conclusion:** Dietary habits and physical activity were key determinants of nonadherence.

KEYWORDS

Hypertension; Blood Pressure; Nonadherence

INTRODUCTION

Raised blood pressure is one of the critical risk factors for cardiovascular diseases (CVDs) that can be modified but still poses a great threat to the population(1-2). Hypertensive patients who are compliant to their antihypertensive treatment are expected to manage their illness effectively,(3) yet non-compliance remains the commonest cause of uncontrolled BP. This uncontrolled raised blood pressure leads to an increase in mortality from cardiovascular diseases and associated complications(4).

The World Health Organization (WHO) defines hypertension as a systolic BP ≥140 mm Hg and/or diastolic BP ≥90 mm Hg, measured on two consecutive occasions(5). Hypertensive patients experience much higher cardiovascular mortality and this risk is further exacerbated by the rise in premature cardiovascular deaths, which stems from the worldwide increase in non-communicable diseases. In 2017, the WHO estimated that 1.13 billion of the 40.5 million NCD patients had hypertension, leading to the death of about 18 million people. Moreover, it was reported that over 44% of mortality was due to hypertension(6,7). That means timely, effective, and appropriate treatment strategies for the disease that results in elevated blood pressure must be utilized(8).

Nepal is undergoing an epidemiological transition, with NCDs overtaking communicable diseases as

the major health burden(9). The effective management of hypertension depends on adherence to antihypertensive medications and lifestyle modification(10,11). However, medication adherence remains a challenge in Nepal. A study conducted in Nepal revealed that among 51.9% of hypertensive patients, treatment adherence was achieved, and the female patients showed better compliance (57%) than males(12). Likewise, a randomized community-based study conducted in 2013 in the Pokhara Valley found that only 35.4% of patients adhered to their prescribed antihypertensive regimens, highlighting the urgent need for interventions to improve adherence(13).

Poor adherence to antihypertensive medication has far-reaching consequences, including uncontrolled BP, an increased burden of cardiovascular complications, increased risk for premature mortality and disability, and higher healthcare costs owing to frequent hospitalization(14,15). Non-compliance hampers BP control even in patients receiving treatment and increases the risk and adverse outcomes(16). Addressing adherence issues will play an important part in alleviating hypertension and related diseases in Nepal.

Aim & Objective(s)

The aims and objectives of the study were; to assess the prevalence of nonadherence to antihypertensive medicine among the adult population. to apprise determinants of nonadherence to antihypertensive medication to control hypertension among the adult population.

MATERIAL & METHODS

This cross-sectional study was conducted among the permanent residents of the 30–69-year-old population of selected wards in Bharatpur Metropolitan City, Nepal, who had been taking antihypertensive medications for at least the preceding three months. Bharatpur Metropolitan City, located in the western part of Bagmati Province, was selected as the study site. Three wards were selected by using a random sampling method. A list of hypertensive patients taking medicine for at least 3 months was acquired from the health facilities. Then the households of patients were identified, and the sampled households were selected by using a systematic random sampling method. Within each household, a single eligible participant was chosen through a simple random sampling process. The data was collected at the household level. This comprehensive approach ensured a representative and methodologically robust selection of study participants. Ethical approval was taken from the "Himalayan Institute of Medical Sciences, Swami Rama Himalayan University, Dehradun, India" (ethical approval no. SRHU/HIMS/E-1/2023/81). The study was conducted from January to March 2024.

Adult population aged 30 years and above and below 70 years, permanently residing in the selected wards of the Metropolitan City, hypertensive patients, who were prescribed at least one anti-hypertensive medicine for the last three months, were included in the study. Pregnant women, individuals diagnosed with mental health conditions, patients on antihypertensive medication for less than three months before the survey, hypertensive patients with cardiovascular complications, and those who were severely ill were excluded. Adherence was operationally defined as "hypertensive patients who were taking prescribed anti-hypertensive medicine in a given dose and time without missing any dose"(17). If there was any missing dose or day, it was defined as non-adherence to the medication. The current user of tobacco and alcohol was defined as the one who continuously uses since the last 30 days, The average systolic blood pressure between 120 to 140 mmHg and the average diastolic blood pressure between 60-90 mmHg of the two consecutive blood pressures measured in the 15-minute different period in the complete rest was defined as normal blood pressure in this study.

