



Medication adherence and associated factors among hypertensive patients attending medical clinics at Teaching Hospital Jaffna

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Abstract

Hypertension is a major global public health challenge, with an increasing prevalence in developing countries such as Sri Lanka. Uncontrolled hypertension affects multiple body systems and leads to serious complications. Medication adherence plays a crucial role in achieving optimal blood pressure control, preventing complications, and improving clinical outcomes. Identifying factors associated with medication adherence is essential for developing effective strategies to improve adherence. This study aimed to assess medication adherence and its associated factors among hypertensive patients attending medical clinics at Teaching Hospital Jaffna. A descriptive cross-sectional study was conducted among 224 hypertensive patients attending the medical clinic at Teaching Hospital Jaffna in November 2022. Data were collected using a pretested interviewer-administered questionnaire to assess socio-demographic characteristics and medication adherence, while treatment-related factors were obtained using a data extraction sheet. Medication adherence was assessed using the Morisky Medication Adherence Scale-8 (MMAS-8) and categorized into good and poor adherence. Associations between adherence and selected factors were analyzed using the Chi-square test. All 224 selected participants were interviewed, yielding a response rate of 100%. The majority were male (64.7%), and the mean age was 64.5 years (SD = 9.6). Good medication adherence was observed in 46.4% of participants, while 53.6% had poor adherence. The mean MMAS-8 score was 5.9 out of 8. Medication adherence showed a significant association with marital status ($p = 0.03$), frequency of alcohol consumption ($p = 0.02$), state of hypertension control ($p = 0.02$), and number of clinic visits during the previous three months ($p = 0.04$). A negative association was identified between adherence and frequency of alcohol drinking (OR = 0.21). Forgetfulness was the most commonly reported reason for poor adherence. In conclusion, less than half of the hypertensive patients demonstrated good medication adherence. Several socio-demographic and clinical factors influenced adherence, highlighting the need for targeted interventions to improve medication-taking behavior among hypertensive patients.

Keywords: Hypertension, medication adherence, socio-demographic factors, treatment related factors, Jaffna

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Introduction

Blood pressure, according to the World Health Organization (WHO) is the force exerted by the blood against the walls of the blood vessels as it flows through them. Two numbers are used to represent blood pressure. When the heart contracts or beats, the first number (systolic) refers to the pressure in blood vessels. The second number (diastolic) relates to the pressure in the vessels while the heart is not beating. A systolic blood pressure measurement on two different days that are greater than 140 mmHg or diastolic blood pressure readings that is higher than 90 mmHg on both days was considered hypertension (WHO Fact sheet, 2021).

According to the World Health Statistics Report in 2021, the prevalence of hypertension in adults was 22.1 percent, with men and women accounting for 24.1 percent and 20.1 percent respectively (World Health Statistics, 2021). According to the Ministry of Health, Prevention and Control of Non Communicable Diseases in Sri Lanka (2018), hypertension affects 26.1 percent of adults aged 18 to 69 years old (25.4 percent of males and 26.7 percent of females) (Prevention and Control of Non Communicable Diseases, 2018). According to a survey, 17 percent of the overall population in Jaffna district (20 percent males and 15 percent females) are hypertensive. (Mayurathan et al., 2017).

Left ventricular hypertrophy, heart failure, stroke, transient ischemic attack, dementia, kidney failure, atherosclerosis leading to myocardial infarction and retinopathy can all result from uncontrolled hypertension (Anoop Kumar et al., 2018). As a result, hypertension therapy is critical. Hypertension is treated with a combination of lifestyle changes and medication. Reduction of salt intake, a balanced diet, moderate alcohol intake, weight management, smoking cessation, regular physical activity, and stress reduction are examples of lifestyle changes. Pharmacological management of hypertension is crucial after lifestyle changes. According to current data from over 100 countries, several countries have adherence issues with people using antihypertensive medicine. As a result, antihypertensive medication adherence should be improved, as inadequate adherence to treatment leads to increased blood pressure and resulting health complications (Unger et al., 2020).

