Medication Adherence and Associated Factors among Adult Patients with Hypertension Attending Two County Referral Hospitals in Kenya

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Abstract

BACKGROUND

Inadequately controlled hypertension increases risks of morbidity and mortality associated with damage to cardiovascular, cerebrovascular or renal systems. Sub-optimal adherence to antihypertensive medications significantly contributes to inadequate hypertension control rates among the majority of the patients. This study assessed medication adherence (MA) and associated factors among adults with hypertension attending two county referral hospitals in Kenya.

METHODOLOGY

This was an analytical cross-sectional study that was part of a larger experimental study. A total of 328 adults with hypertension were recruited using simple random sampling. The Hill-Bone Medication Adherence Scale (HB-MAS) was used to measure antihypertensive MA while a researcher-developed questionnaire captured demographic and health-related data. Anthropometric variables were gathered using standard tools and standard procedures. The obtained data were analyzed using R software (v 4.1.2). Multiple linear regression analysis was done to identify determinants of adherence to antihypertensive medications. For all analyses, the level of statistical significance was set at $P < 0.05$.

RESULTS

The participants attained a mean score of 33 with a minimum and maximum score of 27 and 36 respectively. The predictors of better MA included younger age (p=0.02), higher knowledge of medications (p=0.03), improved communication with doctors and other healthcare workers (p< 0.001), positive self-rating of BP status (p< 0.001) and lower BMI (p=0.01). Most participants considered forgetfulness (80.5%) and running out of medications (76.5%) the most significant factors in decreasing MA.

CONCLUSION

The level of MA was above average. The predictors of better MA included younger age, knowledge of medications, the individual perception that their BP status was better compared to the previous year, and having active and regular communication with doctors and other healthcare providers to address issues related to their disease and other personal problems.

Keywords: *Hypertension, Control, Medication Adherence, Predictors*

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Introduction

Cardiovascular disease (CVD) is the current leading cause of global morbidity and mortality. In 2021, approximately one-third of all global deaths were attributed to a cardiovascular condition with hypertension being the leading modifiable risk factor for global CVD mortality accounting for approximately 10.8 million deaths (1). Among the CVD deaths caused by modifiable risk factors, approximately 40% are

attributable to hypertension. Countries in sub-Saharan Africa (SSA) including Kenya, continue to be the leading drivers of global morbidity and mortality attributable to CVD (2). In 2015, a national survey on non-communicable diseases (NCDs) in Kenya indicated that 25.1% and 22.6% of men and women respectively had raised blood pressure (BP) [systolic BP (SBP) ≥ 140 mmHg or diastolic BP (DBP) ≥ 90 mmHg] (3). During the study period, the majority of the Kenyan population with raised BP were unaware and untreated. The few patients who were on antihypertensive medications were uncontrolled (3).

The morbidity and mortality attributed to hypertension are mainly related to poorly controlled or uncontrolled BP. Antihypertensive medications play a crucial role in controlling BP and lowering the risk of associated complications. Effective lowering of BP using targeted pharmacotherapy is an essential strategy known to slow the progression of target organ damage among patients living with hypertension (4, 5). Moreover, clinical trials have shown that intensification of BP control reduces cardiovascular events compared to the standard BP control in older adult populations (6). However, the effectiveness of the antihypertensive medications is highly dependent on patient adherence to the prescribed regimen.

Medication adherence (MA), as defined in the World Health Organization Health Report of 2003 (7), refers to the extent to which a person's behaviour of taking medications corresponds with the agreed recommendation from a healthcare provider. Adherence to the instructions requires the patient to take the correct dosage at the right time and for the recommended duration. Medications only work among patients who take them. Medication adherence is an important factor in the effectiveness of evidence-based therapies, and therefore, a key enabler of optimal health outcomes. During the management of hypertension, optimal levels of MA enhance the achievement of controlled BP that prevents or minimizes damage to target organs, preserving their functions and thus reducing the risks of complications (8).

Medication adherence guides the healthcare providers in making informed decisions during the course of care including adjusting dosages or trying different medications, tailoring the treatment plan to individual needs and responses (9). Consistent medication use prevents sudden and severe rises in BP that can increase risks of hypertensive emergencies, hospitalizations and escalation of healthcare costs (10). MA reduces the need for costly emergency care, admissions, and costs associated with treatments for complications associated with non-adherence.

