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FACTORS ASSOCIATED WITH ADHERENCE TO ANTI-HYPERTENSIVE TREATMENTS IN KABGAYI HOSPITAL, RWANDA

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Abstract: **Adherence to anti-hypertensive treatment is essential for controlling hypertension and preventing complications such as stroke, heart failure, and kidney disease. However, poor adherence remains a significant challenge in many low-resource settings. This study assessed factors associated with adherence to anti-hypertensive treatment among hypertensive patients in the Kabgayi Hospital catchment area, Rwanda. A descriptive cross-sectional study was conducted among 418 hypertensive patients selected through consecutive sampling. Data were collected using a structured questionnaire and analyzed using SPSS version 23.0. Descriptive statistics, Chi-square tests, and logistic regression were used to determine factors associated with adherence. The findings revealed low adherence levels, with only 14.6% of participants demonstrating high medication adherence, while 51.4% exhibited low adherence and 45.0% reported missing at least one dose within the previous two weeks. Financial constraints (62.2%) and out-of-pocket expenditures for medicines due to stock-outs at health facilities significantly reduced adherence (AOR = 0.52, p = 0.002; AOR = 0.55, p = 0.018), whereas health insurance positively influenced adherence (AOR = 1.70, p = 0.025). Healthcare system factors, including shorter waiting times, consistent medication availability, accessibility of health facilities, and patient satisfaction, significantly improved adherence (AOR = 1.65–2.50, p < 0.05). Patient education, understanding of treatment consequences, and motivation were also significant predictors, with motivation showing the strongest association (AOR = 2.80, p < 0.001). The study concludes that adherence remains suboptimal and recommends strengthening medication availability, financial protection mechanisms, patient education, and motivational support to improve treatment outcomes among hypertensive patients.**

Keywords: **Hypertension, treatment adherence, anti-hypertensive medication, healthcare accessibility, patient motivation, Rwanda.**

I. INTRODUCTION

Hypertension is a major global public health challenge and one of the leading risk factors for cardiovascular diseases, stroke, kidney failure, and premature mortality. According to the World Health Organization (WHO, 2023), more than one billion people worldwide live with hypertension, with the majority residing in low- and middle-income countries. Although effective anti-hypertensive medications are widely available, achieving optimal blood pressure control remains difficult due to poor adherence to prescribed treatment regimens. Medication adherence is recognized as a critical component of hypertension management, as non-adherence contributes to uncontrolled blood pressure, increased disease complications, reduced quality of life, and higher healthcare expenditures (Burnier & Egan, 2019).

Previous studies have shown that adherence to anti-hypertensive treatment is influenced by multiple factors. Socio-economic barriers such as poverty, medication costs, and limited insurance coverage have been reported to reduce adherence among hypertensive patients (Abegaz et al., 2019; Ogundapo et al., 2020). Healthcare system factors including medication stockouts, long waiting times, inadequate follow-up, and limited access to health facilities have also been associated with poor adherence (Dzudie et al., 2017; Wekesah et al., 2020). In addition, patient-related biomedical factors such as inadequate knowledge of hypertension, poor motivation, fear of side effects, and misconceptions about treatment have been identified as important determinants of adherence (Vrijens et al., 2017; Kibachio et al., 2018).

In Rwanda, hypertension prevalence continues to increase, posing a growing burden on the healthcare system. Studies have reported suboptimal adherence to anti-hypertensive treatment, largely attributed to financial limitations, inadequate healthcare access, and health system challenges (Nahimana et al., 2017; Uwizeye et al., 2023; Habimana et al., 2023). However, limited evidence exists regarding the combined influence of socio-economic, healthcare system, and biomedical factors on treatment adherence among hypertensive patients in district hospital catchment areas. This knowledge gap is particularly important in Kabgayi Hospital, where hypertension-related complications remain common despite the availability of treatment services.

Therefore, the purpose of this study was to assess the level of adherence to anti-hypertensive treatment and identify socio-economic, healthcare system-related, and biomedical factors associated with adherence among hypertensive patients in the Kabgayi Hospital catchment area, Rwanda. The findings of this study contribute to the existing body of knowledge on hypertension management in low-resource settings and provide evidence for policymakers, healthcare managers, and clinicians to design targeted interventions aimed at improving treatment adherence and reducing hypertension-related complications. This study was guided by the following specific objectives:

i. To determine the level of adherence to anti-hypertensive treatment among hypertensive patients at Kabgayi Hospital, Rwanda.

ii. To assess the socio-economic factors associated with adherence to anti-hypertensive treatment at Kabgayi Hospital, Rwanda.

iii. To examine healthcare system-related factors influencing adherence to anti-hypertensive treatment at Kabgayi Hospital, Rwanda.

iv. To identify biomedical factors associated with adherence to anti-hypertensive treatment among hypertensive patients at Kabgayi Hospital, Rwanda.

II. THEORETICAL FRAMEWORK

Social Cognitive Theory (SCT)

Social Cognitive Theory (SCT), developed by psychologist Albert Bandura in 1986, is a comprehensive framework that explains how individuals acquire and maintain certain behavioral patterns. The theory evolved from Bandura's earlier work on Social Learning Theory in the 1960s and was formally presented in his seminal book *Social Foundations of Thought and Action: A Social Cognitive Theory* published in 1986. SCT emphasizes the dynamic and reciprocal interaction between three key factors: personal factors (such as cognitive, emotional, and biological events), behavioral patterns, and environmental influences. This triadic reciprocal model—known as reciprocal determinism—asserts that individuals are both products and producers of their environment.

