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ORIGINAL ARTICLE | MEDICATION ADHERENCE

Prevalence and Correlates of Medication Non-adherence among Hypertensive Patients on Follow-up in Central Kenya

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ABSTRACT

Background and Objective: Poor adherence to antihypertensive medications is a major barrier to blood pressure control among patients living with hypertension. In Kenya, a significant number of hypertensive patients have uncontrolled blood pressure, but data on medication adherence among this patient population is scarce. This study sought to determine the prevalence and correlates of medication non-adherence among hypertensive patients on follow-up in two referral hospitals in central Kenya.

Methods: We undertook a cross-sectional study comprising of 339 hypertensive patients undergoing follow-up care in two referral hospitals located in Nyeri County between October and December 2019. Medication adherence was assessed using a validated medication adherence questionnaire. Medication adherence was a dichotomous variable (adherent vs non-adherent), with the prevalence of non-adherence being measured as a proportion. Independent predictors of medication non-adherence were identified by fitting a multiple logistic regression model, where adjusted odds ratios (AORs) were computed for various covariates and interpreted at a 5% level of significance and 95% confidence interval (CI).

Results: The study sample largely comprised of the female gender (65.2%) and elderly people (mean age, 65 years +/- 12). Nearly half (46.6%) of the hypertensive patients interviewed were non-adherent to their medications. The factors associated with non-adherence were: having poor hypertension knowledge (AOR, 5.6, 95% CI, 3.3, 9.4); being on more than one antihypertensive medication (AOR, 2.8, 95% CI, 1.7, 4.7) and being on two or more daily doses of medications (AOR, 2.3, 95% CI, 1.3, 4.1).

Conclusion and Implications for Translation: Non-adherence to prescribed medications is highly prevalent among hypertensive patients in central Kenya, and it should therefore be identified as a public health concern. Strategies aimed at optimizing medication adherence among hypertensive patients in this region may consider focusing on educational interventions to increase hypertension knowledge and also on simplification of treatment regimens.

Keywords: • Hypertension • Non-adherence • Prevalence • Correlates • Antihypertensive Medication • Kenya

1. Introduction

Hypertension is the leading modifiable risk factor of cardiovascular morbidity and all-cause mortality worldwide.[1,2] In 2019, it was estimated that over one billion people globally had hypertension, with the number representing a double increase in prevalence since 1990.[3] In Kenya, a nationally representative survey conducted in 2015 reported that 28.6% of adults aged 18-69 years were living with hypertension.[4] Existing evidence highlights the need for achieving adequate blood control among people living with hypertension in order to minimize the risk of developing end-organ complications such as heart disease, stroke, and kidney disease.[5]

The current Kenya Ministry of Health clinical guidelines on the management of hypertension recommend that patients with the condition should aim to achieve a blood level of <140/90 mmHg.[6] However, achieving this clinical target has remained a challenge, with available data indicating that only 12.5% of people living with hypertension in Kenya have their blood pressures within the recommended limits.[4] It is therefore important that barriers contributing to poor blood pressure control are identified and addressed in order to optimize treatment outcomes among people living with hypertension.

Non-adherence to medication among hypertensive patients has been identified as one of the most important barriers to blood pressure control.[7] The World Health Organization defines adherence as the extent to which a persons' behavior (including taking of prescribed medications) corresponds with agreed recommendations from a healthcare provider.[7] A previous systematic review comprising of studies conducted in multiple countries estimated that nearly half of patients with hypertension are non-adherent to their prescribed medications.[8]

In Kenya, published studies on prevalence of medication non adherence among hypertensive patients are scarce, and there is no national data to quantify the burden of the problem. The few studies that have been done indicate that between 43% and 85.4% of hypertensive patients have suboptimal medication adherence.[9-12] The factors contributing to non-adherence in the Kenyan context have also not been conclusively addressed in the existing studies. Synthesis of research conducted elsewhere indicates that non-adherence to antihypertensive medication is influenced by several determinants, including patient's knowledge about hypertension, affordability of medications and therapy related factors such as complexity of treatment regimens and medication adverse effects, among other factors.[13]

To our knowledge, there is no study that has been published regarding medication adherence among hypertensive patients on follow-up in Nyeri County, Kenya. This study therefore sought to estimate the prevalence of non-adherence to antihypertensive medications and explore the associated factors in order to inform the design of interventions to address the problem in the Kenyan healthcare setting.