Medication adherence is known to prevent or slow disease progression consequently reducing costs associated with long-term healthcare. For chronic diseases like hypertension, sustained adherence to medications helps achieve controlled BP thus preserving the patients' cardiovascular health leading to improved quality of life and longevity (11). Among patients with chronic conditions, adherence to prescribed medications promotes trust and communication with healthcare providers. Improved communication with healthcare providers enhances overall patient safety as disease-related concerns are shared promptly and acted upon, decreasing the modifiable risks that may contribute to the worsening of their health condition (12).

Multiple challenges can impede patients from adhering to their prescribed medication regimens. Studies have documented a lack of symptoms and limited health literacy as frequent contributors to nonadherence (13). Hypertension is often asymptomatic and the affected population may lack noticeable changes when their BP rises. This lack of noticeable symptoms may lead to comfort that reduces motivation to adhere to prescribed medications. Patients with limited

health literacy may not understand the long-term implications of not taking their medication consistently and hence may be more likely to skip or forget their medications (14). Issues related to the healthcare system, such as inadequate communication between patients and healthcare providers or insufficient follow-up, can also contribute to medication non-adherence (15).

In addition, complex medical regimens, cost of medications, drug side effects and perceived risks have been associated with poor adherence (16). Prescriptions containing multiple medications with different dosing schedules can be confusing to patients and increase the likelihood of missing doses. The financial burden associated with purchasing medications can be overwhelming to some patients' leading them to skip doses or discontinue treatment altogether (17). Moreover, the side effects associated with antihypertensive medications and the fear of long-term effects of medications may discourage patients from taking their medication regularly (17).

Addressing the challenges associated with nonadherence to medications requires a comprehensive and patient-centred approach that includes health education, improving communication and involving patients in shared decision-making about their treatment plans (18). In addition, simplification of medication regimens, addressing cost concerns and maintaining regular follow-up may achieve long-term success in managing hypertension (19). This study assessed medication adherence and associated factors among adult patients with hypertension attending Chuka and Embu County Referral Hospitals in Kenya.

Methodology

Study design and setting

This was an analytical cross-sectional study that was carried out at the baseline level of a larger experimental study done at Chuka and Embu County Referral Hospitals. The experimental and control groups were in Chuka and Embu County Referral Hospitals respectively. The facilities were purposively selected as they serve as referral centres for the Eastern Kenya region where statistics indicate a relatively increasing burden of non-communicable diseases.

Study sample and sample size

This cross-sectional study was nested within a larger experimental study investigating the effect of managing hypertension using the Chronic Care Model on blood pressure control among participants with hypertension at Chuka County Referral Hospital. Participants were recruited from both the intervention and control arms of the trial. The inclusion criteria required participants to have a confirmed diagnosis of hypertension of at least 1 year. Moreover, they needed to complete the baseline assessment and provide complete data on sociodemographic characteristics, physiological and anthropometric parameters, explanatory models on individual general health, lifestyle behaviour, healthcare utilization, and adherence to antihypertensive medications. A total of 328 participants were included, with 166 from the intervention group and 162 from the control group, enabling a comparative analysis of medication adherence and associated factors.

The main aim of the large experimental study was to know the effect of the intervention (i.e., the change in the mean systolic blood pressure (SBP) between baseline and the post-intervention phases). From previous experimental studies, (20,21), the effect size (d), or the mean reduction in the SBP between baseline and post-intervention phases, ranged from 2 mmHg to 10 mmHg with an SD of 12. In this study, the authors set the effect size (d) of 4 mmHg to be clinically significant. The authors also selected the significance level to be at 5% and the power for the study at 80%. The two-tailed unpaired t-test was applied in the sample size calculation.

Using the following quantitative formula (22);

$$\text{Sample size} = \frac{2SD^2(Z_{\alpha/2} + Z_{\beta})^2}{d^2}$$

From the Z table, $Z_{\alpha/2}$ is 1.96 and at the power of 80%, Zβ is 0.84

Therefore;

$$n = \frac{2(12)^2(1.96 + 0.84)^2}{4^2}$$

$$= \frac{288\ (7.84)}{16}$$

$$= 141.12$$

A 20% increment was made to take care of attrition, leading to a total of 169 participants recruited for each group (the experimental and the control groups). Therefore, the total sample size was 338 participants. Simple random sampling was used to select the eligible participants at the two study sites. Eligible participants who were severely sick or pregnant were excluded.

The sample included 166 and 162 participants at Chuka and Embu Referral Hospitals respectively. Data from 10 participants (3 from Chuka and 7 from Embu County Referral Hospitals) were not included in the analysis due to inconsistencies. Data from 328 participants was analysed.