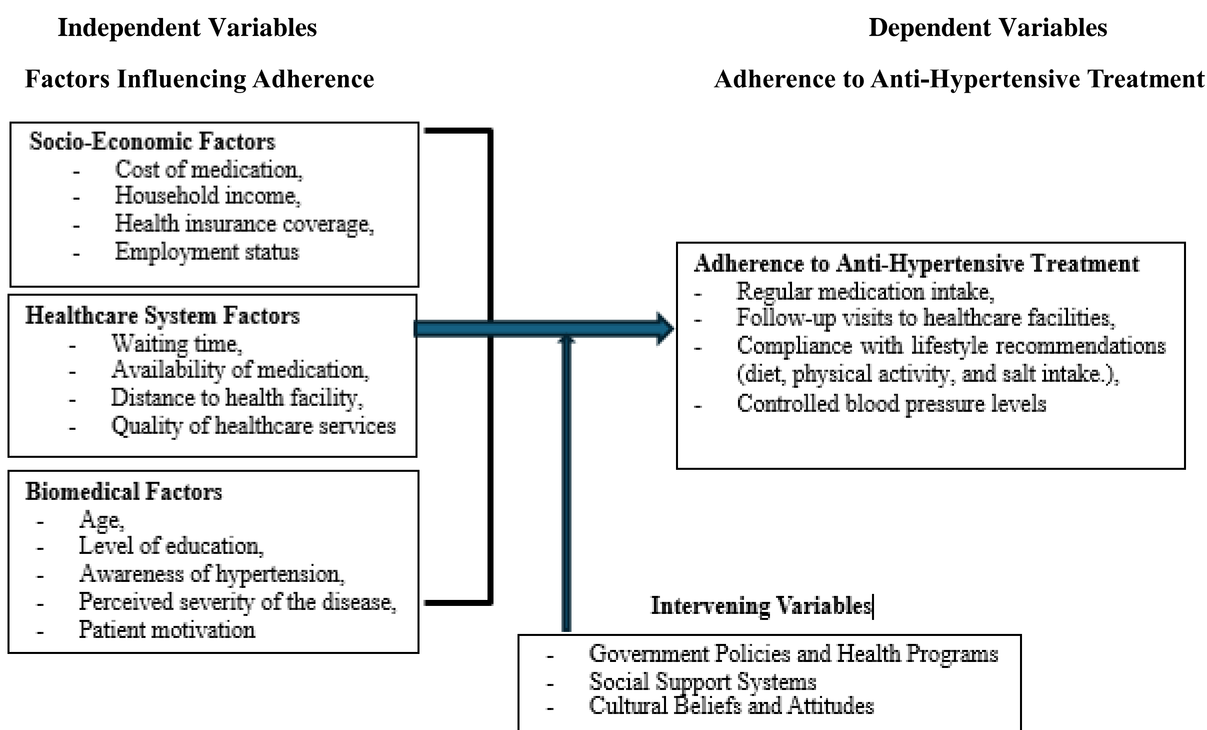
One of the central constructs of SCT is self-efficacy, which refers to a person's belief in their ability to execute behaviors necessary to produce specific performance attainments. In the context of hypertension treatment adherence, self-efficacy plays a crucial role in determining whether patients believe they can follow their prescribed medication regimens consistently. Another core element of the theory is behavioral capability, which emphasizes the importance of possessing the knowledge and skills required to perform a specific behavior. For hypertensive patients, this involves understanding the nature of their condition, how and when to take medications, and how to manage lifestyle factors such as diet and physical activity.

Observational learning, another key SCT component, involves learning by watching the actions and outcomes of others' behavior. Patients can learn effective hypertension management strategies by observing peers or healthcare providers. Furthermore, outcome expectations—beliefs about the likely results of actions—motivate individuals to engage in behaviors they perceive as beneficial. For example, patients who expect improved health outcomes from adhering to treatment are more likely to comply with medical advice. Finally, SCT acknowledges that environmental factors such as access to healthcare, support from family and community, and communication with providers also significantly impact behavior.

In the context of this study on anti-hypertensive treatment adherence among non-communicable disease patients at Kabgayi Hospital, SCT provides a useful theoretical lens. It allows for a deeper understanding of how personal beliefs, social influences, and systemic barriers interact to shape adherence behaviors. The theory not only emphasizes the role of individual agency but also the importance of supportive environments and effective patient education in promoting sustained adherence to treatment. Thus, SCT offers a holistic approach to identifying and addressing the multifaceted challenges associated with medication adherence in a low-resource healthcare setting.

III. CONCEPTUAL FRAMEWORK

The conceptual framework of this study provides a structured approach to understanding the factors influencing adherence to anti-hypertensive treatment among NCD patients in Kabgayi Hospital's catchment area. It outlines the relationship between independent variables (socio-economic, healthcare system, and patient-related factors), the dependent variable (adherence to anti-hypertensive treatment), and intervening variables (government policies, social support systems, and cultural beliefs). These factors interact dynamically, either facilitating or hindering adherence.



Source: Researcher developed (2025)

Figure 1: Conceptual Framework

Socio-economic factors, such as income level, health insurance coverage, and employment status, directly influence a patient's ability to afford medication and access healthcare services, affecting adherence to anti-hypertensive treatment. Healthcare system factors, including waiting time, availability of medication, and distance to health facilities, also play a crucial role. Long waiting hours and frequent stockouts of medication may discourage patients from following their prescribed treatment. Patient-related factors, such as age, education level, and awareness of hypertension, further impact adherence, with more knowledgeable patients being more likely to comply with their treatment regimen.

Intervening variables, such as government policies, social support systems, and cultural beliefs, can either enhance or weaken the relationship between these independent variables and treatment adherence. Policies that subsidize medication and promote awareness campaigns may improve adherence by reducing financial barriers and increasing knowledge about hypertension. Similarly, strong social support from family and community health workers can encourage patients to stay committed to their treatment. However, negative cultural beliefs about chronic medication use and reliance on traditional medicine may reduce adherence. These interactions highlight the need for a multi-faceted approach to improving adherence, addressing financial, healthcare, and social barriers in Kabgayi Hospital's catchment area.

IV. RESEARCH METHODOLOGY

Research Design

The study adopted a descriptive cross-sectional research design. This design is chosen because it allows for the collection of data at a single point in time, making it suitable for assessing the prevalence and relationships between variables within a population. In the context of this study, the design facilitates the exploration of various socio-economic, healthcare system, and patient-related factors that may influence adherence to anti-hypertensive treatments. According to Setia (2016), a cross-sectional design is effective for identifying associations and describing characteristics of a target population, especially in public health research where time and resource constraints may limit the use of longitudinal designs. Therefore, the cross-sectional approach is appropriate for capturing a snapshot of adherence behaviors and associated factors among non-communicable disease patients at Kabgayi Hospital.

Study Population

The study population consists of adult hypertensive patients receiving treatment at Kabgayi District Hospital. Based on data provided by the Head of the Non-Communicable Diseases (NCD) department at Kabgayi District Hospital, a total of 4020 hypertensive patients sought medical care at the hospital or other health centers around Kabgayi District Hospital during the last twelve months up to March 2025. These patients regularly attend follow-up consultations and receive anti-hypertensive treatment as part of their disease management, this means that at least this hospital receives a mean of 335 patients monthly.

Inclusion Criteria:

Participants included in the study if they meet the following conditions: they must be aged 18 years and above, have a confirmed diagnosis of either primary or secondary hypertension, and have been on anti-hypertensive medication for a minimum duration of three months. Additionally, eligible participants must be attending follow-up visits at the outpatient department of Kabgayi Hospital and be willing to provide informed consent for participation in the study.