Adherence to long term therapy, as defined by the World Health Organization (WHO), is the “extent to which a person’s behavior-taking medication, following diet, and /or executing lifestyle changes, corresponds with agreed recommendations from a health care provider”. In this respect, medication adherence might be defined as the degree to which patients take their drugs as prescribed by their doctors (De Oliveira and Santos, 2018). The global adherence rate for chronic diseases has been reported to be 50%. In poor countries, the rate is slightly lower (Yuvaraj et al., 2019). Up to 80% of hypertension patients in South Asia do not take their medicine as prescribed (Win et al., 2021).

According to the WHO (2003), adherence to treatment is affected by a variety of factors across five dimensions including socioeconomic factors, health-care-system-related factors, condition-related factors, therapy-related factors, and patient-related factors. Poor socioeconomic status, poverty, illiteracy, a low level of education, unemployment, a lack of effective social support networks, high transportation cost, unstable living conditions, a long distance from the treatment

center, high medication costs, changing environmental situations, culture, and lay beliefs about illness and treatment are all socioeconomic factors that influence adherence to long-term therapy. Adherence is influenced by sociodemographic factors as well. Poor pharmaceutical delivery systems, insufficient knowledge and training of health care practitioners, overworked health care workers, brief consultations, and a system's lack of capacity to educate patients and provide follow-up are all problems that affect the health care system. Severity of symptoms, level of disability, availability of effective therapies, co-morbidities such as depression, and drug and alcohol misuse are also additional factors that should be considered to influence adherence to hypertensive medications and therapy. Treatment intricacy, medicine taste, side effects, treatment duration, and previous treatment failure are all issues to be considered as influences that affect adherence to therapy. Knowledge, attitudes, perceptions, beliefs, expectations, forgetfulness, demographic characteristics, emotional issues and understanding of hypertension treatment and complications are all elements that affect patients (WHO, 2003).

Methodology

Study setting

This study was conducted in medical clinics of Teaching Hospital Jaffna.

Study design, population and sampling methodology

A hospital based descriptive cross-sectional study was conducted in November 2022. Patients over the age of 18, undergoing antihypertensive drug therapy were included in the study. Patients that were newly diagnosed within 3 months, patients who were unable to give consent due to mental incompetence, and patients with hearing disabilities were excluded. The sample size was calculated according to previous studies using the following formula:

$$n = \frac{Z^2 p(1-p)}{d^2} \quad (1)$$

Here,

n - Sample size of the study

Z - The critical value of specified confidence, usually 95% of confidence level is needed from the study (1.96)

p - Adherence value (15.5%)

d - Acceptable amount of absolute error (5%)

A study was done by (Pirasath et al., 2017) regarding Knowledge, Awareness, and Medication Adherence in Patients with hypertension from a tertiary care centre from Northern Sri Lanka. According to this study finding (Adherence value -15.5%), sample size was calculated using the following formula;

$$n = \frac{(1.96)^2 \times 0.155(1 - 0.155)}{(0.05)^2} \quad (2)$$

n = 201

Nonresponding rate was considered as 10%. Thus, $201 \times \frac{100}{90} = 223.3 = 224$, Thus, actual needed sample size was 224.

The maximum sample size was received for an acceptable amount of absolute error (d) 5% with the prevalence of adherence value (p) taken as 15.5% from a previous study in Sri Lanka. Systematic sampling technique was used to select the participants. About 11,000 patients were attending medical clinics at Teaching Hospital Jaffna per month. Nine sessions were conducted per week in total. Around 300 patients attended one clinic session. The sampling interval was 38. It was calculated by dividing the total number of patients attending a single session ($n=300$) by the number of participants ($n=8$) who planned to collect data on a particular session (8 participants were selected per session).

