Factors Associated with Medication Adherence among Patients with Stroke in Rural Nanhe County, China

by

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Defense Date: March 25, 2025

Approved:

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Thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in the DKU Global Health Program in the Graduate School of
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ABSTRACT

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Abstract

Aims: This study aimed to examine the prevalence of use of the four medications, to investigate medication adherence, and to identify factors influencing medication adherence in a model of five interacting dimensions (social and economic factors, healthcare system factors, condition-related factors, therapy-related factors, and patient-related factors) in rural patients with stroke in Nanhe County, China. Methods: A cross-sectional analysis used data from 857 stroke patients enrolled in a previous trial. The outcome variable was medication adherence. It was measured using the Morisky Green Levine Scale (MGLS). The independent variables were social and economic factors (age, sex, marital status, education, current job, and annual total income), health system-related factors (Non-communicable disease insurance and frequency of visiting village clinics), condition-related factors (stroke recurrence, far vision, near vision, hearing capability, disability, overall health status, whether having a family caregiver), therapy-related factors (number of diseases patients have and total number of medication use), and patient-related factors (patients' attitudes towards medication, smoking status, and depression). Bivariable analysis and logistic regression models were used to analyze the association between medication adherence and five dimensions of factors. Analyses were stratified by four medication classes ((anti-hypertensive drugs, statins, anti-platelet drugs, and anti-hypoglycemic drugs). Results: For anti-hypertensive drugs: Higher education (OR=1.87, 95% CI:1.06–3.30), better health-related quality of life (EQ-5D-5L Index; OR=3.24, 95% CI:1.23–8.54), good hearing capability (OR=1.79, 95% CI:1.20–2.67), and active attitudes toward medications (OR = 1.62, 95% CI: 1.03 - 2.53) were associated with high adherence. For anti-hyperglycemia drugs: Male sex (OR=0.13, 95% CI:0.03–0.58) and frequently visiting clinics (OR=0.23, 95% CI:0.07–0.73) were associated with lower adherence, while primary (OR=5.71, 95% CI:1.28–25.44) and higher education

(OR=4.65, 95% CI:1.11–19.57) were associated with high adherence. For statins and anti-platelet drugs: No significant associations were identified. Conclusions: Medication adherence in rural stroke patients was associated with sex, education level, health status, and active attitudes toward medications. Contrary to expectations, frequent healthcare utilization was associated with medium to low adherence. These findings provide essential information for the current status of secondary stroke prevention in China's underserved rural population.

Keywords: Medication adherence, stroke, rural health, China, secondary prevention.

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Acknowledgements

I would like to express my sincere gratitude to my supervisor, Prof. Lijing L. Yan, for her invaluable guidance, critical feedback, and continuous support throughout this research. I am also deeply thankful to Prof. Truls Ostbye and Prof. Enying Gong for sharing their expertise in academic writing and thesis design.

I extend my appreciation to the research team members Bolu, Xingxing, Tanjie, Tongde, Yutong, and other members for their assistance with data.

I would like to thank the administrators, health workers, and interviewers who participated in the fieldwork in Nanhe County for their strong support.

Finally, I owe my deepest thanks to my beloved family and friends for their unwavering encouragement during this journey.

1. Introduction

1.1 Background of Stroke in Rural China

Stroke is a leading cause of death and disability in China[1], imposing a huge economic burden on both Chinese society and individuals[2]. National research has found urban-rural disparities in the burden of stroke[3]. Compared with urban areas, the mortality rate and incidence of stroke were higher[4]. In addition, in China, approximately 12.5% of patients experience stroke recurrence within 12 months[5], emphasizing the importance of stroke management. With the shortage of village doctors[6], lack of sufficient healthcare institutes[7], and loss of health professionals for primary health care[8], challenges to stroke management are more significant in rural areas.

1.2 Importance of Medication Use and Adherence in Patients with Stroke

Medication is one of the evidence-based effective strategies to reduce the risk of stroke and prevent stroke recurrence in patients with stroke[9]. Consists of anti-hypertensive drugs, anti-platelet drugs such as aspirin, lipid-lowering agents (statins), and anti-hyperglycemic drugs are widely used to control risk factors of stroke such as hypertension, dyslipidemia, and diabetes[10].

Medication adherence is usually defined as whether patients take their medications as prescribed and with persistence[11]. Assessing medication adherence in stroke patients is an essential component of secondary stroke prevention[9]. Non-adherence of medication can lead to higher risk of stroke recurrence and mortality in patients with stroke[12]. Meanwhile, better adherence to medication after stroke is associated with improved survival[13]. Medication adherence of antihypertensive medicines within a half year after stroke can reduce the risk of falls requiring hospitalization[14].

However, a meta-analysis showed that medication adherence rates were low in patients with stroke[15]. A systematic review also found that medication adherence in people living with stroke

decreased over time, and adherence to antiplatelets, anticoagulants, and statin were poor[16]. Adherence to anti-hypertensive medications in hypertensive stroke patients in rural China was reported as suboptimal[17]. Adherence to anti-hyperglycemic medicines was also shown generally poor[18].

1.3 Current Knowledge Gaps and Study Aims

Three knowledge gaps were discussed in this paper.

First, the medication using data in rural patients was limited and not widely discussed. Few studies specifically focused on medication use among rural patients with stroke in China.

Second, limited data was found on all four medications adherence which are all important to stroke management for controlling risk factors and reducing the risk of recurrence and death. The 2014 Chinese Stroke Guidelines stated that stroke patients with hypertension, diabetes, and dyslipidemia, which are risk factors, should use medications such as anti-hypertensive drugs, statins, and anti-hypoglycemic drugs[19]. Anti-platelet treatment was recommended to patients with non-cardioembolic ischemic stroke or transient ischemic attack (TIA) for the purpose of preventing another stroke or cardiovascular events (Grade I recommendation, Class-A evidence)[19]. Studies of rural populations widely discussed medication adherence in rural patients with other single noncommunicable diseases (e.g., hypertension or diabetes mellitus[20] and mental illness[21]). Moreover, it has shown that in rural populations, the use of more pills per day and a higher frequency of medication administration can lead to poor medication adherence[22]. Stroke patients, however, often have to cope with the management of several risk factors and medical conditions and take multiple medications for stroke secondary prevention[23]. This brings more challenges on current stroke management.

Third, limited studies focused on factors associated with medication adherence in rural patients with stroke in China. Existing studies have focused on patients followed up in urban tertiary hospitals and lacked discussions of the medication behavior of patients with stroke in

rural communities. In addition, patients face more barriers to adherence to medication, such as limited healthcare resources[8], than those in urban populations. Therefore, improving medication adherence is more complicated in stroke populations, especially in rural patients[24].

Based on these three knowledge gaps, this study had three aims: a. To examine the prevalence of use of the four medications. b. To investigate medication adherence among people using medications. c. Identify factors influencing medication adherence in rural patients with stroke in China.

2. Literature Reviews

2.1 Stroke Epidemiology: Global vs. Rural China

Stroke is the second leading cause of death, and the third-leading cause of death and disability combined globally[25], and its disease burden is particularly higher in low- and middle-income countries (LMICs)[26]. There are 12.2 million new stroke cases worldwide each year[27].

Epidemiological data of stroke shows significant geographic differences: the 30-day stroke mortality rate in high-income countries, such as France, is approximately 10%, whereas it is as high as 42% in Kolkata, India[28]; and the incidence of stroke in low-income countries is on an increasing trend (annual increase of 5.3%), whereas it is stabilizing in high-income countries[29]. In addition, developing countries have a lower age of stroke onset (19%-30% occurring in people aged 18-50 years), leading to higher loss of disability-adjusted life years (DALYs)[30]. There are also racial differences in the distribution of stroke subtypes, with "atherosclerosis of the great arteries" predominating in Asian populations (33%), whereas "cardioembolic stroke" is more common in white populations (28%)[31].

Globally, stroke care systems are deficient with challenges on unequal distribution of resources[32], lack of infrastructure[26], and weak awareness[33]. Despite international initiatives (e.g., MT2020+, WHO NCD Program) to improve access to acute interventions, low-income countries continue to face challenges such as insufficient imaging technology, shortage of health professionals, and high costs[34].

Stroke is already the second leading cause of death in rural China (23.53 percent of all causes of death)[35]. From 2010 to 2020, the crude stroke mortality rate for rural residents was consistently higher than the crude stroke mortality rate for urban residents, with a fluctuating upward trend[35]. The gap between the two has increased since 2012[3]. The stroke mortality rate in 2019 was 159 per 100,000 for rural residents, compared with 129 per 100,000 for urban residents[3]. According to a systematic review, the incidence of stroke is also much higher in rural

than in urban areas[36]. Based on the 2013 Fifth National Health Service Survey analysis report[37], from 1993 to 2013, stroke prevalence in rural China was lower than in urban areas, but in 2013 it was equal to the urban level. In another more recent research, the age-standardized prevalence of stroke was higher in rural areas than in urban areas in the various regions surveyed, except for the southern regions[38].

2.2 Medication Use in Patients with Stroke

Patients with stroke may require multiple medications for secondary stroke prevention depending on their medical conditions. For secondary prevention of stroke in people with hypertension, it is recommended that antihypertensive treatment be given as a single agent or in combination and that the choice of drug and combination regimen be individualized[39]. In stroke patients with comorbid diabetes mellitus, blood glucose should be controlled to HbA1 C <6.5%, but in patients with high-risk type 2 diabetes mellitus, low blood glucose can be harmful[39]. Statin is required for patients with stroke who have elevated cholesterol levels[9]. Early treatment with statin is recommended for ischemic stroke (IS) patients with intracranial and extracranial atherosclerotic vulnerable plaques in large arteries or atherosclerotic embolism[39]. It is also worth noting that long-term use of statin is generally safe, but it should be used with caution in people with a history or at high risk of cerebral hemorrhage[39]. In people with symptomatic intracranial atherosclerotic disease or with minor stroke, short-term dual antiplatelet treatment is recommended[9].

2.3 Medication Adherence in Patients with Stroke

The World Health Organization (WHO) defines medication adherence as the degree to which a patient's behavior (including medication-taking behavior) is consistent with the treatment plan agreed upon by the healthcare provider[40]. Urgent needs to improve long-term medication adherence were pointed out in 2003[40]. After the first stroke is controlled, several risk factors need

to be controlled, and medication adherence is required to prevent recurrence and other adverse outcomes[15]. Non-adherence to medication is associated with poor prognosis for stroke patients[12].

In research and clinical practice, measures of medication adherence are usually classified into subjective measures and objective measures. Subjective measures rely mainly on patient or healthcare worker assessment and include patient self-reporting, questionnaires, and healthcare worker interviews[41].

The Morisky Green Levine Scale (MGLS) is one of the most commonly used self-report measures of medication non-adherence which is brief and simple with four questions[42]. MGLS has been used in different language versions[43]. It has been adopted by various research such as the Atherosclerosis Risk in Communities (ARIC) Study[42], patients with glaucoma[44], patients with hypertension[45], and other diseases and exhibited good reliability and validity in evaluating medication adherence. Other currently commonly used scales include the Maastricht Utrecht Adherence in Hypertension (MUAH), Medicine Adherence Report Scale (MARS), Adherence to Refills and Medications Scale (ARMS), etc.

Objective measurements are usually made through pharmacoepidemiologic database analyses, Electronic Medication Event Monitoring System (MEMS), pill counts, and blood or urine drug concentration assays[41]. Due to the limitations of single measures, the current study recommends the use of multiple measures to improve the accuracy of adherence assessment. For example, using MEMS in combination with patient questionnaires not only provides objective data on the actual medication taken by patients but also analyzes the potential causes of poor adherence[41].

2.4 Factors Influencing Medication Adherence

WHO has discussed a model of five interacting dimensions that affect adherence (social and economic factors, health care team and system-related factors, condition-related factors,

therapy-related factors, and patient-related factors), shown in Figure 1, also known as the Multidimensional Adherence Model (MAM)[40].

