# Prevalence and Predictors of Antihypertensive Medication Adherence in a Tertiary Outpatient Population

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### ABSTRACT
***Background:*** *Hypertension is a prevalent chronic condition worldwide, particularly in low- and middle-income countries, where poor adherence to antihypertensive medication remains a significant barrier to effective blood pressure control.*
***Aim of the study:*** *To determine the prevalence of antihypertensive medication adherence and identify associated predictors among hypertensive patients in a tertiary care outpatient setting in Bangladesh.*
***Methods:*** *This cross-sectional study included 180 adult hypertensive patients attending a tertiary outpatient clinic. Data were collected using a structured questionnaire and patient medical records. Adherence was assessed using a validated self-reporting scale. Logistic regression analysis identified factors associated with good adherence.*
***Result:*** *Only 40% of patients demonstrated good adherence, while 60% had poor adherence. Factors significantly associated with better adherence included male gender (OR=5.54, p<0.001), being married (OR=4.65, p=0.034), higher education, non-smoking status (OR=7.78, p=0.008), shorter hypertension duration (OR=7.11, p<0.001), and more frequent dosing regimens. Forgetfulness was the most commonly reported reason for non-adherence.*
***Conclusion:*** *The study highlights a concerningly low adherence rate among hypertensive patients and underscores the need for targeted interventions addressing behavioral, educational, and systemic barriers to improve medication compliance.*
***Keywords:*** *Hypertension, Medication adherence, Predictors, Tertiary care, Bangladesh, Blood pressure control.*

## I. INTRODUCTION

Hypertension, commonly known as high blood pressure, is a chronic medical condition characterized by persistently elevated arterial blood pressure, which significantly increases the risk of cardiovascular diseases, stroke, and renal failure [1]. According to the global statics approximately 1.28 billion adults aged 30-79 worldwide have hypertension, with only about one in five having the condition under control [2]. This global burden is compounded by the challenge of medication adherence, which is crucial for effective blood pressure control and prevention of associated complications [3]. In Bangladesh, the prevalence of hypertension has risen alarmingly in recent years, with recent national surveys indicating that nearly 3.4% of adults suffer from hypertension, reflecting a significant public health challenge in this low-middle-income country [4]. Medication adherence in hypertension management is defined as the extent to which patients take their antihypertensive medications as prescribed by their healthcare providers [5]. Adherence is fundamental to achieving optimal therapeutic outcomes, minimizing morbidity and mortality, and reducing healthcare costs. However, antihypertensive medication adherence remains suboptimal worldwide, with adherence rates showing considerable variation depending on the population studied and the methods used to measure adherence [6]. Non-adherence to antihypertensive therapy contributes to poor blood pressure control, increased risk of cardiovascular events, hospitalizations, and healthcare resource utilization [7]. The adherence to antihypertensive medication is of particular concern due to several socioeconomic, cultural, and healthcare system factors. Limited access to healthcare, financial constraints, low health literacy, and insufficient patient-provider communication often hinder continuous and effective medication use [8]. Additionally, the asymptomatic nature of hypertension leads many patients to underestimate the importance of strict medication adherence, resulting in high rates of discontinuation

or irregular medication intake [9]. Despite these challenges, data on the prevalence and determinants of medication adherence among hypertensive patients in tertiary care outpatient settings in Bangladesh remain scarce and fragmented. Various factors have been identified as predictors of medication adherence in hypertensive populations. These include demographic variables such as age, gender, and education level; clinical factors including duration of hypertension, presence of comorbidities, and complexity of the medication regimen; and psychosocial aspects such as social support, patient beliefs about medication, and depression [10]. Healthcare system-related factors such as accessibility, affordability, and quality of care also play vital roles. Understanding these predictors within the local context is critical to designing effective interventions aimed at improving adherence and, consequently, patient outcomes [11]. Studies conducted in similar low- and middle-income countries have shown that interventions tailored to address the specific barriers faced by patients can significantly enhance adherence rates [12]. These include patient education, reminder systems, simplified drug regimens, and strengthening the patient-healthcare provider relationship [13]. However, to implement such strategies effectively in Bangladesh, robust data on current adherence prevalence and its influencing factors in tertiary outpatient populations are essential [14]. Therefore, this study aims to determine the prevalence of antihypertensive medication adherence and identify its key predictors among patients attending a tertiary outpatient clinic in Bangladesh.

## II.    METHODOLOGY & MATERIALS

This cross-sectional study was conducted at the Department of Internal Medicine Medical College for Women and Hospital, Uttara, Dhaka, Bangladesh over six months period from January 2025 to June 2025. A total of 180 hypertensive patients were recruited using a consecutive sampling technique.