Data collection and measurements

An interviewer administered questionnaire in suitable language was used to collect the data. The questionnaire contained questions to assess medication adherence and associated factors. It contains three sections: Section A: Socio demographic factors. The variables which were included in the socio demographic factors were age, sex, ethnicity, religion, marital status, level of education, occupation, monthly income, alcohol consumption habit and smoking habit. Section B: Morisky Medication Adherence Scale 8 Questionnaire was used with permission. The questionnaire consists of 8 items. The first 7 items are with "Yes" or "No" choices. Every "No" reply was scored as 1 and every "Yes" reply was scored as 0 except item 5 ("Did you take all your hypertension medicine yesterday?") is the only item where "Yes" indicates adherence (score = 1). This is correctly the reverse of items 1–4 and 6–7. Item 8 has a five point Likert response scale like following: Never/ rarely – 4, Once in a while – 3, Sometimes – 2, Usually – 1, All the time – 0; Then, the score was divided by 4. Finally, the total of all responses was calculated and the final score was given out of 8. Here, the score of 8 reflects high adherence, a score of 7 or 6 reflects medium adherence, a score of < 6 reflects low adherence. However, for analysing associated factors on adherence, patients were divided as poor adherent (score < 6) and good adherent (score 6-8). A cut-off point of < 6 has been proven to distinguish patients with poor blood pressure control with high sensitivity (93%). Section C of the Data Extraction Sheet contained treatment related factors.

The variables which were included in the treatment related factors were, duration of hypertension, number of anti hypertensive tablets per day, frequency of antihypertensive medications per day, state of the hypertensive condition, state of the hypertensive condition assessed based on two hypertension readings. Reading-1 refers to the clinic visit. Reading-2 refers to the previous reading within 2 months. Among those two readings, if even one reading was $\geq 140/90$ mmHg, it was considered as poorly controlled. number of clinic visits in the last three months, Co-morbidities.

Statistical analysis

Data were analyzed by using SPSS 25 (statistical package of social sciences). sociodemographic data, treatment related data and adherence score of the participants were represented in descriptive statistics such as frequency, percentage, mean, standard deviation (SD) and range in graphs and tables. The association between selected factors and medication adherence was analysed with Chi-square test. Odds ratios were calculated from 2*2 contingency table.

Ethical considerations

Ethical clearance was obtained from the Ethical Review Committee, Faculty of Medicine, University of Jaffna, (Approval number- ERC.141.4.2.2/NUR/016 dated 24.11.2022 to carry out the research project. The permission for the pretest was obtained from the Medical Superintendent, Tellippalai Base Hospital. The permission for data collection of the study was obtained from the Director, Teaching Hospital Jaffna. The purpose of this study was explained in detail and the written consent was obtained from all relevant participants.

The patient was informed that they can withdraw any time before or during data collection. If the patient was an illiterate participant, the informed consent form was read to the patients clearly and accurately. Consent of the patient was obtained after verifying that the patient understood the scope and purpose of the study, participant obligations and the rights. The privacy of the patient was ensured during data collection. The participants who felt uncomfortable during the interview were allowed to withdraw from the study. When required, patients were allowed to participate in the interview at an alternative less crowded site.

Results

Distribution of socio demographic characteristics of the study participants

The mean age of the participants were 64.5 ± 9.6 years. Majority of them, 64.7% (n=145) were male. All the participants (100%) were Sri Lankan Tamil. More than four fifth (89.3%; n=200) were Hindus. Majority of the participants (87.1%, n=195) reported as married and had obtained education at Grade 6-11 (62.9%; n=141) as the highest level. Unemployed (51.3%, n=115) were predominant as regards their occupation. Most of the participants (61.2%, n=137) had an income of less than LKR 25,000.00. Almost one fourth (26.3%, n=59) of the participants consumed alcohol. Among them, 18.8% (n=42) preferred arrack and 18.3% (n=41) consumed alcohol less than once a week. Less than one fourth (15.2%, n=34) of the participants had a smoking habit (Table 1).

Distribution of treatment related characteristics of the study participants

Tables 2-4 shows treatment related factors which affect medication adherence. Most of the participants' duration of treatment for hypertension was more than ten years 46.4% (n=104). Most of them 72.8% (n=163) took tablets two times per day for hypertension. Most of them 62.1% (n=139) visited the clinic less than two times in the last three months. Most of them 91.1% (n=204) had co morbidities. The most common other chronic disease was Diabetes Mellitus (55.8%). Other than diabetes mellitus they had Dyslipidemia (43.8%), Heart disease (25%) and Thyroid disease (8%) as predominant chronic diseases. About half 52.7% (n=118) of the participants were in a poorly controlled state of hypertension. Almost one third 34.8% (n=78) of participants used 2-4 tablets and more than four tablets at the same level.