Exclusion Criteria:

On the other hand, individuals were excluded from the study if they are under the age of 18 or if they are pregnant, due to the unique treatment protocols associated with hypertension in pregnancy. Furthermore, patients with mental health conditions that may impair their ability to participate effectively in the study were excluded, as well as those who have been diagnosed with hypertension for less than three months. Individuals who are unable or unwilling to provide informed consent were also be excluded from the study.

Sample Size

Here is how I determined the sample size using the Single Population Proportion Formula:

$n=Z^2.P(1-P)/d^2$

Where:

n = required sample size

Z = standard normal value (1.96 for 95% confidence level)

P = estimated proportion of hypertensive patients adhering to treatment (from previous studies, **P = 0.45** based on Sibomana et al., 2019)

d = margin of error (commonly **0.05** or 5%)

Step 1: Applying the Formula

$n=1.96^2.0.45(1-0.45)/0.05^2=380$

The calculated sample size is approximately 380 hypertensive patients.

To account for a 10% non-response rate, we adjust the sample size:

n adjusted=380+(0.10×380) =380+38=418

Sampling Technique

The study used purposive sampling. All hypertensive patients who meet the inclusion criteria and present for follow-up care during the data collection period was recruited consecutively until the required sample size of 418 (including a 10% non-response adjustment) is reached. This technique is more practical in clinical environments and ensures fairness in recruitment, capturing patients as they naturally come for services without selection bias.

Data Collection Methods

Data for this study were collected using a structured questionnaire designed to capture key variables related to adherence to anti-hypertensive treatment. The questionnaire was developed in English and translated into Kinyarwanda to ensure clarity and ease of understanding for all participants. To enhance its reliability and validity, a pre-test was conducted with a small sample of 10 patients who were not part of the main study. This pre-testing helped identify ambiguities or weaknesses in the wording of questions, enabling necessary adjustments before the actual data collection began. According to Krosnick and Presser (2010), pre-testing questionnaires is a vital step in survey research as it improves question clarity, structure, and the overall effectiveness of the data collection tool.

The questionnaire included sections on socio-economic factors such as income, education level, health insurance status, and employment status; healthcare system-related variables such as the availability of medication, distance to health facilities, waiting times, and perceived quality of care; and patient-related factors including age, awareness of hypertension, perceived severity, and motivation to adhere to treatment. Additionally, adherence status was assessed using questions about the frequency of medication intake, attendance of follow-up visits, and compliance with recommended lifestyle changes. Participants completed the questionnaire independently, with assistance from the research team provided when needed. The data collection process spanned two months to ensure adequate coverage and representation of the target population.

Data Analysis

The collected data were coded and entered into SPSS (Statistical Package for the Social Sciences) version 23.0 for statistical analysis. Adherence to antihypertensive treatment was measured as a composite variable that included both medication adherence and lifestyle modification adherence (including diet, physical activity, and salt intake).

Medication adherence was assessed using the validated 8-item Morisky Medication Adherence Scale (MMAS-8). Based on MMAS-8 scoring criteria, patients were categorized as having high adherence (score = 8), medium adherence (score between 6 and <8), or low adherence (score <6).

Lifestyle adherence was evaluated using structured questions adapted from recent studies (2021–2025) focused on non-pharmacological hypertension management. These assessed adherence to a low-sodium diet, regular physical activity (at least 150 minutes per week), weight control practices, and limiting alcohol and tobacco use. Responses were recorded on a five-point Likert scale (Always, Often, Sometimes, Rarely, Never), and an aggregate lifestyle adherence score was generated based on defined cut-off points from prior literature.

Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize the participants' socio-demographic characteristics and adherence levels. The Chi-square test was employed to explore associations between categorical variables (e.g., socio-economic factors and adherence outcomes). Furthermore, binary logistic regression analysis was conducted to determine the influence of independent variables such as socio-economic status, healthcare system factors, and patient-related characteristics on overall adherence to antihypertensive treatment.

The findings were presented in tables with odds ratios (OR), 95% confidence intervals (CI), and p-values, with statistical significance set at $p < 0.05$.

Ethical Considerations

Ethical approval for this study was obtained from Mount Kigali University and Kabgayi Hospital before data collection commenced. Permission to access the study site was granted by the hospital administration. Participation was voluntary, and written informed consent was obtained from all participants after explaining the study objectives, procedures, benefits, and potential risks. Confidentiality, privacy, and anonymity were maintained by using coded identifiers instead of participants' names and restricting data access to the researcher. Participants were informed of their right to refuse participation or withdraw from the study at any stage without any consequences. All collected data were securely stored in password-protected electronic files and locked cabinets in accordance with Rwanda's Data Protection Law (Law No. 058/2021 of 13/10/2021). The researcher adhered to principles of academic integrity by ensuring originality of the work and proper acknowledgment of all sources.

V. RESEARCH FINDINGS AND DISCUSSION

This section presents the demographic profile of the respondents who participated in the study. It provides a summary of key characteristics, including gender, age group, marital status, level of education, occupation, and health insurance status. Understanding these variables is essential, as they influence patients' adherence to anti-hypertensive treatment.

Table 1. Demographic Characteristics of Respondents (n = 418)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	172	41.1
	Female	246	58.9
Age Group	18–30 years	21	5.0
	31–45 years	67	16.0
	46–60 years	153	36.6
	Above 60 years	177	42.3
Marital Status	Single	54	12.9
	Married	269	64.4
	Divorced	35	8.4
	Widowed	60	14.4
Level of Education	No formal education	83	19.9
	Primary	168	40.2
	Secondary	109	26.1
	Tertiary	47	11.2
	Postgraduate	11	2.6
Occupation	Employed	76	18.2
	Self-employed	147	35.2
	Unemployed	102	24.4
	Retired	78	18.7
	Student	15	3.6
Health Insurance	Yes	387	92.6
	No	31	7.4

Source: Primary data, 2025

Table 1 presents the demographic characteristics of the 418 respondents. The majority were female, accounting for 58.9%, while males constituted 41.1%, indicating a higher participation of women in the study. Regarding age, most respondents were above 60 years (42.3%), followed by those aged 46–60 years (36.6%). Only a small proportion were between 18–30 years (5.0%), suggesting that hypertension is more prevalent among older adults.

In terms of marital status, most respondents were married (64.4%), while 12.9% were single, 14.4% widowed, and 8.4% divorced. This shows that a large proportion of participants were living with a partner or spouse, which may influence treatment adherence through social support.