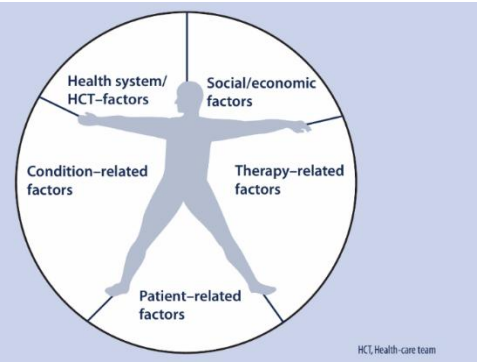

Figure 1: The Five Dimensions of Adherence

2.4.1 Social and Economic Factors

Social and economic factors reported to be associated with medication adherence in patients with non-communicable diseases including age, gender, education, employment, medication costs, and family support[40]. In people with IS, older age, and adequate financial status were associated with better medication adherence, and age less than 75 and female sex were identified as factors of medication non-adherence based on a systematic review[16]. In contrast, a study in India found that patients with stroke who were aged ≤45 years and were female sex had a higher adherence compared with others[46]. It also demonstrated that occupations were associated with medication adherence in patients with stroke[46]. In a cohort study of patients with stroke, higher education levels were associated with suboptimal medication adherence[47].

2.4.2 Health System-related Factors

Health system-related factors include patient-provider relationships, health services, health insurance plans, and healthcare providers[40]. Strong patient–provider relationships with empathy can foster medication adherence[48]. Stroke unit care, in-hospital medical complications, and early follow-up visit were associated with medication adherence in people with IS[16].

2.4.3 Condition-related Factors

Condition-related factors represent particular illness-related demands faced by patients[40]. Important condition-related factors related to medication adherence are the severity of symptoms, degree of disability (physical, psychological, social, and occupational), rate and severity of disease progression, and access to efficient treatment[40]. How they impact a patient's medication adherence depends on how they influence the patient's perception of risk, the importance of receiving treatment, and the priority given to adherence[48]. In people with IS or TIA, an initial diagnosis of IS compared with TIA was associated with a lower chance of poor medication adherence[47].

2.4.4 Therapy-related Factors

The most significant treatment-related factors affecting adherence include the complexity of the medical regimen, previous treatment failures, frequent changes in the treatment regimen, immediacy of efficacy, side effects, and the availability of medical support to cope with these side effects[40]. A cohort study of patients with stroke considered the patient's history of IS and comorbidities (i.e., hypertension, diabetes, heart rhythm disorder) as therapy-related factors[47]. Another study on chronic diseases adopted medication information in digital records and the medication regimen complexity index (MRCI-PT) as therapy-related factors[49].

2.4.5 Patient-related Factors

Patient-related factors include the patient's resources, knowledge, attitudes, beliefs, perceptions, and expectations[40]. These factors—such as what patients know and believe about their illness, their motivation to manage it, their confidence in handling treatment, and their expectations about the outcome of treatment—can influence adherence in ways that are not fully understood yet[40].

Some patient-related factors that affect adherence include: forgetfulness, stress, worries about side effects, low motivation, lack of knowledge or skills in managing the disease, not

seeing a need for treatment, doubts about the treatment's effectiveness, not accepting or understanding the disease or diagnosis, lack of awareness of health risks, misunderstanding treatment instructions, refusal to accept monitoring, low treatment expectations, etc[40]. Studies have tested patient-related factors such as functional dependency in activities of daily living[49] or scales to analyze patients' beliefs about treatments and level of anxiety and depression[47].

3. Methods

3.1 Study Design

This study is a cross-sectional study based on the data of the third follow-up study of the "system-integrated and technology-enabled model of care (SINEMA)[50]. SINEMA is a cluster-randomized controlled trial in rural China to investigate whether a primary care-based integrated mobile health intervention could improve blood pressure (BP) control and secondary prevention of stroke in rural patients with stroke[50]. The intervention was implemented from 2017 to 2018.

3.2 Study Setting and Population

This study was conducted in Nanhe County, a rural region of Hebei Province, Northern China, which was in the stroke belt of China with the incidence of stroke much higher than the national average[51]. According to the Seventh Census, as of November 1, 2020, the resident population of Nanhe District was 350,384 people[52]. Like the trend in the whole of China, the county was also entering an aging society, which made healthcare services for the elderly an urgent challenge[53].

Because this study was based on the SINEMA study population, the study population for this study was drawn from five of the eight townships in the region, which had the largest number of villages with a minimum population of 1500[54]. Each village needed at least one village doctor who was willing to participate[54]. The inclusion criteria was adults with a history of stroke diagnosed at the county- or higher-level hospitals and in a clinically stable condition with at least

basic communication ability[54]. Participants included in this long-term observational trial had survived at least 7 years since they were diagnosed with stroke.

The SINEMA study may have a potential influence on the results of this study. In the SINEMA study, patients in the intervention group had significantly higher adherence to statins and anti-hypertensive medications compared to the control group[50]. Besides, SINEMA intervention had shown to be effective in improving health-related quality of life and physical activity levels in the intervention group[50]. Although the intervention was implemented six years ago, this might lead to higher health-related quality of life and physical activity levels in the study population and a higher adherence rate to statins and anti-hypertensive medications in the study population compared with the whole population with stroke in Nanhe county. Additionally, the effect of intervention might influence medication adherence and factors associated with medication adherence in this study.

Based on the list of participants in the SINEMA study, we invited surviving eligible patients with stroke through village doctors. All patients were informed and provided with written consent before participating in the study. Figure 2 presents the process of enrollment. The sample size of the follow-up was 912 and the sample size of people who were taking at least one of the four medications (anti-hypertensive drugs, statins, anti-platelet drugs, and anti-hypoglycemic drugs) was 857. In these people, the duration after the first stroke event ranged from 7 to 37 years with an average of 13.4 years (standard deviation: 5.4). 772 people were prescribed anti-hypertensive drugs, 427 were prescribed statins, 547 were prescribed anti-platelet drugs, and 203 were prescribed anti-hypoglycemic drugs.

Table 1 below shows the sex distribution of the study population. In people taking anti-hypertensive drugs, statins, or anti-platelet drugs, there were more males compared with females (anti-hypertensive drugs：51.9% vs. 48.1%; statins：52.7% vs. 47.3%; anti-platelet drugs:

54.7% vs. 45.3%). In people taking anti-hyperglycemic drugs, the percentage of males was slightly lower than females (anti-hyperglycemic drugs: 49.8% vs.50.3%).

Figure 2: The Flow Diagram of the Study Population

Table 1: Sex Distribution of the Study Population

	Anti-hypertensive drugs	Statins	Anti-platelet drugs	Anti-hyperglycemic drugs
Total	772 (100.0)	427 (100.0)	547 (100.0)	203 (100.0)
Meal	401 (51.9)	225 (52.7)	299 (54.7)	101 (49.8)
Female	371 (48.1)	202 (47.3)	248 (45.3)	102 (50.3)

3.3 Data Collection Methods

A brief interviewer-administered questionnaire was completed for each patient using Qualtrics, an online survey platform, which can ensure the quality of data through setting the format and force response. We used the questionnaire to collect data on demographic information, disease history, medication use and adherence, lifestyle behaviors, and utilization of healthcare services.

3.4 Variables Measured

3.4.1 Outcome Variables

Table 2 displays definitions of outcomes.

In this study, medication use represents if people were prescribed the medication. Because we don't have data on filling in the prescription or regular use of medication, a question about the use of the four medication classes was asked in turn. For each medicine class, patients were first asked a question "Are you taking anti-hypertensive drugs (which would be changed to statins/anti-platelet/ anti-hypoglycemic drugs depending on the class of medication asked for in the question)? (Including those who have been prescribed by the village doctor but have stopped taking the medication without following the doctor's instructions). The answers were "Yes" or "No". After that, within each medication class, we used a question, "Have you taken anti-hypertensive drugs (statins/ anti-platelet/ anti-hypoglycemic drugs) today?" to measure the medication use of the day of the survey and to compare it with the prescriptions. If the medication should be taken at night or later in the day, we asked "Have you taken anti-hypertensive drugs (statins/ anti-platelet/ anti-hypoglycemic drugs) yesterday?" as an alternative question.

Medication adherence was only asked to those who were prescribed one certain medication class. Morisky Green Levine Scale (MGLS) was used to measure the medication adherence of the four medication classes. It included four questions, and it was adapted to the medication classes. The four questions were "Do you ever forget to take your anti-hypertensive

drugs (statins/ anti-platelet/ anti-hypoglycemic drugs)?", "Are you careless at times about taking your anti-hypertensive drugs (statins/ anti-platelet/ anti-hypoglycemic drugs)?", "When you feel better, do you sometimes stop taking your anti-hypertensive drugs (statins/ anti-platelet/ anti-hypoglycemic drugs)?", "Sometimes if you feel worse when you take the anti-hypertensive drugs (statins/ anti-platelet/ anti-hypoglycemic drugs), do you stop taking it?". For each question, the answers were "Yes" or "No". "Yes" represented 1 score and "No" represented 0 score, so the total score ranged from 0 to 4. Adequate adherence was defined as answering "no" to all four questions. To make the analysis easier, we defined medication adherence as a binary outcome. A score of 0 was defined as "high adherence" and a score above 0 and below or equal to 4 was defined as "medium to low adherence." For each medication class, MGLS was asked once if the patient was prescribed the medication.

Table 2: Definitions of Outcome Variables

Outcome	Variables Definitions	Specification for analysis
Medication use	Medication use was self-reported for anti-hypertensive medicine, statins, anti-platelet drugs, and anti-hypoglycemic drugs.	Binary yes/no for each of the four medication types.

Medication adherence	Self-reported medication adherence was measured by the Morisky Green Levine Scale (MGLS) if the participants were taking the medicine. A score of 0 to 4 was calculated by summing all coded responses according to the MGLS, with lower scores indicating better medication adherence.	Medication adherence was defined as a binary outcome. A score of 0 was defined as "high adherence" and a score above 0 and below or equal to 4 was defined as "medium to low adherence."

3.4.2 Independent Variables

According to MAM model of adherence to long term care[40], independent variables were divided using the model of five interacting dimensions that affect adherence (social and economic factors, health system-related factors, condition-related factors, therapy-related factors, and patient-related factors).

Social and economic factors included age, sex, marital status, education level, employment, and annual income.

Health care team and system-related factors included whether enrolled in non-communicable disease insurance (NCD) and frequency of visiting the village clinic due to stroke in the past 12 months. NCD insurance was a special policy in China to alleviate the financial burden of insured persons with non-communicable chronic diseases requiring long-term outpatient treatment. Visiting the village clinic due to stroke in the past 12 months was

determined as a binary outcome, with less than once per month vs equal to or over once per month.

Condition-related factors included recurrence of stroke in the last 2 years, vision capability, hearing capability, levels of disability, health state, and whether having a family caregiver. The 5-level EQ-5D version (EQ-5D-5L) was used to measure the health state of patients through five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression[55]. Each dimension contained 5 levels: no problems, slight problems, moderate problems, severe problems, and extreme problems. The EQ-5D-5L also included EQ VAS which used a vertical scale for patients to rate their own health, with the top end labeled "The best health you can imagine" and the bottom end labeled "The worst health you can imagine.[55]" It provided a quantitative measure of health outcomes based on the patient's personal judgment.

Therapy-related factors included the number of diseases patients have and a total number of medications used based on patients' reports. A Total number of medicines taken by a patient was measured by a question, "How many medications are taken (more than 3 days in a week)?", before separately asking the four medication classes. Therefore, the number of medicines patients taken in this study was calculated based on all the medicines patients were taking.