2. Methods

2.1. Study Design

We conducted a cross sectional study to determine the prevalence of medication non- adherence and the associated factors among hypertensive patients on follow-up in two tertiary care hospitals in central Kenya between October and December, 2019. The study was ethically reviewed and approved by Kenyatta University Ethics Review Committee [Reference Number: KU/ERC/APPROVAL/VOL.1 (267)].

2.2. Study Setting and Participants

This study was conducted in two tertiary hospitals located in Nyeri County, Kenya: Nyeri County Referral Hospital (NCRH) and Consolata Mathari Mission Hospital (CMMH). Nyeri County is one of the 47 counties in Kenya, located in the central region of the Country. Nyeri County Referral Hospital is a level 5 hospital that offers both general and specialized medical and surgical services to Nyeri County residents. Consolata Mathari Mission Hospital is a faith-based health care organization run by the Catholic Archdiocese of Nyeri, Kenya. The hospital offers both inpatient and outpatient services.

Nyeri County is among four counties that were included in the Country's National Universal Health Coverage (UHC) pilot program launched

in 2018.[14] Under UHC, all patients visiting the different County health facilities were provided with services free of charge. During the survey period, hypertensive patients on follow-up in Nyeri County Referral Hospital were accessing medical services, including clinical consultation and prescribed medications, without making any co-payment. The eligible participants for this study were hypertensive patients currently receiving any antihypertensive medication; confirmation of hypertension diagnosis and medication use was done through chart review. Patients who were newly diagnosed with hypertension at the time of the survey were excluded from the study, given that questions on medication adherence would only apply to patients who had been initiated on treatment previously.

2.3. Sample Size and Sampling

The primary objective of this study was to determine the prevalence of medication non-adherence among hypertensive patients on follow-up in the two selected tertiary care hospitals in Nyeri County. Therefore the approach for calculation of the desired minimum sample size was based on the formula for estimation of a proportion as has been described elsewhere in the literature.[15]

The computation of the sample size was implemented using the *open-epi* software[16] incoporating the following ingredients: estimated prevalence of non-adherence among hypertensive patients of 37.6%, based on a previous hospital based study in Kenya[12]; margin of error of 5%; confidence level of 95%; and population size of N=5000 derived from the total caseload of hypertensive patients seen in the two hospitals in the preceding year before the survey of 2018. Based on these parameters, a total of 313 patients was determined as the minimum sample size. This figure was further adjusted upwards for a possible non-response rate of 10%, yielding a total of 348 patients.

The total sample size was distributed to the two hospitals based on their proportionate contribution to the combined caseload of patients seen in the preceding year before the survey. For Consolata Mathari Mission Hospital, the percentage contribution to the total caseload was 19%, thus translating to a sub-sample size of 66 patients. Patients in Nyeri County Referral Hospital accounted for 81% of the total caseload, hence translating into a sub-sample size of 282 patients. The patients to be interviewed on a given clinic day were enrolled through systematic sampling. Patients visiting the regular clinics in each hospital are usually booked on a specific day of the week. The list of patients booked for each clinic was used as the sampling frame, with the K^{th} interval being determined by dividing the total number of booked patients by the number of patients targeted for an interview on the material day. The index case was determined through simple random sampling of the first K^{th} patients as captured in the clinic list of booked patients.

2.4. Study Variables and Data Collection

The dependent variable for this study was medication adherence which was measured using a validated medication adherence questionnaire (MAQ).[17] MAQ is a self-report tool comprising of four yes/no questions: 1) Do you at times forget to take your medicines for hypertension? 2) Are there times when you feel there is no need of taking your medicines for hypertension? 3) When you feel better, do you sometimes stop taking your medicines for hypertension? and 4) Sometimes if you feel worse when you take your medicines for hypertension, do you stop taking them? A response of "Yes" in each question is awarded one point, while "No" is allocated zero. Patients answering "Yes" to at least one question (score ≥1) are categorized as non-adherent, while those answering "No" to all questions (score=0) are considered adherent.