Educational attainment varied, with 40.2% having completed primary education and 19.9% having no formal education. Respondents with secondary and tertiary education accounted for 26.1% and 11.2% respectively, while only 2.6% had postgraduate qualifications. This indicates that a considerable number of participants had low educational levels, which may affect their understanding of hypertension management.

Regarding occupation, 35.2% were self-employed, 24.4% unemployed, 18.7% retired, and 18.2% employed in formal sectors. A small proportion (3.6%) were students. This distribution suggests diverse economic backgrounds among the respondents.

Finally, a majority (92.6%) reported having health insurance, while only 7.4% were uninsured.

2. Presentation of Findings

This section presents the results of the data analysis based on the study objectives. The findings are organized according to the major themes of the research, including demographic characteristics, levels of adherence to anti-hypertensive treatment, and the association between adherence and socio-economic, biomedical, and healthcare system factors.

2.1 Adherence status of hypertensive patients to anti-hypertensive treatments

This section presents the findings on medication and lifestyle adherence among hypertensive patients at Kabgayi Hospital. The data includes patients' responses on the MMAS-8 scale for medication adherence and self-reported lifestyle behaviors, highlighting the level of adherence and potential areas for intervention.

Table 2: Medication Adherence (MMAS-8 Results)

Item Responses (MMAS-8)	Yes (%)	No (%)
Sometimes forget to take medications	48	52
Have difficulty remembering to take medications	42	58
Stop medication when feeling better	40	60
Stop medication when feeling worse	28	72
Reduce or stop medication without consulting doctor	35	65
Take medication exactly as prescribed every day	58	42
Find it difficult to follow treatment plan	37	63

Source: Primary data, 2025

The results indicate that more than half of the respondents occasionally forget or interrupt their medication, and 37% report difficulty following their treatment plan. Conversely, 58% consistently take medication as prescribed. These findings suggest that medication adherence is suboptimal, with notable gaps in routine compliance.

Table 3. Missed Medication Days

Missed Medication Days	Frequency (n)	Percentage (%)
0 days	230	55.00
1–2 days	110	26.30
3–5 days	52	12.40
More than 5 days	26	6.30

Source: Primary data, 2025

While over half of the patients (55%) did not miss any medication days, nearly 45% missed at least one dose in the previous two weeks, reflecting inconsistent medication-taking behavior among a significant portion of the respondents.

Table 4. Adherence Level (MMAS-8 Results)

Adherence Level	Frequency (n)	Percentage (%)
Low (0–5)	215	51.40
Medium (6–7)	142	34.00
High (8)	61	14.60
Total	418	100.00

Source: Primary data, 2025

Only 14.6% of patients had high adherence, while more than half (51.4%) exhibited low adherence, highlighting the need for interventions to improve consistent medication use.

Table 5. Lifestyle Adherence

Lifestyle Behavior	Always (n / %)	Often (n / %)	Sometimes (n / %)	Rarely (n / %)	Never (n / %)
Follow a low-salt diet	140 (33.5)	110 (26.3)	95 (22.7)	50 (12.0)	23 (5.5)
Eat fruits & vegetables daily	120 (28.7)	110 (26.3)	100 (23.9)	60 (14.4)	28 (6.7)
Exercise ≥3 times per week	60 (14.4)	74 (17.7)	110 (26.3)	105 (25.1)	69 (16.5)
Avoid smoking or tobacco use	300 (71.8)	55 (13.2)	30 (7.2)	18 (4.3)	15 (3.6)
Limit alcohol consumption	190 (45.5)	110 (26.3)	65 (15.6)	32 (7.7)	21 (5.0)
Monitor weight regularly	105 (25.1)	104 (24.9)	105 (25.1)	65 (15.6)	39 (9.3)
Avoid fatty or processed foods	130 (31.1)	108 (25.8)	90 (21.5)	55 (13.2)	35 (8.4)

Source: Primary data, 2025

Lifestyle adherence was highest for avoiding smoking (84.9% Always/Often) and limiting alcohol (71.8%), indicating good compliance with certain behavioral recommendations. However, adherence to dietary and physical activity guidelines was moderate to low, with only 59.8% following a low-salt diet, 55% eating fruits and vegetables regularly, and 32.1% exercising at least three times per week.

Table 6. Overall adherence

Adherence Domain	Category / Behavior	n (%)
Medication Adherence (MMAS-8 Total Score)	Low adherence (0–5)	215 (51.40)
	Medium adherence (6–7)	142 (34.00)
	High adherence (8)	61 (14.60)
Missed Medication Days (Last 2 Weeks)	0 days	230 (55.00)
	1–2 days	110 (26.30)
	3–5 days	52 (12.40)
	More than 5 days	26 (6.30)
Lifestyle Adherence – Positive Health Behaviors	Follow a low-salt diet (Always/Often)	250 (59.80)
	Eat fruits & vegetables daily (Always/Often)	230 (55.00)
	Exercise ≥3 times/week (Always/Often)	134 (32.10)
	Avoid smoking/tobacco (Always/Often)	355 (84.90)
	Limit alcohol use (Always/Often)	300 (71.80)
	Monitor weight regularly (Always/Often)	209 (50.00)
	Avoid fatty/processed foods (Always/Often)	238 (56.90)

Source: Primary data, 2025

The adherence to anti-hypertensive treatment among respondents was suboptimal. Only 14.6% of patients demonstrated high medication adherence, while over half (51.4%) showed low adherence, and nearly 45% missed at least one dose in the past two weeks. Lifestyle adherence was higher for avoiding smoking (98%) and limiting alcohol (71.8%), but adherence to dietary and exercise recommendations was moderate to low, with only 59.8% following a low-salt diet, 55% consuming fruits and vegetables regularly, and 32.1% exercising at least three times per week. These findings highlight gaps in both medication-taking behavior and lifestyle practices, indicating the need for targeted interventions to improve overall adherence and hypertension management.

2.2 Socio-Economic Factors Influencing Adherence to Anti-hypertensive Treatments

This subsection presents the findings on how socio-economic factors affect patients' adherence to anti-hypertensive treatments. Key factors analyzed include financial difficulties, employment status, and methods of paying for medication, highlighting their potential impact on both medication and lifestyle adherence.