**Inclusion Criteria:**
- Adults aged ≥21 years.
- Diagnosed with hypertension and on antihypertensive medication for at least 6 months.
- Attending the outpatient department of the tertiary care hospital during the study period.
- Able to communicate and provide informed consent.

**Exclusion Criteria:**
- Patients with cognitive impairment or severe psychiatric disorders affecting their ability to respond.
- Patients who were critically ill or hospitalized.
- Blood pressure >220/120 mmHg (hypertensive emergency).
- Patients with incomplete medical records regarding medication history or blood pressure.

**Ethical Considerations**
The study was approved by the Institutional Ethics Committee. Written informed consent was obtained from all participants prior to enrollment, and confidentiality was strictly maintained.

**Assessment of Blood Pressure Control**
Hypertension was considered controlled if blood pressure was <140/90 mmHg at the most recent clinic visit, and uncontrolled if ≥140/90 mmHg.

**Data Collection**
Data were collected using a structured, pre-tested questionnaire through face-to-face interviews complemented by a review of participants' medical records. The questionnaire comprised several key domains. Demographic information included variables such as age, gender, marital status, education level, and monthly income. Clinical information covered smoking status, presence of comorbid conditions, duration of hypertension, frequency of daily antihypertensive dosing, number of medications taken per day, and the current status of blood pressure control. Additionally, participants were asked about any fear of side effects and self-reported reasons for non-adherence, which were documented in a descriptive manner to better understand behavioral and perceptual factors influencing adherence. Adherence was assessed using a validated self-reporting scale and participants were categorized into good and poor adherence groups.

**Statistical Analysis**
Data were entered and analyzed using SPSS version 26.0. Descriptive statistics (frequencies and percentages) were used to summarize demographic and clinical variables. Differences between good and poor adherence groups were assessed using the chi-square test for categorical variables. Binary logistic regression analysis was performed to identify independent predictors of good adherence. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were calculated. A p-value of <0.05 was considered statistically significant.

## III. RESULT

Figure 1 showed the adherence status of the study population (N=180). Overall, 40% of patients demonstrated good adherence, while a larger proportion, 60%, reported poor adherence to antihypertensive medications. Patients aged ≥50 years formed the largest group (51.11%), followed by those aged 30–49 years (37.22%) and 21–29 years (11.67%). Males predominated (69.44%) and had significantly higher adherence (88.89%) compared to females (11.11%). The majority of participants were married (84.44%), with nearly all married patients showing good adherence (97.22%). Educational status revealed that graduates (36.67%) and postgraduates (29.44%) demonstrated better adherence compared to those with only primary or secondary education (6.94%). Monthly income above 50,000 BDT was more common among adherent patients (Table 1). Non-smokers (88.89%) were significantly more adherent (97.22%) than smokers (2.78%). Patients with hypertension of <5 years' duration had markedly better adherence (88.89%) compared to those with longer disease duration (11.11%). Those on a once-daily regimen (23.61%) had notably lower adherence than patients prescribed twice-daily doses (45.83%). Patients taking more than 9 medicines daily (20.83%) also showed relatively higher adherence than those taking fewer drugs. Despite this, 53.33% of patients had uncontrolled hypertension, more frequently among those with good adherence (61.11%). Fear of side effects was equally distributed between both groups (Table 2). Figure 2 demonstrated the self-reported reasons for non-adherence. Forgetfulness was the most common cause (20.56%), followed by a busy work schedule (7.78%), not having enough money (3.33%), feeling well (1.67%), and other causes (4.44%). Table 4 showed the factors associated with adherence. Male gender (OR 5.54, 95% CI 2.50–12.27, p<0.001), being married (OR 4.65, 95% CI 1.12–19.35, p=0.034), higher education (graduate: OR 9.18, p<0.001; postgraduate: OR 5.47, p=0.002), non-smoking status (OR 7.78, p=0.008), shorter hypertension duration (<5 years: OR 7.11, p<0.001), and more frequent dosing schedules (twice daily: OR 6.41, p<0.001; >twice daily: OR 3.91, p=0.004) were significantly associated with better adherence. Additionally, taking more medicines daily was positively associated with adherence (5–9 drugs: OR 2.92, p=0.01; >9 drugs: OR 4.34, p=0.005).