Knowledge about hypertension was assessed through a set four questions developed after a review of the literature to identify the specific aspects of hypertension that are poorly understood in relation to medication adherence.[18,19] The questions included: 1) Do you know the blood pressure reading that indicates good control of hypertension? (If yes, specify); 2) Do you know of any health problems that can arise from having high blood pressure? (If yes, specify); 3) Can someone be

having high blood pressure without experiencing any symptoms? and 4) For how long are you going to be taking your medicines for hypertension? Each correct response per question was awarded a score of one, with the total maximum score being four. The total score obtained per participant was converted into a percentage, and a cut-off of 70% was set to dichotomize the knowledge level into two categories: poor knowledge (<70%) and good knowledge (≥70%). This categorization was adopted from a previous related study.[20] The data collection tools also captured information on socio-demographic characteristics and clinical details, including, diagnosis and prescribed medications. Data was collected by trained research assistants under supervision of the study investigators. Eligible participants were first taken through the details of the study, and then subsequently invited to sign an informed consent form if willing to participate. All the above survey tools- medication adherence and the knowledge assessment questionnaires were framed in two languages- English and Swahili. The original versions which were in English, were translated to Swahili language by a Kenyan language expert who was fluent in both languages. Back translation of the Swahili versions was also done and similarity checks undertaken thereafter to ensure comparability between the two versions. Patients participating in the survey were given the option of choosing their preferred language for interview.

2.5. Statistical Analysis

Statistical analysis for this study was conducted using STATA 11.2 statistical software (StataCorp, Texas, USA). Descriptive analysis was undertaken using summary statistics including mean and standard deviation for continuous variables, and proportions for categorical variables. Analysis of factors associated with medication adherence was undertaken in two steps. Firstly, bivariate analysis was done using chi square and fisher's exact tests to explore any association between the different independent variables (socio-demographic and clinical characteristics) and medication adherence. In step two, covariates were selected for possible inclusion in multivariate analysis at a cut off of $p<0.2$. The dependent variable- medication adherence- was dichotomized into two outcomes: adherent and non-adherent. Multivariate analysis was undertaken by fitting a multiple logistic regression model using the stepwise forward selection method at a 5% probability of entry. The adjusted odds ratios (AORs) generated from the output were interpreted using p values and 95% confidence intervals (CI).

3. Results

3.1. Characteristics of Study Sample

Out of a total of 348 hypertensive patients targeted for the baseline survey, 339 of them participated, translating into a response rate of 97.4%. The participants predominantly comprised of older persons, with a mean age of 65 years (+/- 12). The female gender accounted for a large majority of the participants, comprising of about two thirds (65.2%) of the study sample. Details about other socio-demographic and clinical characteristics of the study participants are presented in Table 1.

3.2. Prevalence of Medication Non-adherence

Nearly half (46.6%) of the patients included in the survey were non-adherent to their medications based on self-report assessment. On subgroup analysis, men appeared to have a higher level of medication non-adherence, though this variation was not statistically significant. The distribution of medication adherence by other characteristics is shown in Table 2.

3.3. Hypertension-Related Knowledge

Close to two thirds (59.9%) of the hypertensive patients surveyed had poor knowledge about hypertension. Knowledge about the recommended blood pressure target was strikingly low, with only 18.3% being able to correctly state the values for good control. A majority of the patients (60.8%) also lacked an understanding that blood pressure can be elevated in an individual who is not experiencing any symptoms of illness. A significant number of the participants (43.7%) were unable to name at least one hypertension mediated organ complication such as kidney disease, heart disease or stroke. The findings in this survey also indicated a lack of understanding about the lifelong nature of hypertension treatment;