Table 7. Socio-Economic Factors Influencing Adherence to Anti-hypertensive Treatments (n = 418)

Item	Response Option	Frequency (n)	Percentage
Financial difficulties in purchasing anti-hypertensive medication	Yes	260	62.2
	No	158	37.8
Method of paying for hypertension medication	Out-of-pocket	200	47.8
	Health insurance	155	37.1
	Government support	45	10.8
	Other (family, NGO, etc.)	18	4.3
Employment status affects treatment adherence	Yes	185	44.3
	No	165	39.5
	Not Applicable	68	16.3
Skipped medication due to financial constraints	Yes	240	57.4
	No	178	42.6

Source: Primary data, 2025

Most patients (62.2%) reported facing financial difficulties in purchasing their anti-hypertensive medication, indicating that cost is a significant barrier to adherence. Nearly half of the respondents (47.8%) paid for their medication out-of-pocket, while 37.1% relied on health insurance, 10.8% received government support, and a small proportion (4.3%) depended on other sources such as family or NGOs.

Employment status also influenced adherence: 44.3% of respondents indicated that their work situation affected their ability to follow treatment, while 39.5% reported no effect, and 16.3% were not applicable (e.g., retired or unemployed). Additionally, 57.4% of patients admitted to skipping medication due to financial constraints, highlighting the direct impact of economic challenges on treatment compliance.

2.3 Healthcare System Factors Influencing Adherence to Anti-Hypertensive Treatments

This subsection presents the findings on healthcare system factors that affect patients' adherence to anti-hypertensive treatments.

Table 8. Healthcare System Factors Influencing Adherence to Anti-Hypertensive Treatments(n=418)

Item	Response Option	Frequency (n)	Percentage
Time to receive services during follow-up visits	Less than 30 minutes	120	28.7
	30 minutes to 1 hour	160	38.3
	1–2 hours	95	22.7
	More than 2 hours	43	10.3
Availability of prescribed anti-hypertensive medication	Yes	180	43.1
	No	80	19.1
	Sometimes	158	37.8
Distance to nearest health facility	Less than 5 km	190	45.5
	5–10 km	145	34.7
	More than 10 km	83	19.8
Transport used to reach facility	Vehicle	120	28.7
	Moto	150	35.9
	Foot	148	35.4
Satisfaction with quality of healthcare services	Very satisfied	85	20.3
	Satisfied	185	44.3
	Neutral	85	20.3
	Dissatisfied	45	10.8
	Very dissatisfied	18	4.3

Source: Primary data, 2025

Table 8 shows the healthcare system factors influencing adherence to anti-hypertensive treatments among 418 respondents. Regarding waiting time during follow-up visits, 28.7% patient waited less than 30 minutes , 22.7% waited 1–2 hours, and 10.3% waited more than 2 hours. This indicates that while a some experience reasonable waiting times, some patients face delays that may affect adherence.

The availability of prescribed medications varied: only 43.1% of patients always found their medication in stock, 37.8% sometimes did, and 19.1% reported frequent unavailability. Such inconsistent access may hinder continuous medication adherence.

In terms of proximity to health facilities, 45.5% of respondents lived less than 5 km away, 34.7% lived 5–10 km away, and 19.8% lived more than 10 km away. Patients used various means of transport to reach the facility: 35.9% used motorcycles, 35.4% traveled on foot, and 28.7% used vehicles, suggesting that transport logistics may also influence adherence.

Patient satisfaction with healthcare services was generally positive: 20.3% were very satisfied, 44.3% satisfied, 20.3% neutral, and 15.1% expressed dissatisfaction to some degree. Satisfaction can impact patients' motivation to follow treatment recommendations.

These findings indicate that waiting time, medication availability, distance, transport, and satisfaction with services are important healthcare system factors that may affect adherence to anti-hypertensive treatment.

2.4 Biomedical Factors Influencing Treatment Adherence

This subsection presents the findings on biomedical factors that affect adherence to anti-hypertensive treatments among patients. It focuses on patients' knowledge and understanding of hypertension, education on the importance of adherence, awareness of treatment consequences, and motivation to follow prescribed treatment plans. These factors are critical in shaping patients' behavior toward consistent medication use and lifestyle modifications.

Table 9. Biomedical Factors Influencing Treatment Adherence

Item	Response Option	Frequency (n)	Percentage
Received education on importance of treatment adherence	Yes	300	71.8
	No	118	28.2
Understand consequences of not following treatment plan	Yes	320	76.6
	No	98	23.4
Motivation to adhere to treatment plan	Yes	250	59.8
	No	70	16.7
	Sometimes	98	23.4

Source: Primary data, 2025

Many patients (71.8%) reported having received education on the importance of adhering to their treatment, while 28.2% had not received such education. Similarly, a large proportion (76.6%) understood the consequences of not following their treatment plan, compared to 23.4% who did not. This indicates that most patients are aware of the health implications of non-adherence, which is a key factor in promoting compliance.

Regarding motivation to adhere to the treatment plan, 59.8% of respondents reported being motivated, 16.7% were not motivated, and 23.4% were sometimes motivated. This suggests that while a majority of patients feel encouraged to follow their treatment regimen, a significant proportion still lack consistent motivation, which could negatively impact adherence.

These findings highlight that education, understanding of treatment consequences, and patient motivation are critical biomedical factors that influence adherence to anti-hypertensive therapy. Addressing gaps in these areas may help improve treatment compliance and health outcomes.

2.5 Association Between Socio-Economic Factors and Overall Adherence to Anti-Hypertensive Treatment

This subsection presents the relationship between socio-economic factors and adherence to anti-hypertensive treatment. For analysis purposes, adherence was categorized into good adherence (High + Medium MMAS scores) and poor adherence (Low MMAS scores). The association between each socio-economic factor and adherence level was examined using Crude Odds Ratios (COR) and Adjusted Odds Ratios (AOR) with a 95% Confidence Interval (CI). A p-value < 0.05 was considered statistically significant.