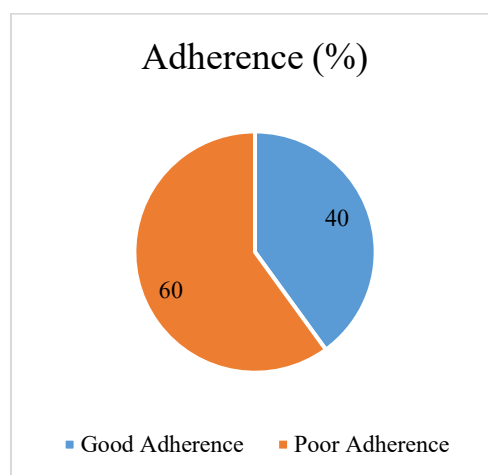**Figure 1:** Medication adherence status among patients (N=180)

**Table 1:** Demographic characteristics of the study population (N=180)

| Variables | Total | | Good Adherence (n=72) | | Poor Adherence (n=108) | |
|---|---|---|---|---|---|---|
| | n | % | n | % | n | % |
| Age (years) | | | | | | |
| 21–29 | 21 | 11.67 | 6 | 8.33 | 15 | 13.89 |
| 30–49 | 67 | 37.22 | 29 | 40.28 | 38 | 35.19 |
| ≥50 | 92 | 51.11 | 37 | 51.39 | 55 | 50.93 |
| Gender | | | | | | |
| Female | 55 | 30.56 | 8 | 11.11 | 47 | 43.52 |
| Male | 125 | 69.44 | 64 | 88.89 | 61 | 56.48 |
| Marital status | | | | | | |
| Married | 152 | 84.44 | 70 | 97.22 | 82 | 75.93 |
| Single | 12 | 6.67 | 1 | 1.39 | 11 | 10.19 |
| Others | 16 | 8.89 | 1 | 1.39 | 15 | 13.89 |
| Education | | | | | | |
| Primary & Secondary | 61 | 33.89 | 5 | 6.94 | 56 | 51.85 |
| Graduate | 66 | 36.67 | 41 | 56.94 | 25 | 23.15 |
| Post-graduate | 53 | 29.44 | 26 | 36.11 | 27 | 25.00 |
| Monthly income | | | | | | |
| < 25,000/month | 14 | 7.78 | 1 | 1.39 | 13 | 12.04 |

| 26–50,000/month | 24 | 13.33 | 4 | 5.56 | 20 | 18.52 |
|---|---|---|---|---|---|---|
| 51–100,000/month | 79 | 43.89 | 41 | 56.94 | 38 | 35.19 |
| > 100,000/month | 63 | 35.00 | 26 | 36.11 | 37 | 34.26 |