Sampling and data collection procedures

A list of patients attending the hypertension clinic was obtained on each clinic day at the facilities. Using the facility lists, numbers were assigned to each patient and randomly selected using Excel random number generation. Standard tools and procedures captured the anthropometric values including weight, height, and waist and hip circumferences. Individual participants self-rating of their health and explanation of their illness were documented using the adopted patient's Kleinman's Explanatory Model questions (23). The elements of lifestyle behaviour included nature and level of physical activities, alcohol use, tobacco use and/or cigarette smoking. Healthcare utilization questions assessed awareness and duration of hypertension, the individual perception of their current BP status, patient-provider communication and payment of healthcare services. Questions concerning antihypertensive medication knowledge included type, number and schedule. The participants completed the medication adherence scale (HB-MAS) by scoring their medication-taking behaviours on a Likert scale. The 9 questions covered medication-taking behaviours and included frequency of; forgetfulness, decision not to take medications, failure to fill prescriptions, running out of medications, skipping medications, missing medications when feeling better or sick, taking someone's medications and missing medications because of carelessness.

Research instruments

Interviewer-administered questionnaires captured the sociodemographic data, anthropometry, lifestyle behaviour, utilization of healthcare services and antihypertensive medication knowledge. Open-ended questions adopted from the patient Explanatory Model (23) captured information about participants' views concerning their illness. Antihypertensive medication adherence was measured using the Hill-Bone Medication Adherence Scale (HB-MAS). The HB-MAS is a 9-item survey concerning medication adherence. The scale contains nine questions regarding medication adherence using a Likert scale where respondents rate each item on a scale of 1 to 4, with 1 indicating all of the time, 2 -most of the time, 3-some of the time and 4-none of the time. Higher scores indicate better adherence (24). The HB-MAS is valid with a Cronbach's alpha of 0.84 (24).

Pre-testing of research instruments

The content validity of the questionnaire was ascertained by healthcare professionals at the university and at the teaching and referral hospitals. The study tools were pretested at the Meru County Teaching & Referral Hospital (MeTRH). To confirm the internal consistency of

the questionnaires, the interviewer administered 34 questionnaires (10% of the sample size) to patients with hypertension at the MeTRH. The data generated was analysed using a split-half reliability test and Cronbach's alpha value was 0.842.

Data management

Data entry and cleaning were done using Microsoft Excel. Data were imported to R software (v 4.1.2) for statistical analysis. The socio-demographics, anthropometry, lifestyle, and utilization of healthcare services data were summarized using descriptive statistics. Similarly, the patients' explanatory models about hypertension were captured using descriptive statistics. Descriptive statistics were also used for participants' HB-MAS scores. Using the total HB-MAS scores, a multiple linear regression model was used to determine the predictors of antihypertensive medication adherence. Data were presented using percentages, tables, graphs & charts.

Ethical considerations

Chuka University ERC approved the study (Approval No: NACOSTI/NBC/AC-0812) and the National Council of Science, Technology, and Innovation (NACOSTI) granted the research permit (License No: NACOSTI/P/21/9429). The management of Embu and Chuka County Referral Hospitals gave written permission for data collection. Participants gave written consent after the details of the research were given. The prevailing Kenyan Ministry of Health and World Health Organization's guidelines on the COVID-19 pandemic were adhered to.

Results

Sociodemographic characteristics

The recruitment and data collection for the study was done between September and November 2021. A total of 328 participants, 140 (42.7%) men and 188 (57.3%) women, with a mean age of 60 years participated in the study. The majority of the participants were married (n=257, 78.4%), had formal education (72.9%), subsisted on farming (n=255, 77.8%) and had health insurance (n=204, 62%). Table 1.

Anthropometric measurements

Generally, the anthropometric measurements for men and women were within the normal range, except the mean body mass index (BMI) for women which was slightly above the average (25.69±4.1).

Table 1:
Sociodemographic Characteristics of the Participants

Characteristic		Embu Facility	Chuka Facility	Facilities combined
		n=162	n=166	n=328
Age (mean SD)		59.5715±.19	61.051±2.8	60±14
Gender	Male	68	72	140 (42.7%)
	Female	94	94	188 (57.3%)
Marital status	Single	16	11	27
	Married	118	139	257 (78.4%)
	Separated/ divorced	8	1	9
	Widowed	20	15	35
Education	No School	32	57	89
	Formal Education	130	109	239 (72.9%)
Occupation	Employed	25	18	43
	Farming	119	136	255 (77.8%)
	Business	13	11	24
Health Insurance		111	93	204 (62%, NHIF[a] cover)

[a] National Hospital Insurance Fund (Kenyan government contributory insurance fund)

Except for the mean BMI between women, independent samples t-tests indicated that the mean anthropometric values of the male and female were statistically equal at the two health facilities. Table 2.

