



**Medication adherence in hypertension:
A cross-sectional study at Tam Tri Quang Nam General Hospital**

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ABSTRACT

Objective: Hypertension is a prevalent chronic condition in Vietnam that can lead to severe complications if not well controlled. Medication adherence plays a crucial role in effective blood pressure management. This study aimed to assess medication adherence and its associated factors among hypertensive patients in a private hospital setting. **Methods:** A cross-sectional study was conducted at Tam Tri Quang Nam General Hospital in 2025 among adults aged ≥ 18 years with hypertension diagnosed for at least six months. Data were collected using a structured questionnaire, and medication adherence was assessed using the 8-item Morisky Medication Adherence Scale (MMAS-8). Descriptive statistics were used to summarize participant characteristics and levels of medication adherence. Non-parametric tests (Mann–Whitney U and Kruskal–Wallis tests) were applied to examine associations between medication adherence and related factors in univariate analyses. Variables identified were then entered into a multivariable linear regression model to determine independent predictors of medication adherence. **Results:** More than half of patients had low medication adherence (52.9%), while only 8.0% showed high adherence. In univariate analyses, several factors were associated with adherence ($p < 0.05$). In multivariable linear regression, gender and the number of daily medications remained independently associated with adherence, with the number of daily medications being the strongest predictor. **Conclusion:** Medication adherence among patients with hypertension was suboptimal. The number of daily medications was the strongest predictor of poor adherence, indicating the need to simplify treatment regimens and prioritize patients receiving multiple medications.

Keywords: Hypertension; Medication adherence; Associated factors; Vietnam

INTRODUCTION

Hypertension (HTN) is one of the most prevalent non-communicable diseases worldwide and is widely referred to as a “silent killer” because it is often asymptomatic until serious complications occur. In recent years, HTN has been increasingly observed

among younger adults, while continuing to affect individuals across all age groups and socioeconomic strata. According to the World Health Organization (WHO), the number of people living with HTN doubled over the past three decades, rising from approximately 650 million in 1990

to 1.3 billion in 2019. HTN is estimated to contribute to 10.8 million deaths annually and to account for 235 million disability-adjusted life years (DALYs) each year ¹.

In Vietnam, WHO estimates that as of May 2024, approximately 12 million people are living with HTN ². Because HTN is often asymptomatic, many individuals are unaware that they have the condition. Among these estimated 12 million people with HTN, around 60% remain undiagnosed, and up to 80% have not received any treatment ³ brain, kidney and other diseases. It is one of the major causes leading to heart attacks, heart failure, stroke, collectively known as cardiovascular diseases (CVD).

Effective control of HTN requires appropriate, sustained treatment to prevent serious complications, including cardiovascular and renal events, premature mortality, and long-term functional impairment. A cornerstone of HTN management is consistent adherence to antihypertensive medication. In practice, however, some patients take medication only when they perceive symptoms (e.g., headache or fatigue) and discontinue therapy once symptoms improve, despite HTN often being asymptomatic and requiring long-term control. This study had two objectives: To assess the rate of medication adherence;

To identify factors associated with medication adherence among hypertensive patients at Tam Tri Quang Nam General Hospital in 2025.

METHODS

A descriptive cross-sectional study with an analytical component was conducted between January and May 2025. Participants were recruited using convenience sampling by consecutively enrolling all eligible patients until the target

sample size was reached. Following their clinical consultation, eligible patients were approached for participation, and data were collected through structured face-to-face interviews.

Inclusion criteria: Patients diagnosed with HTN for at least 6 months. Provided informed consent to participate in the study. Attended the Cardiology Outpatient Clinic or were hospitalized in the Internal Medicine Department.

Exclusion criteria: Patients under 18 years of age. Hospital staff. Individuals with hearing, speech, or communication impairments. Patients with poor health status or altered consciousness that prevented them from answering questions.