Patient-related factors included patients' attitudes toward medication, smoking status, and depression. Attitudes toward medication were measured using four statements from the Maastricht Utrecht Adherence in Hypertension (MUAH) scale[56]. The statements were "The pros of taking medication weigh up against the cons", "I feel better taking medication every day", "If I take my medication every day, I feel confident that my medical condition is under control", "I think I contribute to the improvement of my medical condition when I take my medication every day". For each question, a Likert five-point scale was used ranging from "strongly disagree" to "strongly agree" with values assigned from 0 to 4. Depression was measured by the Patient Health Questionnaire (PHQ-2), which was a screening instrument for depression[57].

3.5 Data Analysis Plan

The hypothesis of the study was that medication adherence among stroke patients in rural China was associated with social and economic factors, health system-related factors, condition-related factors, therapy-related factors, and patient-related factors.

First, for descriptive analysis, means and standard deviations were used to measure continuous variables, and frequency and percentage were used to measure binary or categorical variables. Second, logistic regression analysis was performed to analyze the relationships between independent variables and outcome variables. P-values were reported to identify potential factors associated with medication adherence and $P< 0.05$ is regarded as statistically significant. Odds ratios (OR) with 95% confidence intervals (CIs) were reported to quantify the strength of the associations.

4. Results

4.1 Medication Use

Medication use on the survey day is shown in Figure 3. 90.41% of participants reported they took their anti-hypertensive drugs as they should on that day. 87.35% of participants reported they took their statins as they should on that day. 86.29% of participants reported they took their anti-platelet drugs as they should on that day. 92.12% of participants reported they took their anti-hyperglycemic drugs as they should on that day.

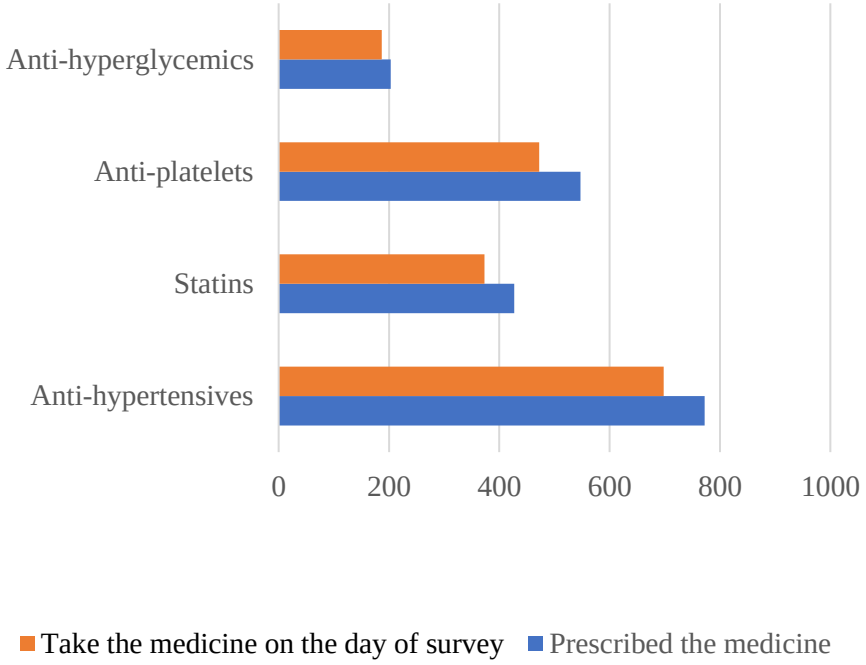

Figure 3: Comparison of Medication Use and Prescriptions

4.2 Medication Adherence

Medication adherence of the four medicines in the study patients is shown in Figure 4. In people taking anti-hypertensive drugs (N=772), 71.50% of participants demonstrated high medication adherence, while 28.50% exhibited medium to low adherence. In people taking statins(N=427), 71.19% of patients reported a high adherence, with 28.81% classified as medium to low adherence. In people taking anti-platelet drugs (N=547), 71.66% of patients reported high

adherence, whereas 28.34% had medium to low adherence. In those who taking anti-hyperglycemic drugs (N=203), the proportion (77.34%) of patients reporting high adherence was the highest among the four medicines, and 22.66% of patients had medium to low adherence.

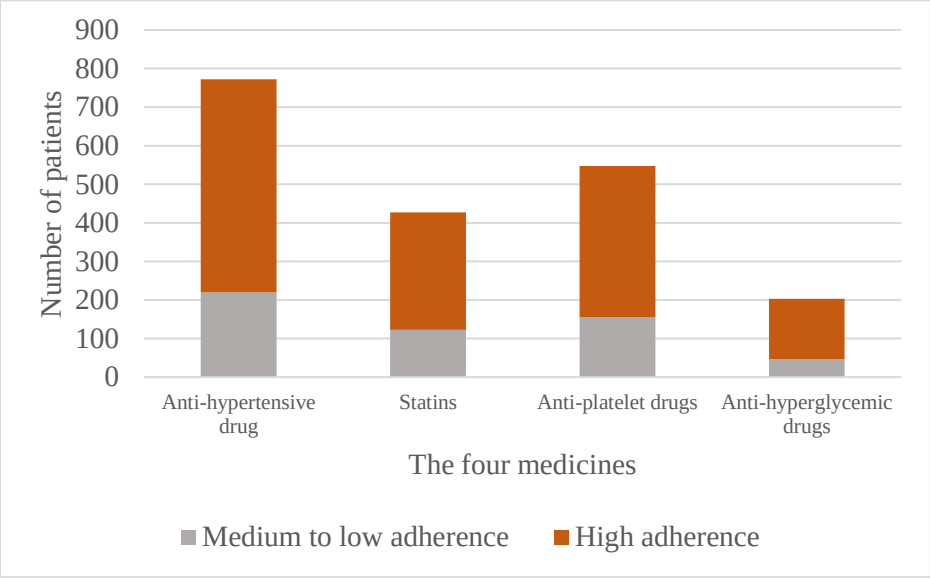

Figure 4: Medication Adherence of the Four Medication Classes in Study Patients

4.3 Bivariable Analysis Results

4.3.1 Socio-economic Factors

Table 3 shows the associations between socio-economic factors and medication adherence. In people taking anti-hypertensive drugs, males were more likely to have high adherence (75.06% vs. 67.65%). Higher education levels were associated with better adherence. In people taking statins, there was no observed relations between socio-economic factors and medication adherence of anti-hypertensive drugs. In people taking anti-hyperglycemic drugs, more percentages of married individuals had high adherence.

4.3.2 Health System-related Factors

Table 4 shows associations between health system-related factors and medication adherence. In patients taking anti-hypertensive drugs, a higher percentage of participants visiting <1 per month had high adherence (75.83%) compared to those visiting ≥1 per

month (67.72%). In patients taking statins or anti-hypertensive drugs, there was no difference in health system-related factors shown. In patients taking anti-hyperglycemic drugs, the frequency of visiting the village clinic was associated with adherence. However, participants visiting ≥1 per month were more likely to have high adherence (85.71%) than those visiting <1 per month (70.54%).

4.3.3 Condition-related Factors

Table 5 presents associations between condition-related factors and medication adherence. In patients taking anti-hypertensive drugs, a higher percentage of people with good or better hearing capability exhibited high adherence (74.36%) compared to those with normal or bad hearing (67.85%). Additionally, a higher percentage of patients with family caregivers demonstrated a high adherence (73.58%) than those without caregivers (66.52%). For stains, higher EQ-5D-5L scores were associated with high adherence (mean=0.64 vs. 0.56 in low adherence). No differences were observed for anti-platelet or anti-hyperglycemic drugs across the evaluated condition-related factors.

4.3.4 Therapy-related Factors

Table 6 presents associations between therapy-related factors and medication adherence. In patients taking anti-hypertensive drugs, a higher number of medications was associated with high adherence (mean=4.30 vs. 3.92 in low adherence). No difference was observed for statins, anti-platelet drugs, or anti-hyperglycemic drugs regarding the number of diseases or medications.

4.3.5 Patient-related Factors

Table 7 demonstrates associations between patient-related factors and medication adherence. No differences were observed for the four types of medicines across the evaluated patient-related factors, including attitudes toward medication, smoking status, and PHQ-2 scores.

Table 3: Associations between Socio-economic Factors and Medication Adherence

	Anti-hypertensive drugs N=772		Statins N=427		Anti-platelet drugs N=547		Anti-hyperglycemic drugs N=203	
	High adherence	Low adherence	High adherence	Low adherence	High adherence	Low adherence	High adherence	Low adherence
Socio-economic factors								
Age	72.2 (7.6)	71.9 (7.7)	71.4 (7.5)	71.1(7.2)	72.5 (7.4)	71.7 (6.8)	70.6 (6.8)	69.0 (7.4)
Sex								
Male	301 (75.1)	100 (24.9)	167 (74.2)	58 (25.8)	221 (73.9)	78 (26.1)	78 (77.2)	23 (22.8)
Female	251 (67.7)	120 (32.4)	137 (67.8)	65 (32.2)	171 (69.0)	77 (31.1)	79 (77.5)	23 (22.6)
Marital Status								
Married	416 (72.5)	158 (27.5)	65 (72.2)	25 (27.8)	294 (71.0)	120 (29.0)	128 (80.5)	31 (19.5)
Others	136 (68.7)	62 (31.3)	239 (70.9)	98 (29.1)	98 (73.7)	35 (26.3)	29 (65.9)	15 (34.1)
Education								
Haven't been to school	221 (68.2)	103 (31.8)	119 (69.2)	53 (30.8)	155 (68.0)	73 (32.0)	60 (72.3)	23 (27.7)
Primary school	157 (67.7)	75 (32.3)	85 (65.4)	45 (34.6)	111 (70.3)	47 (29.8)	43 (82.7)	9 (17.3)
Primary high school and above	174 (80.6)	42 (19.4)	100 (80.0)	25 (20.0)	126 (78.3)	35 (21.7)	54 (79.4)	14 (20.6)
Current job								
Unable to work	193 (76.0)	61 (24.0)	117 (70.9)	48 (29.1)	138 (72.3)	53 (27.8)	71 (82.6)	15 (17.4)
Minor labor	140 (69.3)	62 (30.7)	64 (64.7)	35 (35.4)	103 (71.0)	42 (29.0)	29 (74.4)	10 (25.6)
Normal housework	138 (70.4)	58 (29.6)	73 (73.0)	27 (27.0)	95 (71.4)	38 (28.6)	35 (70.0)	15 (30.0)
Others	81 (67.5)	39 (32.5)	50 (79.4)	13 (20.6)	56 (71.8)	22 (28.2)	22 (78.6)	6 (21.4)
Total income in a year	0.7 (0.6)	0.7 (0.6)	0.8 (0.6)	0.7 (0.6)	0.7 (0.6)	0.7 (0.5)	0.7 (0.6)	0.7 (0.6)

Table 4: Associations between Health System-related Factors and Medication Adherence

	Anti-hypertensive drugs N=772		Statins N=427		Anti-platelet drugs N=547		Anti-hyperglycemic drugs N=203	
	High adherence	Low adherence	High adherence	Low adherence	High adherence	Low adherence	High adherence	Low adherence
Health system factors								
NCD insurance								
Enrolled	110 (70.5)	46 (29.5)	69 (67.0)	34 (33.0)	76 (66.1)	39 (33.9)	36 (67.9)	17 (32.9)
Not enrolled	442 (71.8)	174 (28.3)	235 (72.5)	89 (27.5)	316 (73.2)	116 (26.9)	121 (80.7)	29 (19.3)
Frequency of visiting village clinic								
<1 per month	273 (75.8)	87 (24.2)	156 (74.3)	54 (25.7)	200 (75.2)	66 (24.8)	79 (70.5)	33 (29.5)
≥1 per month	279 (67.7)	133 (32.3)	148 (68.2)	69 (31.8)	192 (68.3)	89 (31.7)	78 (85.7)	13 (14.3)