**Table 2:** Baseline characteristics of the study population (N=180)

| Variables | Total | | Good Adherence (n=72) | | Poor Adherence (n=108) | |
|---|---|---|---|---|---|---|
| | n | % | n | % | n | % |
| Smoking | | | | | | |
| No | 160 | 88.89 | 70 | 97.22 | 90 | 83.33 |
| yes | 20 | 11.11 | 2 | 2.78 | 18 | 16.67 |
| Comorbidity | | | | | | |
| None or One | 158 | 87.78 | 64 | 88.89 | 94 | 87.04 |
| More than one | 22 | 12.22 | 8 | 11.11 | 14 | 12.96 |
| Hypertension duration (years) | | | | | | |
| < 5 | 124 | 68.89 | 64 | 88.89 | 60 | 55.56 |
| ≥ 5 | 56 | 31.11 | 8 | 11.11 | 48 | 44.44 |
| Antihypertensive daily dose | | | | | | |
| Once daily | 83 | 46.11 | 17 | 23.61 | 66 | 61.11 |
| Twice daily | 53 | 29.44 | 33 | 45.83 | 20 | 18.52 |
| More than twice | 44 | 24.44 | 22 | 30.56 | 22 | 20.37 |
| Number of medicines (per day) | | | | | | |
| < 5 | 81 | 45.00 | 24 | 33.33 | 57 | 52.78 |
| 5–9 | 73 | 40.56 | 33 | 45.83 | 40 | 37.04 |
| > 9 | 26 | 14.44 | 15 | 20.83 | 11 | 10.19 |
| Control of hypertension | | | | | | |
| Uncontrolled | 96 | 53.33 | 44 | 61.11 | 52 | 48.15 |
| Controlled | 84 | 46.67 | 28 | 38.89 | 56 | 51.85 |
| Fear of side effects | | | | | | |
| No | 95 | 52.78 | 38 | 52.78 | 57 | 52.78 |
| Yes | 85 | 47.22 | 34 | 47.22 | 51 | 47.22 |
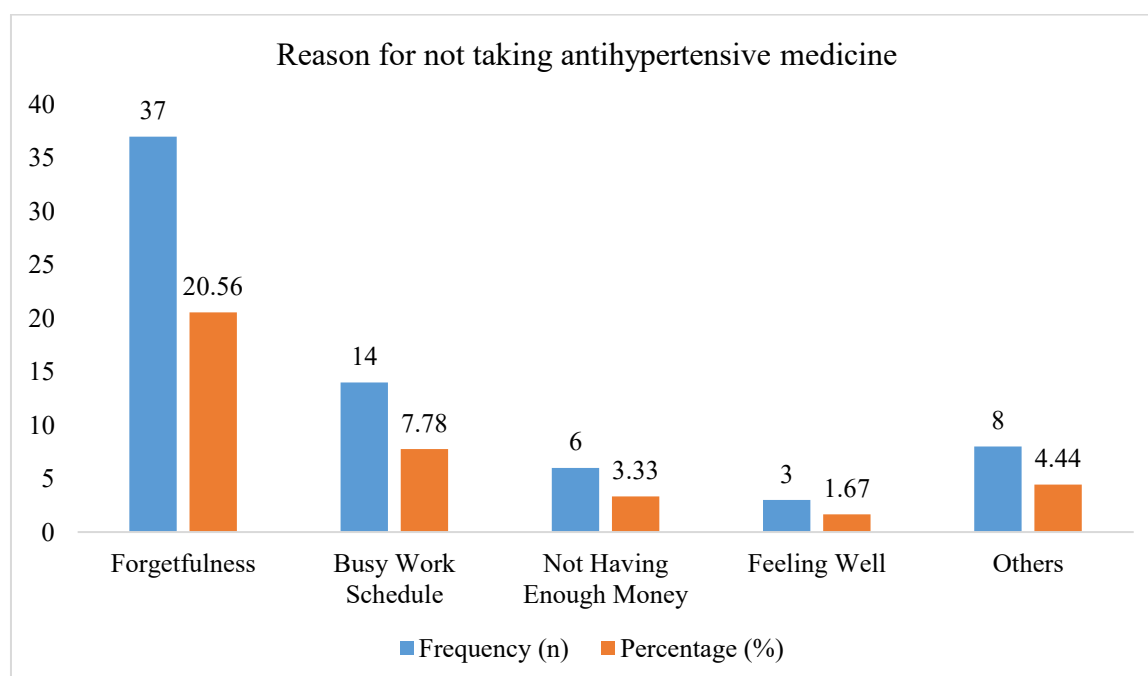


**Figure 2:** Self-reported reasons for not taking antihypertensive medicine regularly by patients

**Table 4:** Factors associated with adherence to antihypertensive medications

| Variables | OR | 95% CI | P-value |
|---|---|---|---|
| Age (years) | | | |
| 21–29 | 1 | Reference | – |
| 30–49 | 1.14 | 0.43–3.00 | 0.79 |
| ≥50 | 1.29 | 0.50–3.37 | 0.59 |
| Gender | | | |
| Female | 1 | Reference | – |
| Male | 5.54 | 2.50–12.27 | <0.001 |
| Marital status | | | |
| Married | 4.65 | 1.12–19.35 | 0.034 |

| | | | |
|---|---|---|---|
| Single/Other | 1 | Reference | – |
| Education | | | |
| Primary & Secondary | 1 | Reference | – |
| Graduate | 9.18 | 3.15–26.75 | <0.001 |
| Post-graduate | 5.47 | 1.89–15.85 | 0.002 |
| Monthly income | | | |
| <25,000 | 1 | Reference | – |
| 26–50,000 | 1.27 | 0.13–11.93 | 0.83 |
| 51–100,000 | 6.71 | 0.87–51.85 | 0.068 |
| >100,000 | 5.94 | 0.76–46.43 | 0.09 |
| Smoking | | | |
| Yes | 1 | Reference | – |
| No | 7.78 | 1.70–35.57 | 0.008 |
| Hypertension duration | | | |
| <5 years | 7.11 | 3.05–16.54 | <0.001 |
| ≥5 years | 1 | Reference | – |
| Dosing frequency | | | |
| Once daily | 1 | Reference | – |
| Twice daily | 6.41 | 2.63–15.60 | <0.001 |
| >Twice daily | 3.91 | 1.55–9.83 | 0.004 |
| Number of medicines/day | | | |
| <5 | 1 | Reference | – |
| 5–9 | 2.92 | 1.29–6.58 | 0.01 |
| >9 | 4.34 | 1.54–12.19 | 0.005 |