A total of 323 patients were enrolled in the study.

$$n = Z_{(1-\alpha/2)}^2 \frac{p(1-p)}{d^2}$$

The sample size was calculated using a single-proportion formula with a 95% confidence level ($\alpha = 0.05$, $z = 1.96$). The expected proportion of medication adherence ($p = 0.747$) was based on a previous study conducted by Dang Thi Ngoc Yen et al. at Can Tho City General Hospital in 2024 ⁴, with a margin of error (d) of 0.05. The minimum required sample size was 291 patients, which was increased to 323 patients after accounting for a 10% anticipated non-response rate.

Instruments: Data were collected using a structured questionnaire including demographic characteristics and medication adherence assessed by the 8-item Morisky Medication Adherence Scale (MMAS-8).

The MMAS-8 consists of eight items with a total score ranging from 0 to 8. Items 1–4 and 6–7 are scored 1 for “No” and 0 for

“Yes”; item 5 is scored 1 for “Yes” and 0 for “No”; item 8 is rated on a 5-point Likert scale (never = 1 to always = 0). Adherence was classified as low (<6), medium ^{5,6}, and high ⁷.

The MMAS-8, developed by Morisky, has demonstrated good reliability and validity, with a sensitivity of 93%, specificity of 57%, and Cronbach’s alpha of 0.83 ⁸. Permission to use the MMAS-8 was obtained from Dr. Donald E. Morisky. The Vietnamese version of the MMAS-8 has been widely used in studies conducted among Vietnamese patients with HTN.

Statistical analysis

Data were coded, cleaned, and analyzed using SPSS: Categorical variables were expressed as frequencies and percentages, and continuous variables as median and interquartile range (Median, IQR) due to the non-normal distribution of the MMAS-8 score. Univariate analysis

was conducted using the Mann–Whitney U test or Kruskal–Wallis test, as appropriate. Variables with $p < 0.20$ in univariate analysis and those of clinical relevance were entered into a multivariable linear regression model to identify independent factors associated with MMAS-8 scores. Statistical significance was set at $p < 0.05$.

Ethical considerations: This study was approved by the Ethics Committee of Phan Chau Trinh University (Decision No. 32–HĐĐĐ–ĐHPCT, March 25, 2025). Written informed consent was obtained from all participants, who were informed of the study purpose and procedures and could withdraw at any time without consequences. Participant confidentiality was strictly protected. As an observational study, it involved no interference with clinical prescribing decisions and posed no anticipated harm. Data were used solely for research and quality improvement purposes, and the study received no external funding.

RESULTS

Demographic characteristics: A total of 323 patients with HTN were included in the study. Most participants were aged ≥ 60 years (62.5%), followed by those aged 40–60 years (31.0%); patients aged < 40 years accounted for 6.5%. Men comprised 170 participants (52.6%) and women 153 (47.4%). The majority were of Kinh ethnicity (298; 92.3%), while other ethnic groups accounted for 25 (7.7%). Almost all participants reported no religious affiliation (320; 99.1%). Regarding nutritional status, 231 participants (71.5%) had a normal BMI (18.5–22.9), and 52 (16.1%) were overweight (BMI 23.0–24.9) (Table 1).

Table 1. General information of study participants, Quang Nam province, Vietnam, 2025 (n = 323)

Demographic characteristics		Frequency (n)	Percentage (%)
Age	≤ 60	121	37.5
	> 60	202	62.5
Gender	Male	170	52.6
	Female	153	47.4

Demographic characteristics		Frequency (n)	Percentage (%)
Ethnicity	Kinh	298	92.3
	Other	25	7.7
Religion	Buddhism	2	0.6
	Protestantism	1	0.3
	Catholicism	0	0
	None	320	99.1
BMI	< 18.5 (Underweight)	26	8
	18.5-22.9 (Normal)	231	71.5
	23.0 -24.9 (Overweight)	52	16.1
	≥ 25.0 (Obese)	14	4.3

Medication adherence rate

Table 2. Medication adherence issues reported by participants, Quang Nam Province, Vietnam, 2025 (n = 323)