Table 5: Associations between Condition-related Factors and Medication Adherence

	Anti-hypertensive drugs N=772		Statins N=427		Anti-platelet drugs N=547		Anti-hyperglycemic drugs N=203	
	High adherence	Low adherence	High adherence	Low adherence	High adherence	Low adherence	High adherence	Low adherence
Condition-related factors Stroke recurrence								
Recur	29 (25.0)	87 (75.0)	72 (75.0)	24 (25.0)	79 (75.2)	26 (24.8)	122 (77.2)	36 (22.8)
Not recur	191 (29.1)	465 (70.9)	232 (70.1)	99 (29.9)	313 (70.8)	129 (29.2)	35 (77.8)	10 (22.2)
Far vision								
Good or better	216 (72.2)	83 (27.8)	120 (74.5)	41 (25.5)	159 (72.9)	59 (27.1)	61 (80.3)	15 (19.7)
Normal or bad	336 (71.0)	137 (29.0)	184 (69.2)	82 (30.8)	233 (70.8)	96 (29.2)	96 (75.6)	31 (24.4)

Near vision								
Good or better	221 (69.7)	96 (30.3)	136 (73.9)	48 (26.1)	168 (74.3)	58 (25.7)	66 (79.5)	17 (20.5)
Normal or bad	331 (72.8)	124 (27.3)	168 (69.1)	75 (30.9)	224 (69.8)	97 (30.2)	91 (75.8)	29 (24.2)
Hearing								
Good or better	332 (74.4)	111 (25.6)	178 (73.0)	66 (27.1)	215 (71.2)	87 (28.8）	94 (77.7)	27 (22.3)
Normal or bad	230 (67.9)	109 (32.2)	126 (68.9)	57 (31.2)	177 (72.2)	68 (27.8)	63 (76.8)	19 (23.2)
Disability								
Moderate to severe	226 (75.3)	74 (24.7)	117 (67.2)	57 (32.8)	145 (70.1)	62 (30.0)	78 (80.4)	19 (19.6)
No to slight	326 (69.1)	146 (30.9)	187 (73.9)	66 (26.1)	247 (72.7)	93 (27.4)	79 (74.5)	27 (25.5)
EQ-5D-5L	0.6 (0.3)	0.6 (0.3)	0.6 (0.3)	0.6 (0.3)	0.7 (0.3)	0.6 (0.3)	0.59 (0.3)	0.61 (0.3)
EQ-VAS	57.4(23.4)	56.5(24.0)	57.6 (23.2)	53.4 (23.5)	57.7 (23.8)	56.8 (22.6)	55.3(24.3)	57.9 (22.1)
Caregiver								
Have	401 (73.6)	144 (26.4)	236 (72.4)	90 (27.6)	291 (72.6)	110 (27.4)	127 (79.4)	33 (20.6)
Not have	151 (66.5)	76 (33.5)	68 (67.3)	33 (32.7)	101 (69.2)	45 (30.8)	30 (69.8)	13 (30.2)

Table 6: Associations between Therapy-related Factors and Medication Adherence

	Anti-hypertensive drugs		Statins		Anti-platelet drugs		Anti-hyperglycemic drugs	
	N=772		N=427		N=547		N=203	
	High adherence	Low adherence	High adherence	Low adherence	High adherence	Low adherence	High adherence	Low adherence
Therapy-related factors								
Number of diseases								
≤ 2	320 (71.3)	129 (28.7)	148 (73.3)	54 (26.7)	232 (72.7)	87 (27.3)	36 (72.0)	14 (28.0)
> 2	232 (71.8)	91 (28.2)	156 (69.3)	69 (30.7)	160 (70.2)	68 (29.8)	121 (79.1)	32 (20.9)
Number of medicines	4.30 (2.0)	3.92 (2.2)	4.93 (1.9)	4.95 (2.2)	4.64 (1.9)	4.57 (2.2)	5.25 (2.1)	5.09 (2.5)

Table 7: Associations between Patient-related Factors and Medication Adherence

	Anti-hypertensive drugs N=772		Statins N=427		Anti-platelet drugs N=547		Anti-hyperglycemic drugs N=203	
	High adherence	Low adherence	High adherence	Low adherence	High adherence	Low adherence	High adherence	Low adherence
Patient-related factors Attitudes towards medication								
Active Attitudes	429 (72.1)	166 (27.9)	228 (70.6)	95 (29.4)	293 (70.9)	120 (29.1)	120 (77.9)	34 (22.1)
Inactive Attitudes	123 (69.5)	54 (30.5)	76 (73.1)	28 (26.9)	99 (73.9)	35 (26.1)	37 (75.5)	12 (24.5)
Smoking Status								
Current smoker	62 (68.9)	28 (31.1)	33 (78.6)	9 (21.4)	46 (74.2)	16 (25.8)	9 (64.3)	5 (35.7)
Former smoker	154 (75.5)	50 (24.5)	89 (72.4)	34 (27.6)	121 (74.2)	42 (25.8)	51 (86.4)	8 (13.6)
Never smoker	336 (70.3)	142 (29.7)	182 (69.5)	80 (30.5)	225 (69.9)	97 (30.1)	97 (74.6)	33 (25.4)
PHQ-2								
≤ 2	509 (72.1)	197 (27.9)	277 (72.7)	104 (27.3)	357 (72.0)	139 (28.0)	145 (78.8)	39 (21.2)
>2	43 (65.2)	23 (34.9)	27 (58.7)	19 (41.3)	35 (68.6)	16 (31.4)	12 (63.2)	7 (36.8)

4.4 Logistic Regression Results

4.4.1 Anti-hypertensive Drugs

Figure 5 presents associations between various factors and the adherence to anti - hypertensive drugs. The logistic regression model was statistically significant (P< 0.001). After controlling for other variables, higher EQ - 5D - 5L Index was significantly associated with high adherence to anti - hypertensive drugs (OR = 3.24, 95% CI: 1.23 - 8.54). Regarding education levels and high adherence to anti - hypertensive drugs, compared with patients who haven't been to school, having a high school education or above was significantly associated with high adherence to anti - hypertensive drugs (OR = 1.87, 95% CI: 1.06 - 3.30). As for hearing capability and high adherence to anti - hypertensive drugs, after controlling for other variables, good or better hearing capability was significantly associated with high adherence to anti - hypertensive drugs (OR = 1.79, 95% CI: 1.20 - 2.67). In terms of attitudes toward medication and high adherence to anti - hypertensive drugs, having an active attitude towards medication was significantly associated with high adherence to anti-hypertensive drugs (OR = 1.62, 95% CI: 1.03 - 2.53).

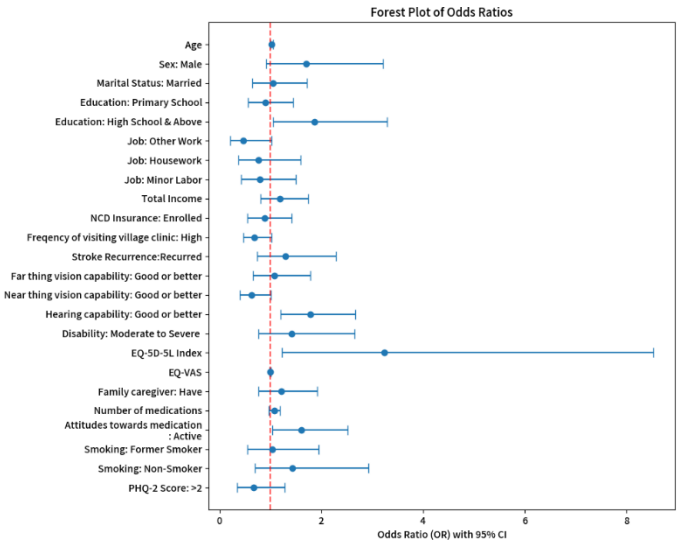

Figure 5: Forest Plot: Factors Associated with Anti-hypertensive Drug Adherence

4.4.2 Statins

Figure 6 shows the associations between various factors and the adherence to anti-hypertensive drugs. The logistic regression model was not statistically significant (P>0.05). There were no statistically significant results of each variable.

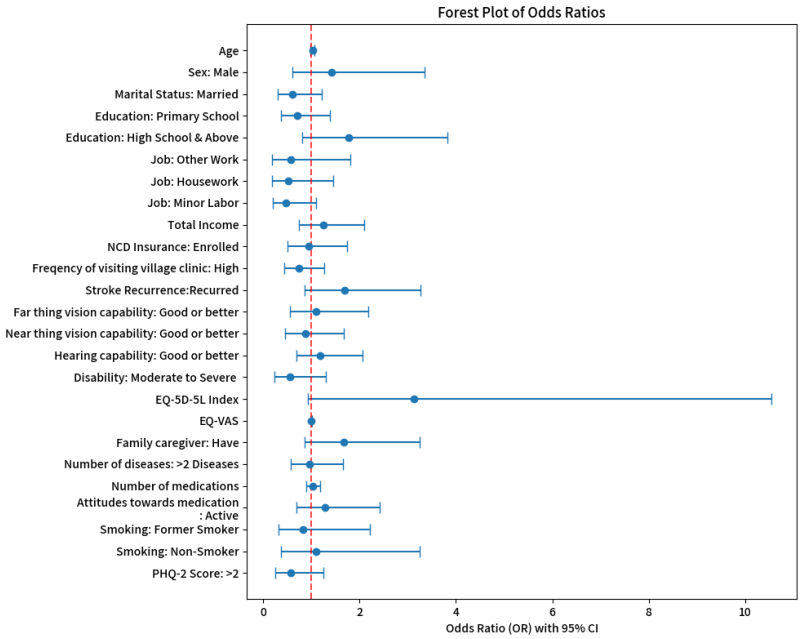

Figure 6: Forest Plot: Factors Associated with Statin Adherence

4.4.3 Anti-platelet Drugs

Figure 7 shows the associations between various factors and the adherence to anti-platelet drugs. The logistic regression model was not statistically significant (P>0.05). There were no statistically significant results of each variable.

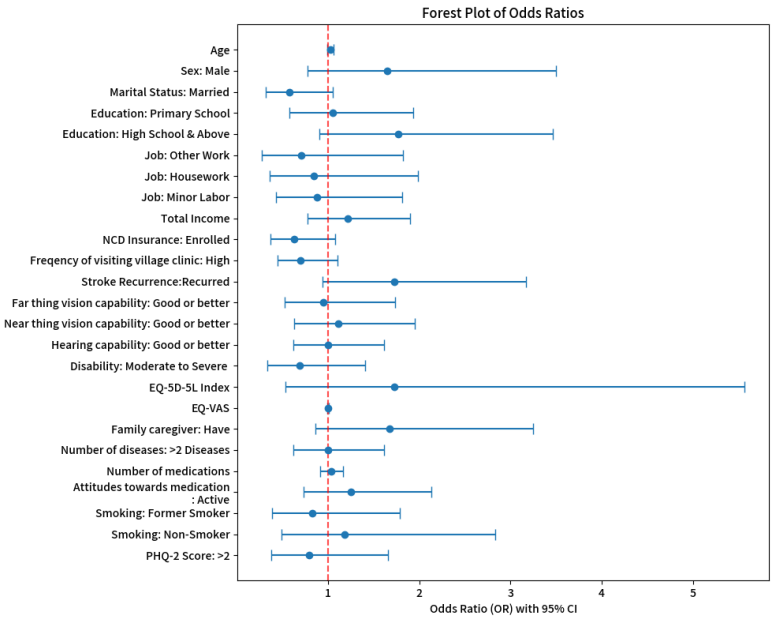

Figure 7: Forest Plot: Factors Associated with Anti-platelet Drug Adherence

4.4.4 Anti-hyperglycemic Drugs

Figure 8 shows the associations between various factors and the adherence to anti-hyperglycemic drugs. The overall logistic regression model was statistically significant (P=0.039). For sex variable, male sex was associated with high adherence than females (OR = 0.13, 95% CI: 0.03–0.58). After controlling for other variables, patients with primary school education were more likely to have high adherence to anti-hyperglycemic drugs compared to those without formal education (OR = 5.71, 95% CI: 1.28–25.44). Similarly, patients with high school education or above were more likely to have high adherence to anti-hyperglycemic drugs compared to those without formal education (OR = 4.65, 95% CI: 1.11–19.57). Additionally, high frequency of visiting village clinics was associated low medication adherence (OR = 0.23, 95% CI: 0.07–0.73).