Communication with doctors and other healthcare providers (HCPs)

Participants were asked to respond to three elements addressing patient-provider communication. These elements included preparing questions before meeting the HCP, asking questions during the meeting and discussing personal problems related to illness. Using a Likert scale, the responses were scored as never, almost never, sometimes, fairly often, very often and always. From the responses, few participants reported preparing questions and/or engaging the HCPs in discussing issues that were treatment-related or personal. The details of patient-provider communication are summarized in Table 3.

Predictors of antihypertensive medication adherence (MA)

Using the HB-MAS, the participants attained a mean score of 33 with a minimum and maximum score of 27 and 36 respectively. Using the total HB-MAS score as the dependent variable, a multiple linear regression model was used to identify the predictors of antihypertensive MA, among the independent variables studied including age, marital status, anthropometry, duration of hypertension, comorbidity, knowledge of managing hypertension and communication with doctors and other HCPs (table 4).

Age significantly predicted MA; for every additional year, MA decreased by 0.04266-unit scores (p=0.023400). Increasing BMI negatively related to MA; for every additional BMI unit, adherence went down by 0.16109 units (p=0.011224).

Table 2:
Anthropometric Characteristics of the Participants

Characteristic		Embu Facility (n=162)	Chuka Facility (n=166)	Facilities Combined (n=328)	t-test
Mean weight (±SD)	Men	67.98±9.51	67.6±9.16	67.6±9.16	t (140) =-0.58108, p=05621
	Women	69.89±11.93	68.2±11.98	68.2±11.98	t (188), p=0.056
Mean height (M)	Men	1.67±0.05	1.68±0.06	1.68±0.06	t (140), =1.3285, p=0.1862
	Women	1.62±0.06	1.63±0.06	1.63±0.06	t (188), p=0.4511
Mean BMI	Men	24.16±3.11	23.62±2.5	24.16±2.82	t (140) = -1.293, p=0.1982
	Women	26.42±3.88	24.94±4.12	25.69±4.1	t (188) =2.4541, p=0.01505
Mean WCb	Men	91.8±12.1	94.7±9.429	93.28±10.88	t (140) =1.2749, p=0.2045
	Women	95.41±13.12	93.27±10.42	94.34±11.86	t (188) =1.3053, p=0.1934

[b] waist circumference

Table 3:
Patient-provider Communication During Clinic Meeting

	Responses						
Patient Communication Task	Never	Almost Never	Sometimes	Fairly Often	Very Often	Always	Totals
Prepared questions before the meeting	74(22.6%)	67 (20.4%)	56 (17.1%)	66(20.1%)	54(16.4%)	11(3.4%)	328
Asked questions during the meeting	24 (7.3%)	81 (24.7%)	81 (24.7%)	70(21.3%)	56(17.1%)	16(4.9%)	328
Discussed personal problems during the meeting	38(11.6%)	71(21.6%)	79 (24.1%)	61(18.6%)	61(18.6%)	18(5.5%)	328

Participants who rated their BP status as worse compared to the previous year had 2.2 times worse MA scores compared to those who rated their BP status as being better compared to the previous year. Participants who knew their BP medication types scored 1.59130 times in MA compared to those who did not (p=<0.01).

On the patient-provider communication, participants who routinely discussed BP targets with HCPs had their MA scores increased by 1.27 units compared to those who did not (p=<0.01). Moreover, participants who always discussed personal problems related to specific antihypertensive medications had their MA increase by 2.45 units compared to those who did not (p=<0.1). Forgetfulness (2.89/4) and running out of medications (2.916/4) were reported as the major contributors to decreased MA. However, all the participants reported not taking other people's medications.

Discussion

Medication adherence (MA) offers significant benefits to patients and the healthcare system. Adherence to medications improves the overall health of patients, prevents complications, reduces healthcare costs, and contributes to better quality of life. The study found that antihypertensive MA was high (HB-MAS of 33/36) among the participants. In our study, participants with a basic knowledge of antihypertensive medications, including drug types, drug combinations, schedules and common side effects had higher MA scores compared to those without the knowledge. These findings are similar to previous studies that reported that the patient's understanding of the common details of medication administration enhances compliance with medication instructions (25). Individual knowledge of medications may decrease the risks of noncompliance when patients face situations that increase the risk of skipping medications in the course of long-term care. Patients who understand the basic details of their health condition including prescription medications are more likely to consult their healthcare providers for advice when facing any medication-related problem. The patient-provider encounter reinforces the benefit of MA. Moreover, patients with basic knowledge of medications may be less likely to experience myths and misconceptions about medications that are associated with increased risks of non-adherence. Consistent with our study findings, similar studies carried out on facilitators of MA in varied clinical settings, have reported a positive correlation between overall health literacy and improved MA scores (26).