Table 1: Characteristics of study participants

Characteristic	Frequency (n=339)	%
Age (years)		
30-44	19	5.6
45-59	101	29.8
≥60	219	64.6
Total	339	100
Sex		
Male	118	34.8
Female	221	65.2
Total	339	100
Educational level		
None	57	16.8
Primary	169	49.9
Secondary	99	29.2
College/University	14	4.1
Total	339	100
Marital Status		
Never married	31	9.1
Married	259	76.4
Divorced/separated	12	3.5
Widowed	37	10.9
Total	339	100
Religion		
Christian	335	98.8
Muslim	4	1.2
Total	339	100
Employment Status		
Formally employed	34	10.0
Unemployed	98	28.9
Self employed	207	61.1
Total	339	100
Number of antihypertensive medications prescribed		
One	130	38.3
Two or more	209	61.7
Total	339	100
Daily dosing frequency		
Once	244	72
Twice or more	95	28
Total	339	100

close to half (46.6%) of those interviewed did not know that they were supposed to take their medications throughout unless advised to stop by their healthcare providers.

3.4. Correlates of Medication Non-adherence

On bivariate analysis, factors that were associated with medication adherence at 5% significance level, included knowledge about hypertension, number medications prescribed and number of daily doses (Table 2). At multivariate level, medication non-adherence was independently predicted by poor hypertension related knowledge, being on two or more medications and having a regimen comprising of twice or more daily dosing (Table 3). Patients who had poor knowledge of hypertension were 5.6 times more likely to be non-adherent to their medications compared to those with good knowledge. The odds of being non-adherent to medications was 2.8 times higher for patients on two or more medications compared to those on mono-therapy. Also, the likelihood of being no-adherent was 2.3 times higher for patients receiving two or more doses per day compared to those on single daily doses.

4. Discussion

Our findings showed that nearly half (46.6%) of hypertensive patients on follow in the two referral hospitals in central Kenya had sub-optimal adherence to their prescribed medications. This finding is consistent with a previous cross sectional study that documented a 42.4% level of medication non-adherence among hypertensive patients on follow-up in a tertiary hospital in the coastal region of Kenya.[21] However, other studies conducted previously in different settings in Kenya recorded a higher level of medication non-adherence.[10,22] This variation may be attributed to the fact that our study was conducted in a setting where patients were obtaining their prescribed medications at no costs under an existing national program on universal health coverage as described elsewhere in this paper. Previous research has identified co-payments for medications as a barrier to adherence.[13]

Non-adherence to medications contributes to poor blood pressure control which subsequently increases the risk of development of end organ complications such as heart disease, chronic

Table 2: Factors associated with medication non-adherence at bivariate analysis

Variable	Medication Adherence		Test statistic	p value
	Adherent (%)	Non Adherent (%)		
Gender			Chi square X^2=0.84 df=1	0.361
Male	67 (56.8)	51 (43.2)		
Female	114 (51.6)	107 (48.4)		
Age			Chi square X^2=3.1 df=2	0.211
30-44	12 (63.2)	7 (36.8)		
45-59	47 (46.5)	54 (53.5)		
≥60	122 (55.7)	97 (44.3)		
Education			Fisher's exact	0.122
None	26 (45.6)	31 (54.4)		
Primary level	94 (55.6)	75 (44.4)		
Secondary level	57 (57.6)	42 (42.4)		
College/university level	4 (28.6)	10 (71.4)		
Employment			Chi square X^2=1.7 df=2	0.420
Formally employed	15 (44.1)	19 (55.9)		
Unemployed	56 (57.1)	42 (42.9)		
Self employed	110 (53.1)	97 (46.9)		
Marital status			Chi square X^2=2.4 df=3	0.494
Never married	16 (51.6)	15 (48.4)		
Married	134 (51.7)	125 (48.3)		
Divorced/separated	7 (58.3)	5 (41.7)		
Widowed	24 (64.9)	13 (35.1)		
Religion			Fisher's exact	0.342
Christian	180 (53.7)	155 (46.3)		
Muslim	1 (25)	3 (75)		
Number of prescribed medications:			Chi square X^2=21.3 df=1	<0.001*
One	90 (69.2)	40 (30.8)		
Two or more	91 (43.5)	118 (56.5)		
Daily dosing frequency			Chi square X^2=9.5 df=1	0.002*
Once	143 (58.6)	101 (41.4)		
Twice or more	38 (40)	57 (60)		
Level of hypertension related knowledge			Chi square X^2=58.3 df=1	<0.001*
Good	107 (78.7)	29 (21.3)		
Poor	74 (36.5)	129 (63.5)		
Co-morbidity			Chi square X^2=3.1 df=1	0.080
Absent	138 (56.3)	107 (43.7)		
Present	43 (45.7)	51 (54.3)		