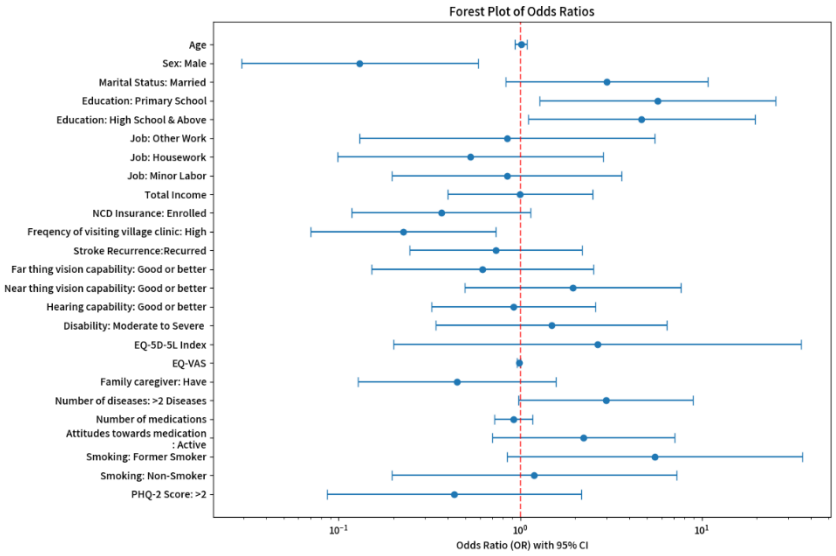

Figure 8: Forest Plot: Factors Associated with Anti-hyperglycemic Drug Adherence

5. Discussion

5.1 Socioeconomic Factors and Adherence

The results of this study demonstrated that higher education level was associated with high adherence to both anti-hypertensive and anti-hyperglycemic drugs. This result is different from a study looking at patients with hypertension showed that those with less education may be more concerned about medication use[58]. Male sex was associated with high adherence than females. This is similar to the result of a study focusing on female health in 2014 which women were less likely than men to be adherent in their use of chronic medications[59]. A possible explanation might be higher rates of side effects in female patients compared with males[59]. Another review had similar findings. In hypercholesterolemia, women exhibited poorer adherence to statin therapy compared to men, with statin-related side effects and patient perception being significant factors[60]. These findings suggested the need for further research to better understand sex differences in medication adherence.

5.2 Health System Factors

Health system factors like health care utilization and health insurance have been widely discussed. In this study, the relationship between healthcare utilization and adherence varied by medicines. Regular tertiary hospital visits can positively affect adherence to anti-hypertensive drugs in Chinese adults[61], which is different from the result of this study focusing on village clinics. For anti-hypertensive drugs, less frequent clinic visits (<1/month) were associated with high adherence. The possible explanation can be a reverse causality that those who have high medication adherence can better control their medical conditions and do not need to visit village clinics frequently. A study suggested that a patient with poorly controlled diabetes may need more frequent specialist consultations and potential hospitalizations[62]. A review also found that medication non-adherence might lead to poor outcomes, increasing healthcare service utilization and overall healthcare costs[63]. A cohort study in the U.S. on patients with chronic conditions

provided evidence-based results with causality that patients in most condition cohorts who were adherent to treatment had significantly lower odds of hospitalization or emergency department use compared to patients who were not adherent[64]. In contrast, for anti-hyperglycemic drugs, frequent clinic visits (⩾1/month) were associated with high adherence, which can be explained by a study in patients with diabetes indicating that frequent visits for diabetes care may lead to better medication adherence and diabetes control[65].

5.3 Condition-related Factors

Health-related quality of life (EQ-5D-5L Index) was shown to be associated with adherence to anti-hypertensive drugs. This is similar to a study on patients with dyslipidemia that higher rates of medication non-adherence are independently associated with lower EQ-5D score[66]. Also, good hearing capability was associated with high adherence, like in older adults, hearing loss can lead to a higher likelihood of medication non-adherence (OR=1.57. 95% CI:1.03–2.37)[67]. It also demonstrated the need to consider integrated care for older adults with stroke based on WHO report[68].

Notably, having a family caregiver was likely to have high medication adherence in patients taking anti-hypertensive drugs in the bivariate analysis, which confirmed that the role of social support was related to higher medication adherence[69]. However, the association between the presence of a family caregiver and adherence to anti-hyperglycemic drugs was not significant in the logistic model. In contrast, studies in diabetic patients have shown that social support improves glycemic control by enhancing self-efficacy and, in turn, medication adherence[70]. Because the study population of rural elderly patients had a limited understanding of the term “social support”, in the social support aspect we only asked the patients about their attitude towards having family caregivers.

5.4 Therapy-related Factors

In this study, a higher number of medicines was associated with high adherence to antihypertensives in the bivariate analysis, which was in contrast to the view that polypharmacy can hurt medication adherence[71]. This might be explained by the U-shape relation between the number of medicines taken and medication adherence[72], meaning when patients take 3 or 4 medicines, the proportion of patients with high adherence was the largest compared with fewer medicines taken or more medicines taken. In this study, the average number of medication patients taken in the high adherence group was 4.3 which was close to the peak of adherence. Additionally, the association between the number of medicines and medication adherence became not significant after adding all variables in the model.

5.5 Patient-related Factors

Active attitudes toward medication were associated with high adherence to anti-hypertensive drugs. This result is the same as a recent study in patients with bipolar disorder[73]. Despite the theoretical importance, smoking status and depression (PHQ-2 scores) did not show a significant association with medication adherence in this study. For depression, the result was different from a meta-analysis showing that depression was associated with poor adherence to medication across a range of chronic diseases[74]. The cause of the difference in the results might be using different depression screening scales. In the meta-analysis, studies included usually used depression screening tools with more items, such as the Beck depression inventory, Brief Symptom Index of Depression 7 items, and Patient Heath Questionnaire with 8 items (PHQ-8) or 9 items (PHQ-9), which had more questions to screen depression compared to PHQ-2[74]. In this study, PHQ-9 was also used in the survey. However, because we only asked PHQ-9 when people were shown to have depression after answering PHQ-2, the number of people answering PHQ-9 was quite small, so PHQ-9 was not used to represent depression in the data analysis.

5.6 Strengths and Limitations

5.6.1 Strengths

This study offers several notable strengths. First, it employs the Multidimensional Adherence Model (MAM) to systematically evaluate factors across socioeconomic, health system, condition-related, therapy-related, and patient-related domains, providing a holistic understanding of medication adherence in rural stroke patients. Methodologically, the use of validated tools such as the Morisky Green Levine Scale (MGLS) and EQ-5D-5L Index ensures reliable measurement of adherence and health-related quality of life. Additionally, the focus on rural China addresses a critical gap in existing literature, which predominantly centers on urban populations, thereby contributing unique insights into a demographic with distinct healthcare access challenges.

5.6.2 Limitations

Although this study has its merits, it has several limitations. First, the cross-sectional design cannot determine causation. The association between the frequency of visiting village clinics and medication adherence cannot be explained by this study. Studies such as cohort studies should be adopted to see the causal relations between healthcare service utilization and medication adherence. As some patients reported directly going to hospitals instead of village clinics, to better understand and include the information on healthcare service utilization in rural patients with stroke, more detailed questions should be asked in the research, such as the usual choice of health care service, the frequency of going to hospitals, etc. Second, relying on self-reported measures like MGLS and PHQ-2 may bring recall and social desirability biases. Third, the statistical analysis did not account for the cluster effect. In studies involving clusters, outcomes are likely to be more closely matched within clusters than between them[75]. In this study, as patients in the small village have the same village doctors, their medication adherence might be more comparable than patients living in different villages. Under this condition, using

logistic regression may increase the risk of Type I errors (false positives)[75]. To better ensure valid results, mixed-effects models or generalized estimating equations (GEEs) should be used in studies with clusters[76]. Fourth, the potential effect of the primary care-based integrated mobile health intervention was not discussed. As patients in the intervention group had significantly higher adherence to statins and antihypertensive medications compared to the control group[50], the medication adherence in the sample might be higher than the whole stroke population in Nanhe County. Additionally, the effect of intervention might also influence the factors associated with medication adherence. Moreover, since the sample is only from Nanhe County, the findings can't be easily generalized to other areas in China.

6. Conclusion

This study provides insigh ts into the multidimensional factors associated with medication adherence among rural stroke patients in Nanhe County, China. Key findings underscored the associations between adherence to secondary preventive medications for stroke and socioeconomic factors (e.g., education level, sex), patient-related factors such as attitudes toward medications, condition-related factors such as health status perceptions (EQ-5D-5R) and hearing capability, and health system-related factors including frequency of visiting the village clinics. Among these findings, the association between frequent clinic visits and reduced adherence to anti-hypertensive drugs cannot be fully explained and requires further discussion.

Appendix A
Nanghe County Practical and Innovative Stroke Prevention Project - 6-Year Follow-up Survey
Patient Questionnaire

A. Basic Information

A1. Interview Date: ☐ Month ☐ ☐ Day

A2. Patient Name Initials (e.g., for Zhang Jianguo, write ZJG): _____

A3. Patient Project ID: ☐ ☐ ☐ ☐ ☐

A4. Patient's Village: _____

A5. Patient's Gender: ☐ Male ☐ Female

A6. Marital Status: ☐ Married ☐ Single ☐ Widowed ☐ Divorced ☐ Other

A7. Patient's Health Insurance Status (Select all that apply)

☐ Xingtai Urban and Rural Resident Basic Medical Insurance (New Rural Cooperative Medical Scheme)

☐ Xingtai Urban and Rural Resident Outpatient Special Chronic Disease Management

☐ Xingtai Urban Employee Medical Insurance

☐ Other types of insurance (e.g., commercial insurance)

☐ No insurance

A8. What is your current occupation?

☐ Unable to work due to health reasons (including farming and housework)

☐ Only able to do light work (e.g., housework or handicrafts)

☐ Able to do normal household chores

☐ Able to do simple farm work (e.g., watering, weeding)

☐ Able to do heavy farm work (e.g., plowing, planting)

☐ Engaged in manual labor such as migrant work

☐ Running a business/self-employed

☐ Intellectual work (e.g., government official, doctor, teacher, professional)

☐ Other

B. Household Information

B1. Do you have a mobile phone (including shared use with others)?

☐ Yes, a basic phone (feature phone)

☐ Yes, a smartphone

☐ No (skip to B3)

B2. Do you share a mobile phone with family members?

☐ Yes

☐ No

B3. How many people live with you (excluding yourself, but including those who share meals with you, such as children over 6, teenagers, and adults)? _____

B4. Does anyone take care of you (including reminding you to take medication)?

☐ Yes

☐ No (If "No," skip to B8)

B5. Who is your primary caregiver?

☐ Spouse

☐ Daughter

☐ Son

☐ Child’s spouse

☐ Grandchild

☐ Grandchild’s spouse

☐ Great-grandchild & spouse

☐ Sibling

☐ Parents

☐ Parents-in-law

☐ Other

B6. How often does your caregiver assist you (including reminding you to take medication)?

☐ Never (0 days per week)

☐ Rarely (1-2 days per week)

☐ Sometimes (3-4 days per week)

☐ Often (4-5 days per week)

☐ Always (6-7 days per week)

B9. How much do you and your spouse earn annually? _____ ☐ Don’t know

B10. What is your and your spouse's annual income from social welfare (pension, retirement benefits, subsidies, etc.)? _____ ☐ Don’t know

B11. How much money do your children give you annually? _____ ☐ Don’t know

A_1. Please write the patient project ID again: ☐ ☐ ☐ ☐ ☐

C. Smoking

C1. Do you smoke (tobacco)?