Table 1: Distribution of socio demographic characteristics of the study participants (n=224)

Socio demographic variables	Category	Frequency (n)	Percentage (%)
Age (Years)	30-50	17	7.6
	51-70	144	64.3
	>70	63	28.1
Sex	Male	145	64.7
	Female	79	35.3
Ethnicity	Sri Lankan Tamil	224	100
Religion	Hinduism	200	89.3
	Christianism	22	9.8
	Islam	2	0.9
Marital status	Single	5	2.2
	Married	195	87.1
	Widowed	22	9.8
	Divorced	2	0.9
Highest level of education	No Schooling	18	8.0
	Grade 1-5	34	15.2
	Grade 6-11	141	62.9
	Advanced Level	23	10.3
	Diploma and above	8	3.6
Occupation	Employed	75	33.5
	Un employed	115	51.3
	Retired	34	15.2
Household monthly income in LKR	<25,000	137	61.2
	25,000-45,000	73	32.6
	>45,000	14	6.3
Alcohol consumption	No	165	73.7
	Yes	59	26.3
Type of alcohol	Toddy	17	7.6
	Arrack	42	18.8
Frequency of drinking alcohol	Days per week	18	8.0
	Less than weekly	41	18.3
Smoking habit	No	190	84.8
	Yes	34	15.2
Pack years	≤10	25	11.2
	>10	9	4.0

The percentages for "Type of alcohol" (Toddy: 7.6%, Arrack: 18.8%) and "Frequency of drinking" (Days per week: 8.0%, Less than weekly: 18.3%) were calculated based on the total sample (n=224), not from the subgroup of alcohol drinkers (n=59).

Table 2: Distribution of treatment related characteristics of the study participants (n=224)

Treatment related variables	Category	Frequency(n)	Percentage (%)
Duration (Years)	<5	39	17.4
	5-10	81	36.2
	>10	104	46.4

Treatment related variables	Category	Frequency(n)	Percentage (%)
Number of antihypertensive tablets per day	<2	68	30.4
	2-4	78	34.8
	>4	78	34.8
Frequency of taking medication daily.	1	45	20.1
	2	163	72.8
	3	16	7.1
State of the hypertensive condition	Controlled	106	47.3
	Poorly controlled	118	52.7
Number of clinic visit at last three months	<2	139	62.1
	≥2	85	37.9
Presence of Co-morbidities	Yes	204	91.1
	No	20	8.9
Type of Co-morbidities	Diabetes Mellitus	125	55.8
	Dyslipidemia	98	43.8
	Heart disease	56	25.0
	Thyroid disease	18	8.0
	Neurological disease	10	4.5
	Renal disease	20	8.9
	PUD	9	4.0
	Respiratory disease	35	15.6
	Liver disease	12	5.4
	Anemia	3	1.3
	Stroke	5	2.2

Table 3: Responses of participants for Morisky Medication Adherence Scale-8 Questionnaire (n=224)

Statements	Responses	Frequency (n)	Percentage (%)
Forget to take medications	Yes	127	56.7
	No	97	43.3
Other reasons to avoid or miss the medications	Yes	94	42.0
	No	130	58.0
Stopped the medications without telling doctor	Yes	28	12.5
	No	196	87.5
Forget to bring medications on travelling or leaving the home	Yes	55	24.6
	No	169	75.4
Took all medications yesterday	Yes	187	83.5
	No	37	16.5
Stopped the medications when the feeling of health is under control	Yes	35	15.6
	No	189	84.4
Feeling inconvenience to the treatment plan	Yes	58	25.9
	No	166	74.1

Statements	Responses	Frequency (n)	Percentage (%)
Difficulty in remembering to take all medications			
Never/rarely		64	28.6
Once in a while		89	39.7
Some times		59	26.3
Usually		10	4.5
All the time		2	0.9

Level of adherence to antihypertensive medications by the Participants

The Morisky Medication Adherence Scale-8 (MMAS-8) was used to assess the level of adherence. In this study, the level of good adherence to antihypertensive medications was 46.4%. Figure-1 illustrates the prevalence. Most of the participants 56.7% (n=127) forget to take their medication, only 12.5% (n=28) of participants defaulted treatment without physician's advice and only 25.9% (n=58) of participants felt inconvenience for sticking to the treatment plan. Nearly one fourth of participants 24.6% (n=55) missed the medication when they travel or leave the home. Most of the participants 83.5% (n=187) took their medication on the previous day of data collection. About two fifths of participants 39.7% (n=89) forget to take it once in a while.