Data collection involved structured questionnaire-based interviews, blood pressure (BP) measurements using a standardized sphygmomanometer and stethoscope, and Body Mass Index (BMI) was measured by using calibrated weighing and height measurement equipment.

The sample size for the study was determined using the formula $z^2pq/d^{2,}$ proportions of adherence and non-adherence, respectively. Based on a previous study reporting 17% nonadherence to antihypertensive medication(18), the sample size calculation accounted for a 5% test error and an anticipated 5% non-response rate.

Descriptive statistics were used to analyze the sociodemographic characteristics, lifestyle behaviors, and measured values of blood pressure and BMI of the respondents. A statistical (chi-square) test was applied to assess differences between the adherence and non-adherence groups. bivariate logistic regression methods were employed to determine the significance of association with non-adherence to antihypertensive medications. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were calculated to determine the strength and significance of these associations.

RESULTS

Sociodemographic and Behavioral Characteristics of Respondents

The study revealed that 55% of the respondents were female, with the majority (51.7%) aged 60–69 years. Most of the participants (54.6%) belonged to joint families, with 52.1% reporting 3–5 family members. In terms of education, 34% were illiterate, while 37% had attained secondary education or higher. The predominant ethnic groups were Brahmin, Chhetri, and others (52.1%), followed by Janajati (32.4%). The majority identified themselves as Hindu (77.7%), with 80.7% reported being single (unmarried, separated, or widowed) during the study period. Employment was low, with 77.7% not currently working.

Behavioral factors showed significant patterns: 42% of respondents used tobacco, among them, primarily smokeless forms (44%), and 36.6% consumed alcohol, with hard drinks being the most common (56.5%). While 52.1% consumed fruits weekly and 63.4% consumed green vegetables regularly, 72.3% reported adding extra salt to meals, 26.1% of respondents were engaged in vigorous activities, and 36.1% engaged in moderate physical activities in a typical week. These findings emphasize behavioral risks such as tobacco use, alcohol consumption, and dietary patterns.

Family History of Hypertension and Measurement Characteristics

Approximately 67.6% of respondents reported a family member with current hypertension, and 30.7% had a direct family history of raised blood pressure. Among the population, 47.1% had raised blood pressure despite treatment, and 79.8% had their BP measured within the last year. However, only 39.1% had measurements in the past three months and 20.6% in the last 30 days. BMI analysis indicated 47.1% were obese, 25.2% overweight, 23.5% normal weight, and 4.2% underweight.

Determinants of Nonadherence to Antihypertensive Medication

Nonadherence was reported by 32.8% of respondents, defined as answering "no" to the question about regularly taking prescribed medication. Analysis revealed significant sociodemographic, behavioral, and treatment-related factors influencing adherence.

Non-Hindus were more likely to adhere compared to Hindus (COR = 0.291, 95% CI: 0.159–0.531, P= 0.009). Dietary factors played a key role: respondents who did not consume fruits (COR = 2.367, 95% CI: 1.488–3.764, P < 0.001) or green vegetables (COR = 1.778, 95% CI: 1.092–2.895, P = 0.014) had lower adherence. Avoiding extra salt significantly improved adherence (COR = 2.226, 95% CI: 1.408–3.520, P < 0.001). Physical activity was another determinant, as those not engaging in vigorous activity found lower odds of adherence (COR = 0.568, 95% CI: 0.370–0.873, P = 0.007).

Other factors showed varying levels of significance. Females exhibited a slight, non-significant trend toward better adherence (COR = 1.636, 95% CI: 0.846–3.164, P = 0.113). Family size and ethnicity, such as Dalit or Janajati, were not associated with adherence. Lifestyle behaviors like tobacco and alcohol use did not significantly influence adherence (P > 0.05). Regular BP monitoring was critical, with those not measuring BP in the last 30 days or three months being significantly less adherent (COR = 2.236, 95% CI: 1.252–3.995, P= 0.003).

Adherence was also influenced by the source of medication. Patients who obtained antihypertensive medications from government facilities showed better adherence, though the trend was non-significant (P = 0.12). Conversely, medication use from private clinics or pharmacies was significantly associated with nonadherence (P = 0.016).