☐ Currently smoke (Go to C2)

☐ Used to smoke, but quit (Go to D)

☐ Never smoked (Skip to D)

C2. How many cigarettes do you smoke per day on average? _____

D. Physical Activity

D1. In the past 7 days, on how many days did you engage in vigorous physical activity (e.g., carrying water, jogging, running, farming, fast cycling)?

Only consider activities lasting at least 10 minutes per session. _____ days

D2. On those days, how many minutes per day did you engage in vigorous physical activity?

_____ minutes

D3. In the past 7 days, on how many days did you engage in moderate physical activity (e.g., brisk walking, lifting light objects, cycling, slow jogging)?

Only consider activities lasting at least 10 minutes per session. _____ days

D4. On those days, how many minutes per day did you engage in moderate physical activity?

_____ minutes

D5. In the past 7 days, on how many days did you walk for at least 10 minutes at a time (for work, at home, commuting, leisure, or recreation)? _____ days

D6. On those days, how many minutes per day did you spend walking? _____ minutes

D7. How many hours do you sleep at night? (Exclude time spent lying down but not sleeping, and daytime naps.) _____ hours

D8. In the past 7 days, how many hours per day did you spend sitting or lying down (excluding nighttime sleep)? _____ hours

E. Diet

E1. How often do you eat vegetables?

☐ Daily (or more than 5 times per week)

☐ 2-5 times per week

☐ Once per week

☐ Less than once per week

☐ Never or almost never

E2. How often do you eat fruit?

☐ Daily (or more than 5 times per week)

☐ 2-5 times per week

☐ Once per week

☐ Less than once per week

☐ Never or almost never

RE Vitality

RE1. In the past three months, have you lost more than 3 kg without intentionally trying to lose weight?

☐ Yes ☐ No

RE2. Have you experienced a loss of appetite?

☐ Yes ☐ No

F1 First Blood Pressure Measurement

During the measurement, please ensure the following:

1. Both feet are flat on the ground.
2. Measurement is taken on the right arm.

3. The upper arm and the blood pressure monitor are at heart level.
4. The center of the cuff is positioned directly over the brachial artery.
5. Use the standard-sized cuff.

Please record the measurement results on the corresponding section of the patient's ID slip.

F1a. Please record the systolic blood pressure (high pressure) from the first measurement:

_____ mmHg

F1b. Please record the diastolic blood pressure (low pressure) from the first measurement:

_____ mmHg

G. Stroke History

Only consider strokes diagnosed by a county-level hospital or higher.

G1. In the past two years, have you been hospitalized due to a recurrent stroke?

(Hospitalization is required to qualify; receiving IV treatment without an overnight hospital stay does not count.)

☐ Yes (Proceed to G2)

☐ No (Skip to H)

G2. How many times have you had a recurrent stroke in the past two years?

_____ times

For each recurrence, please provide the following information:

G5. In which year were you diagnosed with a stroke in the past two years? (If unsure, select "Unknown year")

☐ 2022

☐ 2023

☐ 2024

☐ Unknown year

RG. In which month or season were you diagnosed with a stroke in the past two years?

(If the month is known, write the month; if the month is unknown, select the season. If both are unknown, select "Unknown.")

☐ Month: _____

☐ Spring

☐ Summer

☐ Autumn

☐ Winter

☐ Unknown

G8. How many days were you hospitalized for a recurrent stroke in the past two years?

☐ Number of hospitalization days: _____

☐ Unknown

H. Hospitalization for Other Diseases

H1. In the past two years, have you been hospitalized for reasons other than a stroke?

(Daytime IV treatments without an overnight hospital stay do not count.)

☐ Yes ☐ No

H2. How many times have you been hospitalized for non-stroke reasons in the past two years?

_____ times

H3. What is the total number of days you were hospitalized for non-stroke reasons in the past two years?

_____ days

H4. What were the reasons for your hospitalizations (excluding stroke) in the past two years? (If hospitalized multiple times, select all applicable reasons.)

☐ Hypertension

☐ Dyslipidemia (e.g., elevated total cholesterol)

☐ Diabetes or high blood sugar

☐ Heart diseases (e.g., acute myocardial infarction, angina, heart failure, coronary artery disease, etc.)

☐ Chronic lung disease (e.g., chronic bronchitis, emphysema, excluding tumors or cancer)

☐ Asthma

☐ Cancer or malignant tumors (excluding minor skin cancer)

☐ Blood disorders

☐ Kidney disease (excluding tumors or cancer)

☐ Memory-related diseases (e.g., dementia, brain atrophy, Parkinson's disease, etc.)

☐ Arthritis or rheumatism

☐ Emotional, neurological, or mental health issues

☐ Stomach or other digestive system diseases (excluding tumors or cancer)

☐ Liver diseases (excluding fatty liver, tumors, or cancer)

☐ Other diseases: _____

RH. Disease Diagnosis

Have you been diagnosed with the following diseases at a county-level or higher hospital?

RH1. Hypertension

☐ Diagnosed ☐ Not Diagnosed

If "Diagnosed" is selected, please answer the following questions:

RH1a_1. Where was this disease diagnosed?

☐ County-level hospital or higher

☐ Below county level (e.g., township health center)

☐ Unknown

RH1. Hypertension Diagnosis

RH1a. Year of first hypertension diagnosis

(If diagnosed 2-3 years ago, fill in 2021; if about a decade ago, fill in 2009; if about two decades ago, fill in 1999. Estimate the year as accurately as possible. If unknown, enter 9999):

RH1b. Month of first hypertension diagnosis (Fill in + Select):

☐ If known, please write: _____ (Fill in the specific month, e.g., “January,” then skip to RH2)

☐ Unknown (No need to fill in the month, proceed directly to RH1c)

RH1c. Season of first hypertension diagnosis (Select one):

☐ Spring ☐ Summer ☐ Autumn ☐ Winter ☐ Unknown

RH2. Dyslipidemia (e.g., elevated cholesterol)

☐ Diagnosed ☐ Not Diagnosed

If "Diagnosed" is selected, please answer the following questions:

RH2a_1. Where was this disease diagnosed?

☐ County-level hospital or higher

☐ Below county level (e.g., township health center)

☐ Unknown

RH2a. Year of first dyslipidemia diagnosis

(If diagnosed 2-3 years ago, fill in 2021; if about a decade ago, fill in 2009; if about two decades ago, fill in 1999. Estimate the year as accurately as possible. If unknown, enter 9999):

RH2b. Month of first dyslipidemia diagnosis (Fill in + Select):

☐ If known, please write: _____ (Fill in the specific month, e.g., “January,” then skip to RH3)

☐ Unknown (No need to fill in the month, proceed directly to RH2c)

RH2c. Season of first dyslipidemia diagnosis (Select one):

☐ Spring ☐ Summer ☐ Autumn ☐ Winter ☐ Unknown

RH3. Diabetes or High Blood Sugar

☐ Diagnosed ☐ Not Diagnosed

If "Diagnosed" is selected, please answer the following questions:

RH3a_1. Where was this disease diagnosed?

☐ County-level hospital or higher

☐ Below county level (e.g., township health center)

☐ Unknown

RH3a. Year of first diabetes or high blood sugar diagnosis

(If diagnosed 2-3 years ago, fill in 2021; if about a decade ago, fill in 2009; if about two decades ago, fill in 1999. Estimate the year as accurately as possible. If unknown, enter 9999):

RH3b. Month of first diabetes or high blood sugar diagnosis (Fill in + Select):

☐ If known, please write: _____ (Fill in the specific month, then skip to RH4)

☐ Unknown (No need to fill in the month, proceed directly to RH3c)

RH3c. Season of first diabetes or high blood sugar diagnosis (Select one):

☐ Spring ☐ Summer ☐ Autumn ☐ Winter ☐ Unknown

RH4. Heart Diseases (e.g., Angina, Heart Failure, Coronary Artery Disease, etc.)

☐ Diagnosed ☐ Not Diagnosed

If "Diagnosed" is selected, please answer the following questions:

RH4a_1. Where was this disease diagnosed?

☐ County-level hospital or higher

☐ Below county level (e.g., township health center)

☐ Unknown

RH4a. Year of first heart disease diagnosis

(If diagnosed 2-3 years ago, fill in 2021; if about a decade ago, fill in 2009; if about two decades ago, fill in 1999. Estimate the year as accurately as possible. If unknown, enter 9999):

RH4b. Month of first heart disease diagnosis (Fill in + Select):

☐ If known, please write: _____ (Fill in the specific month, then skip to RH5)

☐ Unknown (No need to fill in the month, proceed directly to RH4c)

RH4c. Season of first heart disease diagnosis (Select one):

☐ Spring ☐ Summer ☐ Autumn ☐ Winter ☐ Unknown

RH5. Chronic Obstructive Pulmonary Disease (COPD) (e.g., Chronic Bronchitis, Emphysema, etc.)

☐ Diagnosed ☐ Not Diagnosed

If "Diagnosed" is selected, please answer the following questions:

RH5a_1. Where was this disease diagnosed?

☐ County-level hospital or higher

☐ Below county level (e.g., township health center)

☐ Unknown

RH5a. Year of first COPD diagnosis

(If diagnosed 2-3 years ago, fill in 2021; if about a decade ago, fill in 2009; if about two decades ago, fill in 1999. Estimate the year as accurately as possible. If unknown, enter 9999):

RH5b. Month of first COPD diagnosis (Fill in + Select):

☐ If known, please write: _____ (Fill in the specific month, then skip to RH6)

☐ Unknown (No need to fill in the month, proceed directly to RH5c)

RH5c. Season of first COPD diagnosis (Select one):

☐ Spring ☐ Summer ☐ Autumn ☐ Winter ☐ Unknown

RH10. Arthritis or Rheumatism

☐ Diagnosed ☐ Not Diagnosed

If “Diagnosed” is selected, please continue with the following questions:

RH10a_1. Where was this disease diagnosed?

☐ County-level and above hospitals

☐ Hospitals below county level, such as township health centers

☐ Do not know where it was diagnosed

RH10a. Year of first arthritis or rheumatism diagnosis (For 2-3 years ago, enter 2021; for over ten years ago, enter 2009; for over twenty years ago, enter 1999; estimate as accurately as possible. If unknown, enter 9999): _____

RH10b. Month of first arthritis or rheumatism diagnosis (fill in + select):

☐ If remembered, please specify: _____ (Fill in the specific month, then proceed to RH12)

☐ Not sure (Skip month entry and proceed directly to RH11c)

RH10c. Season of arthritis or rheumatism diagnosis (select one):

☐ Spring ☐ Summer ☐ Autumn ☐ Winter ☐ Not sure

RH11. Emotional or Mental Disorders, such as Depression or Anxiety

☐ Diagnosed ☐ Not Diagnosed

If "Diagnosed" is selected, please continue with the following questions:

RH11a_1. Where was this disease diagnosed?

☐ County-level and above hospitals

☐ Hospitals below county level, such as township health centers

☐ Do not know where it was diagnosed

RH11a. Year of first emotional or mental disorder diagnosis (For 2-3 years ago, enter 2021; for over ten years ago, enter 2009; for over twenty years ago, enter 1999; estimate as accurately as possible. If unknown, enter 9999): _____

RH11b. Month of first emotional or mental disorder diagnosis (fill in + select):

☐ If remembered, please specify: _____ (Fill in the specific month, then proceed to RH13)

☐ Not sure (Skip month entry and proceed directly to RH12c)

RH11c. Season of emotional or mental disorder diagnosis (select one):

☐ Spring ☐ Summer ☐ Autumn ☐ Winter ☐ Not sure

RH12. Gastrointestinal or Other Digestive System Diseases (Excluding Tumors or Cancer)

☐ Diagnosed ☐ Not Diagnosed

If "Diagnosed" is selected, please continue with the following questions:

RH12a_1. Where was this disease diagnosed?