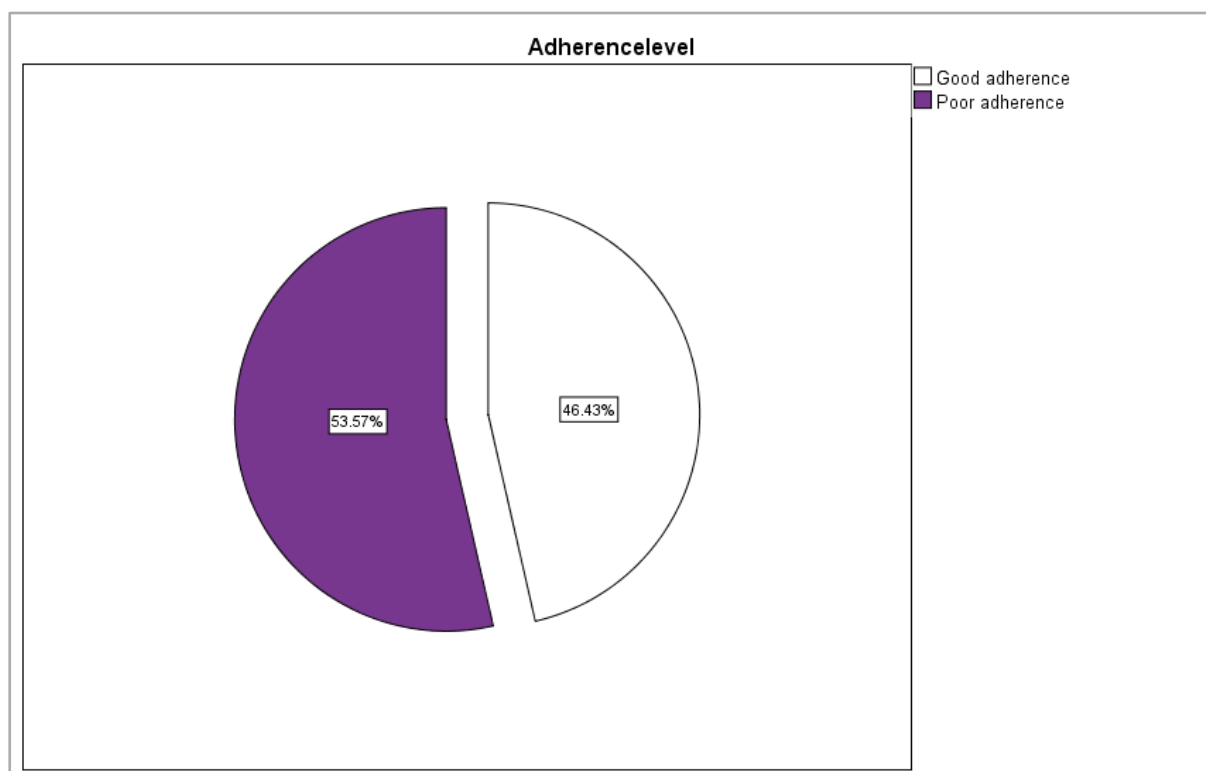


Figure 1. Medication adherence level (prevalence) of the participants to hypertensive medications

Table 4: Association of selected socio demographic factors with adherence of antihypertensive medications (n=224)