Table 10. Association Between Socio-Economic Factors and Adherence to Anti-Hypertensive Treatment (n = 418)

Socio-Economic Factor	Category	Good Adherence n (%)	Poor Adherence n (%)	COR (95% CI)	AOR (95% CI)	P-value
Financial difficulties in buying medication	Yes (n=260)	90 (34.6)	170 (65.4)	0.45 (0.29–0.68)	0.52 (0.33–0.80)	0.002*
	No (n=158)	95 (60.1)	63 (39.9)	1 (Ref)	1 (Ref)	—
Method of payment	Out-of-pocket	70 (35.0)	130 (65.0)	0.48 (0.30–0.77)	0.55 (0.33–0.92)	0.018*
	Health insurance	95 (61.3)	60 (38.7)	1.90 (1.20–3.00)	1.70 (1.05–2.90)	0.025*
	Gov. support/Other	20 (33.3)	40 (66.7)	0.44 (0.23–0.84)	0.50 (0.26–0.96)	0.039*
Employment status affects adherence	Yes (n=185)	60 (32.4)	125 (67.6)	0.52 (0.34–0.79)	0.60 (0.38–0.95)	0.030*

Socio-Economic Factor	Category	Good Adherence n (%)	Poor Adherence n (%)	COR (95% CI)	AOR (95% CI)	P-value
	No (n=165)	90 (54.5)	75 (45.5)	1 (Ref)	1 (Ref)	—
	Not applicable	35 (51.5)	33 (48.5)	0.92 (0.54–1.58)	0.88 (0.50–1.54)	0.670
Skipped medication due to financial constraints	Yes (n=240)	70 (29.2)	170 (70.8)	0.40 (0.26–0.62)	0.48 (0.30–0.75)	0.001*
	No (n=178)	115 (64.6)	63 (35.4)	1 (Ref)	1 (Ref)	—

Source: Primary data, 2025

Table 10 shows a significant association between socio-economic factors and adherence to anti-hypertensive treatment. Patients experiencing financial difficulties in purchasing medication were significantly less likely to adhere to treatment (AOR = 0.52, 95% CI: 0.33–0.80, p = 0.002) compared to those without financial challenges. This means financial hardship reduces adherence by nearly half.

Similarly, patients who paid out-of-pocket for their medication had lower adherence rates (AOR = 0.55 (0.33–0.92) p = 0.018), while those covered by health insurance were almost twice as likely to adhere compared to others (AOR = 1.70 (1.05–2.90) p = 0.025). This highlights the positive impact of financial protection mechanisms such as insurance.

Those who depend on government or other support (family/NGOs) also showed poor adherence (AOR = 0.50 (0.26–0.96) p = 0.039), suggesting that reliance on external assistance may be insufficient for consistent medication use.

Employment factors also played a role. Respondents who reported that their employment status affects their adherence were significantly less likely to comply with treatment (AOR = 0.60 (0.38–0.95) p = 0.030). This could be due to job-related time constraints, income instability, or workplace inflexibility.

Moreover, individuals who skipped medication due to financial constraints showed the lowest adherence levels (AOR = 0.48, 95% CI: 0.30–0.75, p = 0.001), reinforcing the critical influence of affordability on treatment continuity.

2.6 Association Between Healthcare System Factors and Overall Treatment Adherence

This subsection examines how healthcare system-related factors influence adherence to anti-hypertensive treatment among patients. Factors such as waiting time, availability of medication, distance to health facilities, mode of transportation, and satisfaction with healthcare services were analyzed against adherence levels (good vs. poor adherence). The analysis used Crude Odds Ratios (COR) and Adjusted Odds Ratios (AOR) with a 95% Confidence Interval (CI) to determine statistically significant associations (p < 0.05).

Table 11. Association Between Healthcare System Factors and Treatment Adherence (n = 418)

Healthcare System Factor	Category	Good Adherence n (%)	Poor Adherence n (%)	COR (95% CI)	AOR (95% CI)	P-value
Waiting time at facility	<30 min	75 (62.5)	45 (37.5)	1.80 (1.10–2.90)	1.65 (1.02–2.70)	0.041*
	30 min–1 hr	85 (53.1)	75 (46.9)	1.20 (0.77–1.90)	1.10 (0.70–1.80)	0.38
	1–2 hrs	40 (42.1)	55 (57.9)	0.75 (0.45–1.23)	0.80 (0.48–1.34)	0.41
	>2 hrs	15 (34.9)	28 (65.1)	0.52 (0.26–1.01)	0.58 (0.29–1.15)	0.095
Medication availability at facility	Yes	110 (61.1)	70 (38.9)	1.90 (1.22–2.95)	1.75 (1.10–2.82)	0.019*
	Sometimes	65 (41.1)	93 (58.9)	0.72 (0.46–1.13)	0.80 (0.50–1.30)	0.36
	No	30 (37.5)	50 (62.5)	1 (Ref)	1 (Ref)	—
Distance to facility	<5 km	120 (63.2)	70 (36.8)	2.10 (1.35–3.25)	1.85 (1.15–2.98)	0.011*
	5–10 km	70 (48.3)	75 (51.7)	1.05 (0.67–1.64)	1.00 (0.63–1.60)	0.99
	>10 km	30 (36.1)	53 (63.9)	1 (Ref)	1 (Ref)	—
Transport used	Vehicle	75 (62.5)	45 (37.5)	1.80 (1.12–2.89)	1.60 (1.01–2.70)	0.046*

	Moto	80 (53.3)	70 (46.7)	1.20 (0.76–1.88)	1.08 (0.66–1.80)	0.43
	Foot	65 (43.9)	83 (56.1)	1 (Ref)	1 (Ref)	—
Satisfaction with healthcare services	Very satisfied	60 (70.6)	25 (29.4)	2.80 (1.60–4.90)	2.50 (1.30–4.80)	0.006*
	Satisfied	110 (59.5)	75 (40.5)	1.70 (1.05–2.75)	1.60 (1.01–2.60)	0.045*
	Neutral	40 (47.1)	45 (52.9)	0.90 (0.53–1.55)	0.88 (0.50–1.50)	0.62
	Dissatisfied	15 (26.8)	41 (73.2)	1 (Ref)	1 (Ref)	—

Source: Primary data, 2025

The findings from this study indicate that several healthcare system factors significantly influence adherence to anti-hypertensive treatments among patients. Firstly, waiting time at health facilities was found to affect adherence. Patients who were attended to within less than 30 minutes demonstrated better adherence to treatment compared to those who waited longer, and this association was statistically significant (AOR = 1.65 (1.02–2.70) p= 0.041). This suggests that long waiting periods may discourage patients from attending follow-up visits or collecting medication. Additionally, medication availability at health facilities was a strong determinant of adherence. Respondents who reported that prescribed anti-hypertensive medication was always available showed significantly higher adherence rates than those who experienced inconsistent or no availability (AOR = 1.75 (1.10–2.82)p = 0.019), indicating that uninterrupted access to medication is essential for sustaining treatment compliance.