Table 4:
Predictors of Antihypertensive Medication Adherence (MA)

Independent variable	Estimate	Std. Error	t value	Pr (>|t|)
Age	-0.04266	0.01861	-2.293	0.023400
Marital status: single	0.03073	0.60968	0.050	0.959874
Marital status: married	0.87225	0.75253	1.159	0.248465
Waist circumference	0.04663	0.01792	2.602	0.010306
BMI	-0.16109	0.06266	-2.571	0.011224
Duration of hypertension	0.03219	0.04669	0.689	0.491768
Presence of comorbidity	-0.34337	0.37566	-0.914	0.362334
Knowledge of dietary management	0.46350	0.36886	1.257	0.211079
Knowledgeable about medications	1.59130	0.41983	3.790	0.000226
Self-rated BP status as worse compared to one year before	-2.20901	0.93595	-2.360	0.019698
Discussed BP target with doctor	1.27238	0.46747	2.722	0.007349
Always shared personal issues related to medications	2.45190	0.65022	3.771	0.000242

Participants who reported their BP status as getting better compared to the previous year had better MA scores compared to those who reported that their BP status was getting worse. Our finding agrees with Goldman (27) Et al, and Eaton (28) Et al report that positive beliefs about own health condition may increase adherence to treatment instructions including adherence to antihypertensive medications. Consistent with related studies (29), our participants' reports of positive attitudes towards their health and well-being may have positively influenced adherence which is associated with positive health outcomes.

High BMI has been associated with increased risks of non-communicable including hypertension. In our study, the mean BMI for women was slightly elevated and associated with decreased MA.

The study findings agree with previous related studies (30,31,32) that increased BMI increases risks of comorbidity, physical limitations, pain syndrome, anxiety, depression and low self-esteem that are associated with decreased adherence to treatment instructions including MA. Patients who are overweight or obese may experience factors that may negatively affect the ability to follow medication instructions, including negative self-esteem, comorbidity and lack of tailored medication plans.

Participants who shared problems related to their disease and treatment with HCPs had improved MA scores, compared to those who did not. In addition, participants who routinely discussed personal problems related to specific antihypertensive medications with their HCPs had improved MA scores compared to those who did not. Our findings relate with previous study reports that effective patient-provider communication plays a crucial role in promoting MA as reported in previous studies (33). During the patient-provider encounter, effective communication promotes mutual understanding of the patient's problems and the healthcare provider's treatment instructions. This builds trust, enhances shared decision making and empowers patients to take active roles in their treatment, contributing to better health outcomes. Through active and continuous collaborative relationships and open dialogue with patients, HCPs can optimize adherence to treatment guidelines, including MA in patients with chronic diseases. In our study, patients who reported ineffective communication with their HCPs had higher odds of non-adherence to antihypertensive as reported in previous studies (34). In chronic care, effective communication with the patient creates an interactive and supportive environment that addresses the unique needs of individual patients. The provider-patient partnership significantly increases the likelihood that patients will follow their treatment instructions, including medication adherence.

Findings from this study indicate that MA was high among the participants at the two study sites. The predictors of MA included knowledge of medications, self-view of illness, BMI and communication patterns between patients and the HCPs.

Limitations of the study

The study adopted an analytical cross-sectional design. Researcher-administered questionnaires were used for data collection. Therefore, the data collected and analysed was based on individual perceptions and judgments among the respondents that were potentially prone to bias. Due to the large number of patients who attend the hypertension clinic at the two referral facilities, the timing of the survey could not guarantee the representativeness of the sampled population. An experimental study design that minimizes biases and controls the confounding variables would be more objective in studying the association between antihypertensive medication adherence and the study's variables.

Conclusion

This study assessed medication adherence (MA) and associated factors among adults with hypertension attending two county referral facilities. The study revealed that the level of antihypertensive MA was relatively high (Mean HB-MAS score of 33/36). The predictors of better adherence included younger age, knowledge of medications, an individual's perception that their BP status had improved in the last year, and effective communication with healthcare providers to address issues related to individual health conditions.

Conflict of interest statement. The authors declare no conflict of interest during the course of this study.

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