No	Adherence-Related Item	Frequency (n)	Percentage (%)
1	Occasionally forget to take medication	8	2.5
2	Missed taking medication at least one day in the past 2 weeks	21	6.5
3	Have ever reduced or stopped taking medication when feeling worse	35	10.8
4	Forget to bring medication when going out or traveling	56	17.3
5	Did not take medication yesterday	50	15.5
6	Occasionally stop taking medication when blood pressure is under control	53	16.4
7	Feel bothered by having to take medication every day	73	22.6
8	Find it difficult to remember to take medication on a daily schedule	26	8.0

Based on Table 2, the most common reported barrier to medication adherence was feeling inconvenienced by having to take medicine every day (22.6%). This was followed by forgetting to bring medication when leaving home or traveling (17.3%) and occasionally discontinuing medication when blood pressure was perceived to be under control (16.4%).

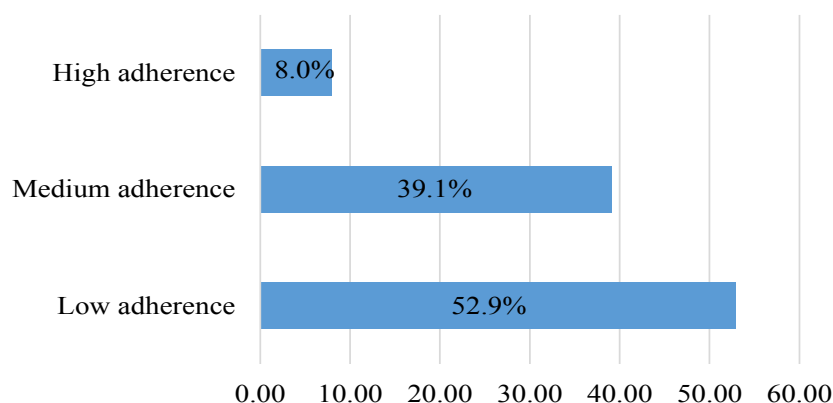


Figure 1. Proportion of patients by medication adherence, Quang Nam Province, Vietnam, 2025 (n = 323)

According to the Morisky Medication Adherence Scale (MMAS-8), 52.9% of participants were classified as having low medication adherence, 39.0% as moderate adherence, and only 8.0% as high adherence (Figure 1).

Factors Associated with Medication Adherence

- Univariate analysis of factors associated with medication adherence

Table 3. Univariate analysis of factors associated with medication adherence, at Tam Tri Quang Nam General Hospital in 2025 (n = 323)

Related factors		N	Mean rank	p
Age	≤ 60 years	109	175.61	0.058
	> 60 years	214	155.07	
Gender	Male	170	152.33	0.047
	Female	153	172.74	
Place of residence	Rural	266	165.57	0.133
	Urban	57	145.36	
Daily reduction of fatty food intake	Yes	279	156.00	0.003
	No	44	200.02	
Fruit and vegetable consumption	Yes	322	162.44	0.124
	No	1	20.00	
Weight loss	Yes	69	149.01	0.186
	No	254	165.53	

Related factors		N	Mean rank	p
Duration of disease	< 5 years	190	177.31	0.002
	5–10 years	107	139.56	
	≥ 10 years	26	142.48	
Duration of treatment	< 5 years	191	176.48	0.001
	≥ 5 years	132	141.04	
Marital status	Single	14	223.32	0.011
	Married	309	159.22	
Comorbidities	Yes	147	146.40	0.005
	No	176	175.03	
Comparison of medications across follow-up visits	No change	247	168.52	0.025
	Medication change	58	138.20	
	Treatment intensification	14	126.25	
	Treatment de-escalation	4	229.50	
Number of daily medications	1	168	181.23	0.000
	2	101	145.97	
	≥ 3	54	132.16	

As shown in Table 3, several factors were significantly associated with medication adherence. Among sociodemographic characteristics, gender was significantly associated with adherence ($p = 0.047$), whereas age and place of residence were not significantly associated ($p > 0.05$).