Socio demographic variables	Category	Adherence Level		Statistics	
		Good n (%)	Poor n (%)	χ^2	p-value/OR
Age	30-50	11(64.7%)	6(35.3%)	2.479	0.289
	51-70	65(45.1%)	79(54.9%)		
	>70	28(44.4%)	35(55.6%)		
Gender	Male	63(43.4%)	82(56.6%)	1.468	0.226
	Female	41(51.9%)	38(48.1%)		
Ethnicity	Sri Lankan Tamil	constant			
Religion	Hinduism	97(48.5%)	103(51.5%)	3.22	0.073
	Others	7(29.2%)	17(70.8%)		
Marital status	Single	3(60.0%)	2(40.0%)	7.307	0.026*
	Married	96(49.2%)	99(50.8%)		
	Others	5(20.8%)	19(79.2%)		
Highest level of education	No Schooling	5(27.8%)	13(72.2%)	3.412	0.182
	Grade 1-11	82(46.9%)	93(53.1%)		
	A/Level and above	17(54.8%)	14(45.2%)		
Occupation	Employed	37(49.3%)	38(50.7%)	5.380	0.068
	Un employed	46(40.0%)	69(60.0%)		
	Retired	21(61.8%)	13(38.2%)		
Household monthly income in LKR	<25,000	61(44.5%)	76(55.5%)	0.516	0.773
	25,000-45,000	36(49.3%)	37(50.7%)		
	>45,000	7(50.0%)	7(50.0%)		
Alcohol consumption	No	81(49.1%)	84(50.9%)	1.785	0.182
	Yes	23(39.0%)	36(61.0%)		
Frequency of drinking alcohol	Days per week	3(16.7%)	15(83.3%)	5.423	0.020* (OR=0.210;95%-CI)
	Less than weekly	20(48.8%)	21(51.2%)		
Smoking habit	No	92(48.4%)	98(51.6%)	1.998	0.158
	Yes	12(35.3%)	22(64.7%)		

* χ^2 -chi-square test. *Significant at the p value <0.05, CI- Confidence Interval**Table 5:** Association of selected treatment related factors with adherence of hypertensive medications (n=224)

Treatment related variables	Category	Adherence Level		Statistics	
		Good n (%)	Poor n (%)	χ^2	p-value/OR
Duration (Years)	<5	16(41.0%)	23(59.0%)	1.093	0.579
	5-10	41(50.6%)	40(49.4%)		
	>10	47(45.2%)	57(54.8%)		
Number of antihypertensive tablets per day	<2	30(44.1%)	38(55.9%)	1.137	0.566
	2-4	34(43.6%)	44(56.4%)		
	>4	40(51.3%)	38(48.7%)		

Treatment related variables	Category	Adherence Level		Statistics	
		Good	Poor	χ^2	p-value/OR
		n (%)	n (%)		
Frequency of taking medication daily	1	20(44.4%)	25(55.6%)	1.802	0.406
	2	74(45.4%)	89(54.6%)		
	3	10(62.5%)	6(37.5%)		
State of the hypertensive condition	Controlled	58(54.7%)	48(45.3%)	5.558	0.018* (OR=1; 95%-CI)
	Poorly controlled	46(39.0%)	72(61.0%)		
Number of clinic visit at last three months	<2	57(41.0%)	82(59.0%)	4.329	0.037* (OR=0.562;95%-CI)
	≥2	47(55.3%)	38(44.7%)		
Presence of Co-morbidities	Yes	95(46.6%)	109(53.4%)	0.018	0.893
	No	9(45.0%)	11(55.0%)		

* χ^2 -chi-square test. *Significant at the p value <0.05, CI-Confidence Interval

Factors associated with adherence to antihypertensive medications

The Chi square test revealed that marital status, frequency of drinking alcohol, state of the hypertensive condition and the number of clinic visits at least three months were significantly associated with adherence to antihypertensive medications and the results are summarized in Tables 4 and 5.

Marital status other than single and married, alcohol drinking with the frequency of days per week, poorly controlled state of hypertension, patients with the clinic visits of less than two times were the categories associated with poor adherence while single respondents for marital status were associated with good adherence. Negative association was noted with the frequency of alcohol drinking (OR=0.210).

Discussion

Medication adherence of antihypertensive drugs is important to improve clinical outcome. It contributes to control blood pressure and prevention of complication. In many developing countries, maintaining adherence to antihypertensive medications remained most important challenge.