Table 1: Socio-demographic variables and non-adherence to anti-hypertensive medication

Variables	Anti-hypertensive medication (n=238)		COR (95% CI)	p-value
	Nonadherence (%)	Adherence (%)		
Gender				
Male	43 (40.2)	64 (59.8)	Ref	0.143
female	62 (47.3)	69 (52.7)	1.636 (0.869-3.164)	
Education of the respondents				
Illiterate	40 (49.4)	41 (50.6)	1.391(0.312-1.376)	0.264
Primary	26 (37.7)	43 (62.3)	0.933(0.559-3.350)	0.492
Secondary and above	39 (44.3)	49 (55.7)	Ref	
Type of family				
Single	38 (46.3)	44 (53.7)	Ref	0.616
Joint and extended	67 (42.9)	89 (57.1)	0.872(0.509-1.492)	
Religion				
Hindu	90 (48.6)	95 (51.4)	0.286(0.118-0.694)	0.006

Variables	Anti-hypertensive medication (n=238)		COR (95% CI)	p-value
	Nonadherence (%)	Adherence (%)		
Non-Hindu	15 (28.3)	38 (71.7)	Ref	
Marital status				
Currently Married	18 (39.1)	28 (60.9)	1.341(0.866-4.286)	0.108
Single/ widowed/ divorced/ separated	87 (45.3)	105 (54.7)	Ref	
Occupation of the respondent				
Employed	21 (39.6)	32 (60.4)	1.391(0.539-2.403)	0.734
Unemployed/ retired/ housemaker	84 (45.4)	101 (54.6)	Ref	

Table 2: Behavioural variables and non-adherence to anti-hypertensive medication

Variables	Anti-hypertensive medication (n=238)		COR (95% CI)	p-value
	Nonadherence (%)	Adherence (%)		
Currently using tobacco				
No	62 (44.9)	76 (55.1)	1.123 (0.726-1.736)	0.768
Yes	43 (43)	57 (57)	Ref	
Current alcohol use				
No	62 (41.1)	89 (58.9)	1.322 (0.862-2.028)	0.211
Yes	44 (49.4)	43 (50.6)	Ref	
Vigorous intensity physical activity done by the respondent in a typical week				
No	75 (46)	88 (54)	0.568 (0.370-0.873)	**0.007**
Yes	30 (40)	45 (60)	Ref	

Table 3: Dietary habits and non-adherence to anti-hypertensive medication

Variables	Anti-hypertensive medication (n=238)		COR (95% CI)	p-value
	Nonadherence (%)	Adherence (%)		
Consumption of fruits in a typical week				
No	14 (51.9)	13 (48.1)	2.367 (1.488-3.764)	<0.001
Yes	91 (43.1)	120 (56.9)	Ref	
Consumption of green vegetable in a typical week				
No	9 (32.1)	19 (67.9)	1.778 (1.092-2.895)	0.014
Yes	96 (45.7)	114 (54.3)	Ref	
Additional salt taken in the daily meal				
No	48 (42.5)	65 (57.5)	2.226 (1.408-3.520)	<0.001
Yes	57 (45.6)	68 (54.4)	Ref	

Table 4: Health-seeking behaviour and non-adherence to anti-hypertensive medication

Variables	Anti-hypertensive medication (n=238)		COR (95% CI)	p-value
	Nonadherence (%)	Adherence (%)		
Blood Pressure measured within the last 12 months				
No	23 (47.9)	25 (52.1)	0.708 (0.390-1.285)	0.162
Yes	82 (43.2)	108 (56.8)	Ref	
Blood Pressure measured within the last 3 months				
No	73 (50.3)	72 (49.7)	1.840 (1.174-2.885)	**0.016**
Yes	32 (34.4)	61 (65.6)	Ref	
Blood Pressure measured within the last 30 days				
No	89 (47.1)	100 (52.9)	2.236 (1.252-3.995)	**0.004**
Yes	16 (32.7)	33 (67.3)	Ref	
Anti-hypertensive medicine taken by the respondents from government hospitals				
No	86 (41.5)	121 (58.5)	0.600 (0.308-1.170)	0.088
Yes	19 (63.3)	12 (38.7)	Ref	
Anti-hypertensive medicine taken by the respondents from private clinics/pharmacy				
No	51 (44.3)	64 (55.7)	0.658 (0.426-1.018)	**0.038**
Yes	54 (43.9)	69 (56.1)	Ref	

Variables	Anti-hypertensive medication (n=238)		COR (95% CI)	p-value
	Nonadherence (%)	Adherence (%)		
Mean Arterial Pressure of the respondents				
Normal BP	53 (42.1)	73 (57.9)	1.368 (0.893-2.097)	0.91
Raised	52 (46.4)	60 (53.6)	Ref	