Regarding lifestyle factors, daily reduction of fatty food intake was significantly associated with medication adherence ($p = 0.003$), while fruit and vegetable consumption and weight loss were not significantly associated ($p > 0.05$).

For disease- and treatment-related characteristics, both duration of disease and duration of treatment were significantly associated with medication adherence ($p = 0.002$ and $p = 0.001$, respectively). Marital status and comorbidities also showed significant associations with medication adherence ($p < 0.05$).

In addition, changes in medication regimens between follow-up visits and the number of daily medications were significantly associated with medication adherence ($p = 0.025$ and $p < 0.001$, respectively).

- Multivariable linear regression analysis

Based on the results of the univariate analysis, variables with p-values < 0.20 were entered into the multiple linear regression model to identify independent factors associated with medication adherence.

Table 4. Multivariable linear regression analysis of factors associated with medication adherence

Related factors	Unstandardized coefficients	Standardized coefficients	p-value	95.0% Confidence interval for B	
	B	Beta		Lower bound	Upper bound
(Constant)	10.246		0.000	5.298	15.195
Age	0.072	0.018	0.785	-0.445	0.589
Gender	0.482	0.130	0.022	0.070	0.893
Place of residence	-0.303	-0.062	0.269	-0.842	0.235
Educational level	-0.114	-0.050	0.424	-0.393	0.165
Daily reduction of fatty food intake	0.585	0.108	0.071	-0.051	1.221
Fruit and vegetable consumption	-2.936	-0.088	0.105	-6.492	0.620
Weight loss	0.236	0.052	0.344	-0.255	0.728
Duration of disease	0.047	0.016	0.904	-0.723	0.818
Duration of treatment	-0.499	-0.132	0.327	-1.498	0.500
Marital status	-0.988	-0.109	0.074	-2.073	0.097
Comorbidities	-0.103	-0.028	0.724	-0.675	0.469
Comparison of medications used across follow-up visits	-0.024	-0.008	0.891	-0.369	0.321
Number of daily medications	-0.448	-0.181	0.020	-0.826	-0.070

Model fit: $R = 0.35$; $R^2 = 0.122$; adjusted $R^2 = 0.085$; Durbin–Watson = 2.08.

Model statistics: $F = 3.31$; $p < 0.001$; Multicollinearity: All VIF < 10

As shown in Table 4, multivariable linear regression analysis showed that gender ($\beta = 0.130$, $p = 0.022$) and the number of daily medications ($\beta = -0.181$, $p = 0.020$) were independently associated with medication adherence. Among these, the number of daily medications was the strongest predictor, showing an inverse association between the number of medications and the level of adherence. The remaining variables, including age, place of residence, educational level, lifestyle factors, duration of disease, duration of treatment, marital status, comorbidities, and changes in medication regimens between follow-up visits, were not statistically significant after adjustment for potential confounders ($p > 0.05$).

DISCUSSION

Our findings show that the majority of participants were aged 60 or older (62.5%) and male (52.6%), consistent with prior studies. The predominance of the Kinh ethnicity (92.3%) and normal BMI (71.5%) also align with previous reports ⁴. The high prevalence of HTN among older adults may reflect age-related vascular changes, while gender differences are likely influenced by behavioral factors such as smoking and diet. Maintaining a healthy weight remains critical in blood pressure management due to its systemic impact.

Based on Table 2, intentional discontinuation of medication when blood pressure was perceived to be under control was one of the commonly reported non-adherence behaviors. This finding highlights a gap in patients' understanding of hypertension as a chronic condition requiring long-term treatment. Similar results have been reported in studies conducted in Vietnam and other developing countries, where patients often adjust medication use based on subjective symptom improvement rather than adhering to medical prescriptions, thereby increasing the risk of disease recurrence and unstable blood pressure control ^{4,5}.