☐ County-level and above hospitals

☐ Hospitals below county level, such as township health centers

☐ Do not know where it was diagnosed

RH12a. Year of first digestive system disease diagnosis (For 2-3 years ago, enter 2021; for over ten years ago, enter 2009; for over twenty years ago, enter 1999; estimate as accurately as possible. If unknown, enter 9999): _____

RH12b. Month of first digestive system disease diagnosis (fill in + select):

☐ If remembered, please specify: _____ (Fill in the specific month, then proceed to RH14)

☐ Not sure (Skip month entry and proceed directly to RH13c)

RH12c. Season of digestive system disease diagnosis (select one):

☐ Spring ☐ Summer ☐ Autumn ☐ Winter ☐ Not sure

RH13. Liver Diseases such as Hepatitis or Cirrhosis (Excluding Fatty Liver, Tumors, or Cancer)

☐ Diagnosed ☐ Not Diagnosed

If "Diagnosed" is selected, please continue with the following questions:

RH13a_1. Where was this disease diagnosed?

☐ County-level and above hospitals

☐ Hospitals below county level, such as township health centers

☐ Do not know where it was diagnosed

RH13a. Year of first liver disease diagnosis (For 2-3 years ago, enter 2021; for over ten years ago, enter 2009; for over twenty years ago, enter 1999; estimate as accurately as possible. If unknown, enter 9999): _____

RH13b. Month of first liver disease diagnosis (fill in + select):

☐ If remembered, please specify: _____ (Fill in the specific month, then proceed to RH15)

☐ Not sure (Skip month entry and proceed directly to RH14c)

RH13c. Season of liver disease diagnosis (select one):

☐ Spring ☐ Summer ☐ Autumn ☐ Winter ☐ Not sure

RH14. Cancer or Malignant Tumors (Excluding Minor Skin Cancer)

☐ Diagnosed ☐ Not Diagnosed

If "Diagnosed" is selected, please continue with the following questions:

RH14a_1. Where was this disease diagnosed?

☐ County-level and above hospitals

☐ Hospitals below county level, such as township health centers

☐ Do not know where it was diagnosed

RH14a. Year of first cancer or malignant tumor diagnosis (For 2-3 years ago, enter 2021; for over ten years ago, enter 2009; for over twenty years ago, enter 1999; estimate as accurately as possible. If unknown, enter 9999): _____

RH14b. Month of first cancer or malignant tumor diagnosis (fill in + select):

☐ If remembered, please specify: _____ (Fill in the specific month, then proceed to RH8)

☐ Not sure (Skip month entry and proceed directly to RH7c)

RH14c. Season of cancer or malignant tumor diagnosis (select one):

☐ Spring ☐ Summer ☐ Autumn ☐ Winter ☐ Not sure

RH15. Other Diagnosed Diseases (Beyond Those Mentioned Above) at County-Level or Higher Hospitals

☐ Yes, _____ (Please specify the disease name) ☐ No

RA. Vision and Hearing Condition

RA1. Here are some questions about your vision. Do you usually wear glasses (including corrective lenses)?

☐ Yes ☐ Occasionally ☐ No ☐ Blind (Skip to RA4)

RA2. How well can you see distant objects? For example, can you recognize a friend across the street? (If you wear glasses, answer based on your vision while wearing them.)

☐ Excellent ☐ Very good ☐ Good ☐ Fair ☐ Poor

RA3. How well can you see nearby objects? For example, can you read a newspaper while wearing glasses? (If you wear glasses, answer based on your vision while wearing them.)

☐ Excellent ☐ Very good ☐ Good ☐ Fair ☐ Poor

RA4. Do you wear a hearing aid?

☐ Yes ☐ Occasionally ☐ No ☐ Deaf (Hearing loss)

RA5. How is your hearing? (If you regularly wear a hearing aid, answer based on your hearing with it; if you do not wear it often, answer based on your hearing without it.)

☐ Excellent ☐ Very good ☐ Good ☐ Fair ☐ Poor

I. Village Health Clinic (Only for Stroke-Related Visits)

I1. In the past 12 months, how often have you visited the village health clinic due to a stroke? (Including consultations, blood pressure checks, medication collection, or blood sugar control; excluding preventive infusions or visits for other illnesses such as colds, diarrhea, kidney disease, etc.)

☐ Once a week or more (≥4 times per month)

☐ 2–3 times per month

☐ Once per month

☐ Once every two months (inclusive) to less than once per month

☐ Once every three months (inclusive) to less than once every two months

☐ Less than once every three months

Q. Daily Activity Ability

Q1. Do you need any help from others when you shower (including scrubbing your upper or lower body)? (Single choice)

☐ Do not need any help (skip to Q2)

☐ Needed help with one part of the body

☐ Need help with more than two parts of the body

Q2. Do you need help with getting dressed (including finding and putting on clothes.) ?

☐ Can find and put on clothes by myself without any help (skip to Q3)

☐ Can find and put on clothes, but cannot put on shoes by myself

☐ Needed help from others to find or put on clothes

Q3. Do you need help from others when you go to the toilet to urinate or defecate (including washing your hands and undressing and putting on your clothes after urinating or defecating, including using the toilet in your room.) ? (Single choice)

☐ Completely able to do this alone, without help (skip to Q4)

☐ Able to take care of himself/herself, but needs help from others

☐ Bedridden, can only use the bedpan etc. with help from others in bed

Q4. Do you need help from others when moving around indoors (indoor activities are getting in and out of bed, sitting on a chair or stool, or getting up from a chair or stool)? (Single choice)

☐ No help needed; assistive devices available (skip to Q5)

☐ Needs assistance

☐ Bed-ridden

Q5. Are you able to control your bowel movements? (Single choice)

☐ Able to control bowel movements (skip to Q6)

☐ Occasionally/sometimes incontinent

☐ Use of catheter, etc. to assist control or cannot control

Q6. Do you need help with eating? (Eating without help means eating without the help of others and being able to eat independently on your own.) (Single choice)

☐ Eat without help (skip to Q7)

☐ Able to eat on their own, but needing some help

☐ Fed entirely by others

Q7. Would you be able to visit a neighbor's house by yourself?

☐Able ☐With some difficulty ☐No

Q8. Can you go out shopping alone? ☐Yes ☐With some difficulty ☐No

Q9. Would you be able to cook alone if needed? ☐Yes ☐With some difficulty ☐No

Q10. Would you be able to do laundry alone if needed? ☐Yes ☐With some difficulty ☐No

Q11. Are you able to walk 2 miles continuously? ☐Yes ☐With some difficulty ☐No

Q12. Can you lift about 10 pounds? ☐Yes ☐With some difficulty ☐No

Q13. Can you squat down and stand up three times in a row? ☐Yes ☐With some difficulty ☐No

Q14. Can you travel alone on public transportation? ☐Yes ☐With some difficulty ☐No

R. Community Dementia Screening Inventory (CSI-D)

R1a. Now I will tell you three words and ask you to repeat them when I have finished. Boat ---- house ---- fish

How many words did the subject remember during the first repetition? (If the subject remembers them all, skip directly to R7; if not all, repeat the test again)

☐ did not remember ☐ remembered 1 ☐ remembered 2 ☐ remembered 3

R1b. Now I am going to tell you three words and ask you to repeat them after I have finished. boat ---- house ---- fish

How many words did the subject remember on the second repetition? (If the subject remembers them all, skip directly to R7; if not all, repeat the test again)

☐ did not remember ☐ remembered 1 ☐ remembered 2 ☐ remembered 3

R1c. Now I will tell you three words and ask you to repeat them when I am finished. Boat ---- house ---- fish

How many words did the subject remember on the third repetition? (If the subject remembers them all, skip directly to R7; if not all, repeat the test again)

☐ did not remember ☐ remembered 1 ☐ remembered 2 ☐ remembered 3

R1d. Now I am going to say three words and ask you to repeat them after I have finished. Boat ---- house ---- fish

How many words did the subject remember on the fourth repetition? (If the subject remembers them all, skip directly to R7; if not all, repeat the test again)

☐ did not remember ☐ remembered 1 ☐ remembered 2 ☐ remembered 3

R1e. Now I am going to tell you three words, please repeat them after I have finished. Boat ---- house ---- fish

How many words did the subject remember on the fifth repetition? (If the subject remembered all of them, skip directly to R7; if not all of them, repeat the test again)

☐ did not remember ☐ remembered 1 ☐ remembered 2 ☐ remembered 3

R1f. Now I am going to tell you three words and ask you to repeat them after I have finished.

Boat ---- house ---- fish

How many words did the subject remember on the sixth repetition? (whether or not they remembered all of them, skip to R7)

☐ no words remembered ☐ 1 word remembered ☐ 2 words remembered ☐ 3 words remembered

OK, now please remember these words, I will have to ask you again in a few minutes.

	Yes	No	Cannot answer
R2. The examiner points to his elbow and asks, What do we call this?			
R3. What is a hammer usually used for? (Answer: nailing or similar)			
R4. Where is the market/shop near you?			

R5. What day of the week is today?			
R6. What season is it?			
R7. Please point to the window and then to the door.			
R8. Can you please say the three words I told you before?			
Boat			
House			
Fish			

J Modified Rankin Scale (mRS)

J0_a. Which is your dominant hand?

☐Left hand ☐Right hand

J0_b. Which side of your limb was affected by the stroke?

☐ left ☐ right ☐ bilateral ☐ no effect

J1. patient's condition (single choice)

☐ No symptoms at all

☐ Despite symptoms, no significant dysfunction, able to perform all daily tasks and activities of life

☐ Mildly disabled, unable to perform all activities prior to illness, but able to care for themselves in daily life without assistance

☐ Moderate disability, need partial help, but can walk independently

☐ Severe disability, unable to walk independently and unable to meet the needs of daily living without help

☐ Severe disability, continuously bedridden, incontinent, requiring constant care and attention, and totally dependent on others for daily living.

K European Five-Dimensional Health Scale (EQ-5D)

First, I am going to read out some questions. Each question has five alternative answers. Please tell me which answer best describes your health today. Choose only one answer for each set of questions.

(Note to interviewer: it may be necessary to remind the respondent frequently that the time period is today. It may also be necessary to repeat the questions verbatim)

K1. first of all, I would like to ask you questions about mobility. you would say: you have no difficulty moving around

☐ No difficulty getting around at all ☐ A little difficulty getting around ☐ Moderate difficulty getting around

☐ Severe difficulty getting around ☐ Unable to get around

K2. Next, I would like to ask you about taking care of yourself. You will say that you

☐ have no difficulty bathing or dressing yourself ☐ have a little difficulty bathing or dressing yourself

☐ have moderate difficulty bathing or dressing yourself ☐ have severe difficulty bathing or dressing yourself

☐ Unable to bathe or dress himself/herself

K3. Next, I would like to ask you questions about your daily activities, such as working, doing housework, studying, family or leisure activities. You will say that you

☐ have no difficulty carrying out daily activities

☐ have a little difficulty performing daily activities

☐ Moderate difficulty performing daily activities

☐ Severe difficulty performing daily activities

☐ Unable to perform daily activities

K4. Next, I would like to ask you about pain or discomfort and you would say that you

☐ have no pain or discomfort

☐ have a little pain or discomfort

☐ have moderate pain or discomfort

☐ have severe pain or discomfort

☐ have very severe pain or discomfort

K5. Finally, I would like to ask you about anxiety and depression. Anxiety means things like nervousness, worry, restlessness, etc. Depression means things like lack of interest in doing things, lack of fun, lack of energy, etc. Would you say that you

☐ are not anxious or depressed

☐ have a little anxiety or depression

☐ have moderate anxiety or depression

☐ have severe anxiety or depression

☐ has very severe anxiety or depression

K6. Next, I would like you to tell me how good or bad your health is today. (Show the patient the scale.) At the top of the scale is a score of 100, which represents the best health condition you have in mind; at the bottom of the scale is a score of 0, which represents the worst health condition you have in mind. Now, I would like you to tell me how many points you would like to rate your health today on this scale. (Please have the patient point out the location.) Record the value corresponding to the marked location _____

F2 Second blood pressure measurement

The following points should be done during the measurement:

1. Place both feet on the ground

2. Measure with the right arm

3. The upper arm and sphygmomanometer are at the same level as the heart.

4. The center of the capsule should be exactly at the brachial artery.

5. A cuff is provided as standard

Please fill in the measurement results on the patient's numbered slip of paper.