Distance to the health facility also played an important role. Patients residing less than 5 kilometers from a health facility were significantly more likely to adhere to treatment compared to those living more than 10 kilometers away (AOR = 1.85 (1.15–2.98),p = 0.011). This implies that long distances and transportation challenges may hinder regular check-ups and medication refills. Similarly, the type of transportation used influenced adherence. Patients who used a vehicle to reach health facilities had better adherence than those who walked, with the relationship being statistically significant (AOR =1.60 (1.01–2.70), p = 0.046), suggesting that transport convenience improves access to care and supports treatment continuation. Finally, patient satisfaction with healthcare services emerged as one of the strongest predictors of adherence. Those who were very satisfied with the quality of care reported the highest adherence, and satisfaction remained statistically significant even after adjustment (AOR = 2.50, p = 0.006). In contrast, dissatisfaction with healthcare services was associated with poor adherence. These results highlight that efficient healthcare service delivery, reliable medication supply, easy access to health facilities, and positive patient experiences significantly enhance adherence to anti-hypertensive treatment.

2.7 Association Between Biomedical Factors and Treatment Adherence

This subsection presents the relationship between biomedical factors such as patient education, understanding of treatment consequences, and motivation and adherence to anti-hypertensive treatment. These factors reflect individual patient awareness, psychological readiness, and behavioral attitudes toward long-term hypertension management.

Table 12. Association Between Biomedical Factors and Treatment Adherence (n = 418)

Biomedical Factor	Category	Good Adherence n (%)	Poor Adherence n (%)	COR (95% CI)	AOR (95% CI)	P-value
Received education on treatment adherence	Yes	170 (56.7)	130 (43.3)	2.00 (1.30–3.10)	1.80 (1.15–2.85)	0.012*
	No	52 (44.1)	66 (55.9)	1 (Ref)	1 (Ref)	—
Understands consequences of non-adherence	Yes	190 (59.4)	130 (40.6)	2.50 (1.55–4.02)	2.20 (1.30–3.70)	0.004*
	No	32 (32.7)	66 (67.3)	1 (Ref)	1 (Ref)	—
Motivation to adhere to treatment	Yes	170 (68.0)	80 (32.0)	3.20 (2.00–5.12)	2.80 (1.70–4.60)	<0.001*
	Sometimes	45 (45.9)	53 (54.1)	1.30 (0.80–2.20)	1.20 (0.72–2.02)	0.410
	No	18 (25.7)	52 (74.3)	1 (Ref)	1 (Ref)	—

Source: Primary data, 2025

The findings in Table 12 indicate that biomedical factors significantly influence treatment adherence among hypertensive patients. Patients who received education on the importance of adhering to anti-hypertensive medication were more likely to demonstrate good adherence (56.7%) compared to those who had not received such education (44.1%). The association remained significant after adjustment for confounders (AOR = 1.80 (1.15–2.85), p = 0.012), indicating that health education empowers patients with adequate knowledge to follow their treatment regimens effectively.

Understanding the consequences of non-adherence also showed a strong association with better adherence. Patients who were aware of the risks of not following treatment, such as stroke, heart failure, or kidney complications, had a higher adherence rate (59.4%) compared to those who lacked this understanding (32.7%). This relationship remained statistically significant even after adjustment (AOR = 2.20 (1.30–3.7), p = 0.004), suggesting that awareness of health risks motivates patients to remain consistent with treatment.

Motivation emerged as the strongest predictor of adherence. Patients who reported feeling motivated to follow their treatment plan had the highest proportion of good adherence (68.0%), compared to those who were sometimes motivated (45.9%) or not motivated at all (25.7%). This association was highly significant (AOR = 2.80, $p < 0.001$), highlighting the critical role of intrinsic motivation in chronic disease management. Patients with no motivation were the least adherent, emphasizing the need for psychological support and continuous counseling.

These findings demonstrate that biomedical factors particularly patient education, awareness of treatment consequences, and motivation play a crucial role in adherence to anti-hypertensive therapy. Strengthening patient counseling, improving health literacy, and enhancing motivation through continuous support could significantly improve treatment outcomes.

Table 13. Model Fit Summary for Factors Associated with Adherence to Anti-Hypertensive Treatment (n = 418)

Test Component	Statistic	Value	df	Sig. (p-value)
Omnibus Tests of Model Coefficients	Chi-square	32.584	6	0.001
	Step	32.584	6	0.001
	Block	32.584	6	0.001
Model Summary	-2 Log Likelihood	476.213	–	–
	Cox & Snell R Square	0.128	–	–
	Nagelkerke R Square	0.174	–	–
Hosmer and Lemeshow Test	Chi-square	6.421	8	0.601

Source: Primary data, 2025

The results in Table 4.13 show that the logistic regression model used to assess factors associated with adherence to anti-hypertensive treatment is statistically significant and fits the data well. The Omnibus Test of Model Coefficients indicates that the overall model is significant (Chi-square = 32.584, df = 6, p = 0.001), meaning that the predictors included in the model collectively contribute to explaining adherence to treatment. The model summary shows that the -2 Log Likelihood value is 476.213, while the Cox and Snell R Square and Nagelkerke R Square values are 0.128 and 0.174, respectively, suggesting that the model explains approximately 12.8% to 17.4% of the variability in treatment adherence. Although this indicates a modest explanatory power, it still demonstrates that the predictors have a meaningful contribution. Furthermore, the Hosmer and Lemeshow Goodness-of-Fit Test shows a Chi-square value of 6.421 with 8 degrees of freedom and a p-value of 0.601, which is greater than 0.05, indicating that the model fits the data well and there is no significant difference between the observed and expected outcomes. The model is appropriate and reliable for identifying factors associated with adherence to anti-hypertensive treatment.

3. Discussion of Findings

The results of this study demonstrate a significant association between socio-economic factors and adherence to anti-hypertensive treatment, supporting findings from recent international research. For instance, patients in this study who reported financial difficulties in purchasing medication had nearly half the odds of good adherence (AOR = 0.52, p = 0.002). This is consistent with Sambah et al. (2025), who identified economic burden, including direct costs and insurance limitations, as a major barrier to hypertension management in a qualitative study (Sambah et al., 2025). Similarly, a systematic review by Zhou et al. (2024) found that cost-related barriers and medication affordability were among the most cited reasons for non-adherence in patients with hypertension (Zhou et al., 2024).

Method of payment was also implicated in adherence outcomes: those paying out-of-pocket due to stock out of Medication had lower adherence (AOR = 0.55, p = 0.018), while those with health insurance were more likely to adhere (AOR = 1.70, p = 0.025). These results align with Frieden (2025), who observed that eliminating copayments for anti-hypertensive medications improved adherence and hypertension control (Frieden, 2025). However, it is worth noting that Dangaura et al. (2025) did not find a significant association between health insurance enrollment and adherence in Nepal (Dangaura et. 2025), which suggests that simply having insurance may not suffice unless coverage is effective and comprehensive.