Behaviors such as forgetting to bring medication when going out, missing doses on the previous day, or having difficulty remembering to take medication according to schedule were also reported at notable rates. These findings are consistent with studies using the Morisky Medication Adherence Scale, in which non-adherence is commonly associated with daily routine disruptions and the complexity of medication schedules, particularly among patients taking multiple medications concurrently ^{6,7}.

Conversely, the relatively low prevalence of behaviors such as occasional forgetfulness or missing medication for at least one day within the past two weeks suggests that most patients still demonstrate an intention to adhere to treatment. However, the presence of these behaviors also underscores that reliance on patient motivation alone is insufficient, and that behavioral support strategies are needed to help patients maintain regular medication use.

Overall, the study showed that more than half of patients had low medication adherence (52.9%), while only 8.0% achieved high adherence, reflecting a concerning situation in the management of HTN. This distribution is consistent with findings from previous studies among patients with chronic diseases, in which low and moderate adherence groups predominate and high adherence accounts for only a small proportion. Studies conducted in Kazakhstan, India, and several other countries have likewise reported high rates of poor adherence to antihypertensive therapy, indicating that this is a globally prevalent problem ^{9,10}.

The proportion of low medication adherence in this study was comparable to that reported by Rowa' Al-Ramahi (2019) and Mekonnen et al. ^{11,12}, but lower than that reported in some other studies, such as the study by Nur Ainiyah et al. ¹³. The high prevalence of low adherence indicates that maintaining long-term treatment remains a challenge, particularly in the context of prolonged therapy and increasingly complex medication regimens.

In this study, univariate analysis showed that several individual, lifestyle, and treatment-related factors were associated

with medication adherence, including gender, daily reduction of fatty food intake, duration of disease, duration of treatment, marital status, comorbidities, changes in medication regimens between follow-up visits, and the number of daily medications. However, after adjustment in multivariable linear regression analysis, only gender and the number of daily medications remained independently associated with medication adherence, with the number of daily medications being the strongest predictor. This finding is consistent with previous studies showing that polypharmacy increases treatment burden, complicates medication schedules, and negatively affects long-term adherence. The use of multiple medications may also increase the risk of adverse effects, thereby further reducing adherence.

In addition, gender was identified as an independent factor associated with medication adherence; however, further qualitative or longitudinal studies are needed to clarify its role. Other factors, including age, place of residence, educational level, dietary habits, duration of disease, duration of treatment, marital status, comorbidities, and changes in medication regimens, were no longer statistically significant in the multivariable model. This suggests that these factors are not independent predictors but may reflect baseline characteristics or indirect effects mediated by core treatment-related factors, particularly the number of daily medications.

From a clinical and nursing perspective, the findings suggest that interventions to improve medication adherence should focus on patients receiving multiple medications, through health education, individualized medication counseling, and collaboration with physicians to optimize

treatment regimens. Consideration of gender differences may also enhance the effectiveness of long-term HTN management.

LIMITATIONS

Several limitations of this study should be acknowledged. First, the cross-sectional design precludes causal inference between associated factors and medication adherence. Second, medication adherence was assessed using a self-reported questionnaire, which may be subject to recall and social desirability bias. Finally, the study was conducted at a single general hospital, which may limit the generalizability of the findings to other settings.

CONCLUSION

The study showed that medication adherence among patients with HTN was suboptimal (52.9%), with more than half of patients classified as having low adherence and only a small proportion achieving high adherence (8.0%). Both intentional and unintentional non-adherence behaviors were common, indicating that medication adherence is influenced by multiple behavioral and contextual factors.

After adjustment for potential confounders, gender and the number of daily medications were identified as independent predictors of medication adherence. These findings highlight the importance of reducing treatment burden and optimizing medication regimens to support long-term adherence among patients with hypertension.

RECOMMENDATIONS

Interventions to improve medication adherence should primarily focus on patients using multiple daily medications, as this was the strongest predictor of poor adherence.

Education should emphasize the need for continuous medication use even when blood pressure is controlled, addressing common intentional and unintentional non-adherence behaviors identified in this study. Simple adherence-support measures may be incorporated into routine care to help patients maintain regular medication use.

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