F2a Please fill in the systolic blood pressure (high pressure) value of the second blood pressure measurement _____ mmHg

F2b Please fill in the diastolic blood pressure (low pressure) value of the second blood pressure measurement _____ mmHg.

RM Drug Profile

RM1. How many medications are taken (more than 3 days in a week)?

0 (skip to M) 1 2 3 4 5 6 7 8 9 10 and more than 10

RM4. Benefits of taking medication outweigh the disadvantages

☐Strongly disagree ☐Slightly disagree ☐Neutral ☐Slightly agree ☐Strongly agree

RM2. Taking my medication every day makes me feel better

☐Strongly disagree ☐Slightly disagree ☐Neutral ☐Slightly agree ☐Strongly agree

RM3. if I take my medication every day, I am confident that I can control my blood pressure

☐Strongly disagree ☐Slightly disagree ☐Neutral ☐Slightly agree ☐Strongly agree

RM5. I think taking my daily medication could help improve my blood pressure

☐strongly disagree ☐slightly disagree ☐neutral ☐slightly agree ☐strongly agree

M Drug use 1_aspirin

M1. Are you taking antiplatelet (aspirin) medication? (Counting those who were prescribed by the village doctor but stopped taking the medication on their own without following the doctor's instructions) ☐Yes ☐No (skip to N)

M2. drug class (ask as thoroughly as possible and check all appropriate boxes)

☐ Aspirin ☐ Bay aspirin ☐ Clopidogrel ☐ Dipyridamole ☐ Cilostazol ☐ Ozagrel

☐ Other (please specify) _____

For this type of medicine:

M3a. when did you start taking this medication? ☐ within 6 months ☐ within 6 months to 1 year

☐ 1-3 years ☐ over 3 years

M3b. How many months in the past year have you been taking this medication? _____ months

(a month of consistently taking the medication for 25 days or more counts)

M4. How many days in total have you taken this medication in the past 2 weeks? _____ days

M5. Have you taken this medicine today? ☐yes ☐no

M6. Do you sometimes forget to take this medicine? M6. Do you sometimes forget to take this medicine?

M7. Do you ever take this medicine without paying attention? ☐Yes ☐No

M8. do you sometimes stop taking this medicine when you feel your symptoms are getting better? ☐ Yes ☐ No

M9. have you reduced or stopped taking this medicine on your own (without informing your doctor) because you felt worse after taking it?

☐ Yes ☐ No

M10. Reasons for not taking this medicine every day as required (ask as fully as possible and tick the most appropriate one or two) ☐ The medicine is too expensive ☐ I forget to take it ☐ It doesn't work ☐ There are side effects ☐ I am worried about side effects ☐ I don't feel I need to take it every day, I can stop when my symptoms improve ☐ I think I take too much medicine in a day ☐ I am taking other medicines ☐ I have run out of my medicines (lack of medicines) ☐ I don't want to take my medicines ☐ Other Reason (please specify) _____

N Medication use 2_Lipid-lowering medications

N1. Are you taking lipid-lowering statins? (counting those who were prescribed by the village doctor but stopped taking them on their own without following the doctor's instructions) ☐Yes ☐No (skip to O)

N2. drug class (ask as thoroughly as possible and check all appropriate boxes)

☐ Simvastatin ☐ Atorvastatin ☐ Pravastatin ☐ Rosuvastatin

☐ Other (please specify) _____

For this type of medicine:

N3a. when did you start taking this medicine? ☐ within 6 months ☐ within 6 months to 1 year ☐ 1-3 years ☐ more than 3 years

N3b. How many months in the past year have you been taking this medication? ____ months (a month of consistently taking the medication for 25 days or more counts)

N4. How many days in total did you take the lipid-lowering medication in the past 2 weeks? _____ days

N5. Have you taken the drug today? ☐ Yes ☐ No

N6. Do you sometimes forget to take this medicine? N6. Do you sometimes forget to take this medicine? ☐Yes ☐No

N7. Do you ever take this medicine without paying attention? ☐Yes ☐No

N8. do you sometimes stop taking this medicine when you feel your symptoms are getting better? ☐ Yes ☐ No

N9. have you reduced or stopped taking this medicine on your own (without informing your doctor) because you felt worse after taking it?

☐ Yes ☐ No

N10. Reasons for not taking this medicine every day as required (ask as fully as possible and tick the most appropriate one or two) ☐ The medicine is too expensive ☐ I forget to take it ☐ It doesn't work ☐ There are side effects ☐ I am worried about side effects ☐ I don't feel I need to take it every day, I can stop it when my symptoms improve ☐ I think I take too much medicine in a day ☐ I am on other medicines ☐ I am running out of my medication (short of medication) ☐ I don't want to take my medication ☐ Other Reason (please specify) _____

O Drug Use 3_Antihypertensive Drugs

Are you taking antihypertensive drugs? (Counting those who were prescribed by the village doctor but stopped taking them on their own without following the doctor's instructions)

☐Yes ☐No (skip to P)

O2. Please select a class of antihypertensive medication (ask as thoroughly as possible and check all appropriate boxes)

☐ nifedipine ☐ nifedipine extended-release tablets ☐ nifedipine ☐ amlodipine ☐ enalapril

☐ Captopril ☐ Hydrochlorothiazide ☐ Indapamide ☐ Compound Risperdal Tablets

☐Lacidipine ☐Felodipine extended-release tablets ☐Levamlodipine ☐Benazepril

☐ Fosinopril ☐ Lenopril ☐ Chlorosartan ☐ Timosartan ☐ Irbesartan

☐Valsartan ☐Atenolol ☐Metoprolol ☐Bisoprolol

☐ Diprazole hydrochlorothiazide capsules ☐Propranolol hydrochloride tablets ☐Blood pressure zero

☐ Other _____

For this class of medications.

O3a. When did you start taking this medication? Choose: ☐ within 6 months ☐ within 6 months to 1 year, ☐ 1-3 years, ☐ over 3 years

O3b.How many months in the past year have you been taking this medication? _____ months (a month is not counted until the medication has been taken consistently for 25 days or more)

O4. How many days in total did you take your antihypertensive medication in the past two weeks? _____ days

O5. Have you taken this medication today? ☐ yes ☐ no

O6. Do you sometimes forget to take this medicine? ☐Yes ☐No

O7. do you ever take this medicine without paying attention? ☐ Yes ☐ No

O8. do you sometimes stop taking this medicine when you feel your symptoms are getting better? ☐ Yes ☐ No

O9. have you reduced or stopped taking this medicine on your own (without informing your doctor) because you felt worse after taking it?

☐ Yes ☐ No

O10.Reasons for not taking this medication every day as required (ask as thoroughly as possible and tick the most appropriate one or two) ☐ The medication is too expensive ☐ I forget to take it ☐ It doesn't work ☐ It has side effects ☐ I am worried about side effects ☐ I don't feel I need to take it every day, I can stop when my symptoms improve ☐ I think I take too much medication in a day ☐ I am taking other medication ☐ I am running out of my medication (running out of medication) ☐ My blood pressure is too low ☐ I don't want to take my medication ☐ Other reasons (please specify) _____

P Medication Use 4_Glucose-Lowering Medications

P1. Are you taking hypoglycemic drugs or injecting insulin? (Those who have been prescribed by the village doctor but stopped taking the medication on their own without following the doctor's instructions are considered to be taking medication) ☐Yes ☐No (skip to the third blood pressure measurement)

P2. Please select a hypoglycemic drug class (ask as thoroughly as possible and check all appropriate boxes)

☐ insulin ☐ glibenclamide ☐ gliclazide

☐ Metformin ☐ Acarbose

☐ Glargine and others ☐ Thirst pills

☐ Others _____

For this type of medicine:

P3a. when did you start taking this medicine? Choose: ☐ within 6 months ☐ within 6 months to 1 year, ☐ 1-3 years, ☐ over 3 years

P3b.How many months have you been taking this medication in the past year? _____ months (a month counts only if the medication is taken consistently for 25 days or more)

P4. How many days in total did you take your hypoglycemic medication in the past two weeks? _____ days

P5. Have you taken the drug today? ☐ yes ☐ no

P6. Do you sometimes forget to take this medicine? ☐Yes ☐No

P7. Do you ever take this medicine without paying attention? ☐ Yes ☐ No

P8. do you sometimes stop taking this medicine when you feel your symptoms are getting better? ☐ Yes ☐ No

P9. have you reduced or stopped taking this medicine on your own (without informing your doctor) because you felt worse after taking it?

☐ Yes ☐ No

P10. Reasons for not taking this medicine every day as required (ask as fully as possible and tick the most appropriate one or two) ☐ The medicine is too expensive ☐ I forget to take it ☐ It doesn't work ☐ There are side effects ☐ I am worried about side effects ☐ I don't think I need to take it every day, I can stop when my symptoms improve ☐ I think I take too many pills in a day ☐ I have other medicines that I'm on ☐ I'm out of my medication (running out of pills) ☐ My

blood pressure is too low ☐ I don't want to take my medication ☐ Other reason (please specify)

_____

F3 Third blood pressure measurement

If there is a difference of 10 mmHg between the two blood pressure values, please take the third blood pressure measurement and fill in the third blood pressure measurement:.

Sa Please fill in the systolic blood pressure (high pressure) value of the third blood pressure measurement _____ mmHg

Sb Please fill in the diastolic blood pressure (low pressure) value of the third blood pressure measurement at _____ mmHg.

L PHQ-2, PHQ-9

In the past 2 weeks, how often have you been bothered by the following problems?

	Almost every day	More than half the time	Some days	Not at all
No interest or pleasure in doing things				
Poor mood, depressed or hopeless in life				

L2. If the sum of the scores of the last two questions is greater than or equal to 3, complete the following 7 questions. If the sum of the scores on the last two questions is less than 3, skip.

	Almost every day	More than half the time	Some days	Not at all
Difficulty falling asleep or waking up easily or sleeping too much				
Feeling tired or having no energy				
Have a poor appetite or eat too much				
Feeling bad about yourself, or being a failure, or letting yourself or your family down				
Difficulty concentrating				

on things, such as reading the newspaper or watching TV				
Moving or talking so slowly that others can see it; or conversely, becoming more irritable or fidgety than usual and walking around				
Having thoughts that it is better to live than to die, or to hurt yourself in some way				

V. Investigator's summary of the interview

V1. Do you think the patient clearly understood the interview questions

☐ not at all ☐ no understanding ☐ basic understanding ☐ understanding ☐ very good understanding

V1a. Can the elderly person interviewed hear the questions you are asking?

☐ Yes, does not need a hearing aid ☐ Yes, needs a hearing aid ☐ Partially, needs a hearing aid ☐ No

V2. Do you think the patient was resistant to the interview?

☐ Not at all resistant ☐ Not resistant ☐ Mostly cooperative ☐ More resistant ☐ Very resistant

V3. Do you think the patient answered the questions truthfully?

☐ Not at all truthful ☐ Quite untruthful ☐ Basically truthful ☐ Quite truthful ☐ Completely truthful

V4. How many of the above questions were answered by the patients themselves rather than with the help of family members?

☐ All answered by the patient himself/herself ☐ 25% answered by family members ☐ 50% answered by family members ☐ 75% answered by family members ☐ 100% answered by family members

☐Other: _____

V5. Please ask the investigators to fill in their own initials _____

Thank you, patient information has been submitted successfully!

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