DISCUSSION

The findings of this study showed that about a quarter of the respondents do not use prescribed antihypertensive medicine regularly, which shows similar results carried out in Nigeria, Nepal and India(19,20,21,22). This research has demonstrated a significant correlation between nonadherence to antihypertensive medication and various socio-demographic factors, behaviors, and treatment variables, as well as lifestyle habits and physical activity. The analysis revealed a minor, yet statistically insignificant, trend indicating that females tended to adhere to their medication regimens more than males which shows contrasting result of a study conducted in Pakistan revealing that females were more likely to skip medication, seek delayed treatment, and request prescribers to suggest low-cost medicine due to the low purchasing capacity and inequality(23). This study reflected that dietary factors played a crucial role on adherence of antihypertensive medication, and individuals who did not consume fruits were less expected to adhere to prescribed antihypertensive medicines.

Research conducted in Nigeria revealed that physical inactivity was statistically associated with nonadherence to antihypertensive medication(24). A study conducted at a Nedjo General Hospital in western Ethiopia showed that additional salt intake was scientifically associated with nonadherence to antihypertensive medication(25). A multicenter cohort study completed in 24 health facilities in urban and rural areas of Korea showed that high salt intake (<0.001), physical inactivity (0.001), and newly treated hypertension (,0.001) significantly affected to the adherence of antihypertensive medication(26). The results of my study align closely with those of previous research. Similar to the aforementioned studies, sample units were drawn from health facilities, and data were gathered through face-to-face interviews. A notable strength of my study was the measurement of blood pressure within the community, which fostered an environment that encouraged participants to provide honest responses. A study carried out in Korea, utilizing data from 5,324 individuals collected between 2008 and 2009 by the Korean Institute for Health and Social Affairs, indicated that individuals with higher educational attainment were more likely to demonstrate adherence compared to those with lower educational levels. However, this finding was not statistically significant(27). This research indicated that adherence was superior among participants who had completed their primary education compared to those with secondary education or higher. However, it is important to note that this study was conducted within a limited timeframe and had a smaller sample size than the Korean study. Additionally, there were constraints regarding resources in this research. In this study, alcohol consumption did not demonstrate statistical significance. This contrasts with a research conducted in Taiwan, which found a significant coorelation between alcohol consumption and nonadherence to antihypertensive medication (28). The aforementioned study provided national data; however, the current study is limited to data from a single metropolitan city. A study carried out in a tertiary-care hospital in Mumbai, India, revealed that medication adherence was significantly lower among individuals who used tobacco and consumed alcohol(29). This study bore similarities to the previous one; however, it was carried out within a community by selecting sample units from health facilities.

CONCLUSION

This study concluded that around a quarter (32.8%) of hypertensive individuals were nonadherent to medication. Behavioral factors such as consumption of fruits and/or green vegetables, additional salt intake, and vigorous physical activity were strongly influenced by adherence to antihypertensive medication. Lifestyle factors like tobacco and alcohol use were not strong predictors of nonadherence. Regular blood pressure monitoring emerged as an important factor for medication adherence. Targeted intervention should be implemented for adherence to the medication and lifestyle modification.

RECOMMENDATION

- Proper counselling to adhere to antihypertensive medication should be provided for treatment adherence to control hypertension.
- Antihypertensive medicine should be available in the government health institutions.

- Lifestyle modification intervention should be implemented for better adherence to the antihypertensive medication.
- Operational research should be conducted to identify the effectiveness of adherence to antihypertensive medication in controlling hypertension.

Limitation of the Study

This study was conducted in a limited timeframe within a low-resource setting. Financial resource was not received from any organization/institution. The study population was selected from the already-registered list of hypertensive patients. Mass screening was not conducted due to the limited human resources and short study period.

Relevance of the Study

Hypertensive patients are at higher risk of Cardiovascular complications because of nonadherence to the prescribed medication schedule. Females are more vulnerable to nonadherence to antihypertensive medication. Lifestyle factors play an important role in nonadherence to medication. Community-based counselling to adhere to anti-hypertensive medication should be implemented and motivated to the patient to take regular medication as prescribed by the health personnel.

Authors Contribution

All authors have contributed equally.

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Nil

Conflict of Interest

There are no conflicts of interest.

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Declaration of Generative AI and AI Assisted Technologies in the Writing Process

The authors haven't used any generative AI/AI assisted technologies in the writing process.

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