## IV. DISCUSSION

Hypertension is a major global health concern and a leading risk factor for cardiovascular morbidity and mortality. Effective blood pressure control largely depends on consistent adherence to prescribed antihypertensive medications. However, non-adherence remains a significant barrier to optimal hypertension management, particularly in outpatient settings. This study was conducted to assess the prevalence of medication adherence and identify key predictors among hypertensive patients attending a tertiary care outpatient clinic. Our study found that the overall adherence rate was 40%, with the majority (60%) of participants demonstrating poor adherence. This aligns with other studies in low- and middle-income countries (LMICs) that report low adherence levels to antihypertensive medications, where the adherence rate was 34.1% in Africa [15], 46% in India [16], and 36.6% in Saudi Arabia [17]. A systematic review and meta-analysis revealed overall non-adherence rates of 45.2%, with the highest rates in Africa (62.4%) and lower rates in Asia (43.5%) [18]. These findings underscore significant regional variation in adherence, influenced by socioeconomic and healthcare system differences. The low adherence in our cohort can be attributed to several factors, including limited access to healthcare, medication costs, and lack of consistent follow-up, which are well-recognized barriers in LMICs [19]. These challenges create a cycle of poor adherence, uncontrolled hypertension, and increased cardiovascular risk. In the present study, compared to the reference group (21–29 years), patients aged 30–49 (OR: 1.14, *p*=0.79) and ≥50 years (OR: 1.29, *p*=0.59) had slightly higher odds of adherence, but the differences were not statistically significant. A study suggested that older age may increase adherence due to heightened risk awareness and more frequent healthcare contact [20]. In this study, men were significantly more likely to adhere to antihypertensive therapy than women (OR = 5.54, p < 0.001). This is consistent with previous findings, where men demonstrated better adherence [21]. However, contrasting evidence from the NHANES survey in the United States reported higher medication use among women [22]. This discrepancy may be explained by sociocultural roles, where women in South Asia often juggle household responsibilities and may neglect their own medication schedules. Married participants were 4.65 times more likely to adhere in comparison of single or widowed individuals. This supports previous research suggesting that family and spousal support improves adherence [23]. Our study found a strong association between education level and adherence, with graduates (OR = 9.18) and postgraduates (OR = 5.47) significantly more likely to adhere than those with only primary or secondary education. These findings are consistent with earlier studies showing that higher education improves health literacy and treatment compliance [24,25]. Participants with higher monthly income (>50,000 BDT) had greater adherence compared to those earning less than 25,000 BDT, though some differences did not reach statistical significance. This observation is consistent with evidence from South Korea, where low income was a predictor of poor adherence and was linked to a higher incidence of stroke in hypertensive patients [26]. Co-payment and out-of-pocket costs have also been cited as barriers in other studies [27]. Non-smokers had significantly better adherence (OR 7.78, p = 0.008). While smoking is less commonly covered in antihypertensive adherence literature than other factors, it is often a marker of lower general health engagement and poorer health behaviors overall. Patients with a shorter duration of hypertension (<5 years) were significantly more adherent (OR = 7.11), which may reflect greater motivation and fewer treatment-related burdens early in the disease course. Interestingly, higher dosing frequency (twice daily) and greater pill burden (>9 medications/day) were also associated with improved adherence. This contradicts earlier findings that once-

daily regimens promote adherence [28]. However, as observed in other studies [29], patients on multiple medications may receive closer monitoring, more counseling, or perceive their condition as more serious, leading to better adherence. This complex relationship suggests that regimen complexity interacts with patient motivation and healthcare engagement [30]. According to our study, the most frequently cited barrier was forgetfulness (n = 37; 20.56%), followed by a busy work schedule (n = 14; 7.78%), lack of money (n = 6; 3.33%), feeling well (n = 3; 1.67%), and other reasons (n = 8; 4.44%). Our results are consistent with the findings of Sharif et al [31].

***Limitations of the study:***
- Data on some variables were self-reported, potentially introducing recall or reporting bias.
- The cross-sectional design precludes establishing causality between the identified factors and outcomes.

## V.     CONCLUSION AND RECOMMENDATIONS

This study revealed that adherence to antihypertensive medication in a tertiary outpatient population is suboptimal, with only 40% of patients being adherent. Multiple socio-demographic and clinical factors, including male gender, marital status, higher education, non-smoking status, shorter disease duration, and increased dosing frequency, were significantly associated with better adherence. Forgetfulness emerged as the most common reason for non-adherence.

Given the vital role of adherence in blood pressure control and the prevention of cardiovascular complications, healthcare providers should prioritize regular counseling, implement reminder systems, and simplify treatment regimens where possible. Public health strategies must also aim to increase health literacy and address socioeconomic barriers through targeted interventions. Further longitudinal and larger-scale studies are recommended to explore adherence patterns and assess the long-term impact of interventions.

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