In this study medication adherence was found to be 46.4%. This findings were relatively similar with other studies done at Palestine (46.8%), Riyadh (45.0%) (Al-ramahi, 2014), (Shaik et al., 2016) whereas these findings were more prominent in studies done in Northwest Ethiopia (67.2%) (Mekonnen et al., 2017). Mangalore, South India (54.4%) (Nithin Kumar *et al.*, 2014) and lower in Kancheepuram, India (25.1%) (Vignesh et al., 2017)., Southwest Ethiopia (38.2%) (Asgedom et al., 2018).

While compared to association between medication adherence and socio demographic factors marital status (p=0.03) and frequency of alcohol intake (p=0.02) had statistically significant indicated the poor adherence. In case of marital status, the finding is inconsistent when compare with the studies which were used in literature review. However, a study from Ghana conducted

by Laryea and a study conducted in Nigeria by Okoro & Ngong (2012) as well as another study from Duke University in Durham had shown similar results. In this study, other than single marital status had the worse adherence compared to single and divorced patients. This seems to indicate the competing needs at home such as care for child or elders and professional jobs. Widowed life might give self -denial state and leads to lack of interest on health and life. Inadequate financial support from the spouse could also be a reason for poor adherence level (Laryea, 2013).

Socio demographic findings which include age, sex, education status, occupation, household monthly income in LKR, alcohol consumption and smoking habit have not shown significant association in this study. Similarly, the same trend was observed in the study which was conducted in Mangalore, South India. However, frequency of alcohol consumption habit has significant association with medication adherence in this study ($p=0.02$) (Nithin Kumar et al., 2014).

While compared to association between medication adherence and treatment related factors, state of the hypertensive condition ($p=0.02$) and number of clinic visits ($p=0.04$) had significant association with medication adherence in this study. The finding of state of the hypertensive condition agreed with the finding of the study done in Riyadh (Shaik et al., 2016) whilst disagreed with the study which was done in Northwest Ethiopia (Mekonnen et al., 2017). In this study, participants with two or more than two times clinic visits at last three months had good adherence (55.3%) than who visited less than two times. More clinic visits provide good opportunity to health care providers to reinforce the importance of medication adherence (Zuo et al., 2019). In this study, other treatment related characteristics which include duration of hypertension, number of antihypertensive tablets per day, frequency and co morbidities were not associated with medication adherence. Duration of hypertension had no significant association with medication adherence in some studies which were conducted in Kancheepuram, India (Vignesh et al., 2017) and Palestine (Al-ramahi, 2014). Co morbidities also had no significant association with medication adherence in a study conducted in Southwest Ethiopia (Asgedom et al., 2018). A possible reason could be the positive influence of factors which include health care system related factors, patient related factors and condition related factors.

However, some studies reflected inconsistencies with the findings of this study. A significant association was documented between number of antihypertensive tablets per day and medication adherence in the studies conducted in Mangalore-South India (Nithin kumar et al., 2014), Palestine (Al-ramahi, 2014) and Southwest Ethiopia (Asgedom, Atey and Desse, 2018). Comorbidities had association with the medication adherence in the studies conducted in Northwest Ethiopia (Mekonnen et al., 2017) and Palestine (Al-ramahi, 2014). However, this study suffers from the limitation of testing fourteen variables simultaneously against adherence using chi-square at $\alpha=0.05$ without correcting for multiple comparisons.

Conclusions

The level of adherence to antihypertensive medications based on the study findings was 46.4%. Forgetfulness was the predominant reason for poor adherence. Identified factors which affected adherence levels were marital status, frequency of alcohol consumption, the state of the

hypertensive condition, and the number of clinic visits. According to the findings of this study, other sociodemographic, treatment related characteristics did not significantly influence medication adherence. More medication adherence enhancing strategies should focus on groups with the risk of poor adherence such as, patients with undefined marital status (other than single or married), patients who consume alcohol on several days per week, patients who had less than two clinic visits in the three months preceding the study as well as patients with poorly controlled state of hypertension.

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Conflict of interest statement:

The authors declare no conflict of interest.

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