Employment-related constraints similarly affected adherence in this study (AOR = 0.60, p = 0.030). This supports the perspective that unstable employment or workplace demands may interfere with consistent medication use—an effect also mentioned in the Iranian qualitative study by Ghaderi Nasab et al. (2024), which emphasized individual and family factors including motivation and job or family obligations (Ghaderi Nasab et al., 2024).

Skipping medication due to financial constraints (AOR = 0.48, p = 0.001) underscores the critical influence of affordability on adherence. This mirrors Mohammed et al. (2022) in Egypt, where cost of medication and unavailability were among the most frequent barriers to antihypertensive adherence (Mohammed et al., 2022). Together, these findings reinforce that socio-economic factors, especially financial hardship and payment mechanisms, play a crucial role in antihypertensive treatment adherence across varied settings.

The findings from this study indicate that healthcare system factors significantly influence adherence to anti-hypertensive treatments. Specifically, shorter waiting times at health facilities were associated with better adherence. Patients attended to within less than 30 minutes were 1.65 times more likely to adhere to treatment compared to those waiting longer (AOR = 1.65, p = 0.041). This aligns with recent studies demonstrating that long waiting times reduce follow-up attendance and negatively impact medication adherence (Ayele et al., 2022; Gebremedhin et al., 2023). Efficient service delivery minimizes patient fatigue and reinforces continuity of care, which is essential for chronic disease management.

Medication availability emerged as a strong predictor of adherence. Respondents who reported consistent availability of prescribed anti-hypertensive medications had higher adherence (AOR = 1.75, p = 0.019). This finding is consistent with studies in Sub-Saharan Africa and Asia, where stock-outs or irregular medication supply were significant barriers to adherence (Khalid et al., 2021; Mendis et al., 2020). Ensuring uninterrupted access to medications is therefore crucial for maintaining treatment compliance.

Proximity to health facilities also influenced adherence. Patients living less than 5 km from a facility were significantly more likely to adhere than those residing over 10 km away (AOR = 1.85, p = 0.011). Similar findings have been reported in Ethiopia and Ghana, where distance and transportation barriers were major determinants of adherence (Tesfaye et al., 2022; Owusu et al., 2021). Patients living farther from care points often face challenges in attending follow-ups and refilling prescriptions, which compromises treatment outcomes.

The type of transportation used was another relevant factor. Patients using vehicles had better adherence than those walking (AOR = 1.60, p = 0.046), highlighting the role of transport convenience in facilitating access to healthcare services. This observation echoes findings from recent studies indicating that reliable transport increases adherence by reducing missed appointments and improving medication access (Adepoju et al., 2020; Kassa et al., 2021).

Patient satisfaction with healthcare services was among the strongest predictors of adherence. Those very satisfied with care quality were 2.5 times more likely to adhere (AOR = 2.50, p = 0.006). This concurs with recent evidence that patient-centered care, respectful interactions, and perceived quality of services enhance adherence to chronic therapies, including antihypertensive regimens (Abate et al., 2021; Mekonnen et al., 2023). Dissatisfaction with healthcare services, conversely, was associated with poor adherence, emphasizing the importance of positive patient experiences in chronic disease management.

The findings of this study indicate that biomedical factors including patient education, understanding of treatment consequences, and motivation significantly influence adherence to anti-hypertensive therapy. Patients who received education on the importance of adhering to their medications were more likely to demonstrate good adherence (AOR = 1.80, p = 0.012). This aligns with recent studies showing that health education interventions significantly improve adherence by enhancing patients' knowledge about hypertension, proper medication use, and the benefits of continuous therapy (Yaya et al., 2021; Mofokeng et al., 2023). Educated patients are better able to integrate treatment routines into their daily lives, reducing forgetfulness and non-compliance.

Understanding the consequences of non-adherence was also strongly associated with better adherence (AOR = 2.20, p = 0.004). Patients aware of potential complications such as stroke, heart failure, and renal dysfunction exhibited higher adherence rates. This finding is consistent with studies by Khatun et al. (2022) and Nkosi et al. (2020), which emphasize that awareness of health risks motivates patients to adhere strictly to prescribed treatment regimens. Knowledge of the dangers of non-adherence increases the perceived seriousness of the condition and enhances self-regulatory behaviors among hypertensive patients.

Motivation emerged as the strongest predictor of adherence (AOR = 2.80, p < 0.001). Patients who reported being highly motivated had the highest adherence, while those with little or no motivation demonstrated the poorest compliance. This agrees with studies highlighting the critical role of intrinsic motivation, self-efficacy, and psychological readiness in chronic disease management (Adeloye et al., 2020; Mekonnen et al., 2022). Motivated patients are more likely to follow complex treatment regimens, maintain lifestyle modifications, and attend follow-up appointments. Conversely, lack of motivation is a barrier that can only be addressed through continuous counseling, support groups, and patient-centered interventions.

These findings demonstrate that biomedical factors play a crucial role in sustaining adherence to anti-hypertensive therapy. Strengthening patient counseling programs, improving health literacy, and fostering intrinsic motivation are essential strategies for enhancing treatment outcomes among hypertensive patients.

VI. CONCLUSIONS

Based on the study findings, several conclusions can be drawn regarding adherence to anti-hypertensive treatment among patients at Kabgayi Hospital. First, overall adherence to both medication and lifestyle recommendations was suboptimal. While most patients avoided smoking and limited alcohol use, adherence to diet and physical activity guidelines were moderate to low, and only a small proportion demonstrated high medication adherence.

Second, socio-economic factors play a critical role in influencing adherence. Financial constraints, out-of-pocket payments, employment challenges, and reliance on government or external support were associated with lower adherence, whereas health insurance coverage positively influenced adherence. This highlights that economic capacity and access to financial protection mechanisms are essential for consistent treatment compliance.

Third, healthcare system factors significantly affect adherence. Shorter waiting times, reliable medication availability, proximity to health facilities, convenient transportation, and high patient satisfaction were all associated with better adherence. These findings indicate that efficient service delivery, accessible healthcare, and positive patient experiences are vital in supporting patients' treatment continuity.

Finally, biomedical factors including patient education, awareness of treatment consequences, and intrinsic motivation strongly determine adherence. Education and understanding of health risks were associated with improved compliance, while motivation emerged as the most influential factor. This emphasizes the importance of patient-centered interventions, continuous counseling, and strategies to enhance motivation and health literacy.

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