*Significant at 5% significance level
df: degrees of freedom

kidney disease, and stroke. Non-adherence to antihypertensive medications also contributes to increased healthcare costs through frequent hospitalizations related to both acute and long-term complications of uncontrolled blood pressure.[23] Therefore, it is vital that the high level of

Table 3: Independent factors associated with antihypertensive medication non-adherence

Variable	Adjusted Odds Ratio (AOR)	95% Confidence Interval (CI)	p value
Level of knowledge about hypertension			
Good (reference)	1	3.3, 9.4	<0.001*
Poor	5.6		
Number of prescribed medications:			
One (reference)	1	1.7, 4.7	0.001*
Two or more	2.8		
Daily dosing frequency			
Once (reference)	1	1.3, 4.1	0.003*
Twice or more	2.3		

*Significant at 5% significance level

non-adherence noted in this patient population is identified as an urgent public health priority.

In this study, it was also established that nearly two-thirds of the patients on follow-up had poor hypertension knowledge, and this factor was an independent predictor of medication non-adherence. Patients with poor knowledge about hypertension were 5.6 times more likely to be non-adherent to their prescribed medications compared to those with good knowledge. Previous studies have established a similar strong link between hypertension knowledge and medication adherence.[24,25] Findings on the responses obtained on various questions assessing specific knowledge about hypertension indicated that a significant number of patients lacked an understanding that hypertension is an asymptomatic and chronic disease requiring lifelong treatment. It is therefore likely that this knowledge deficit may have contributed to some patients skipping medications whenever they felt fine or discontinuing the medication after sometime with the assumption that they had recovered. In a survey conducted on health seeking behaviors among patients with hypertension and diabetes in diverse rural care settings in Kenya, a significant number of patients (30%) reported that they usually discontinue themselves of medication whenever they feel like they have 'recovered' from the disease.[26]

The complexity of the dosage regimens put on patients was found to have a significant influence on medication adherence. Patients who were receiving two or more drugs were 2.8 times more likely to be non-adherent to their medications compared to those on mono-therapy. Previous studies have also observed a similar inverse relationship between the number of prescribed medications and adherence.[24,27] Having multiple medications is associated with "pill burden" and increases the likelihood of a patient forgetting to take some drugs included in his/her treatment regimen. Similarly, being on multiple daily doses (two or more doses) was also associated with a higher likelihood of non-adherence compared to receiving a single dose. An earlier meta-analysis study showed that patients on single daily doses are more likely to be adherent to their medications compared to those on higher dosing frequencies.[28] There is also a growing body of evidence showing that treatment regimens comprising of single pill drug combinations are associated with higher levels of adherence compared to free drug equivalent combinations.[29]

Two important limitations need to be taken into account when making an interpretation of the findings generated from our study. Firstly, our study sample was drawn from a population comprising of patients only seen in the two selected tertiary care hospitals in Nyeri County. Given that there are other facilities in the region where hypertensive patients are followed up, our findings cannot be generalized to the entire population of hypertensive patients in Nyeri County or the country at large. However, the study provides an important entry point into quantifying the burden of medication non-adherence, and also in exploring the contributing factors to the problem among hypertensive

patients on follow-up in Nyeri County. Secondly, the dependent variable of our study (medication adherence) was assessed using a self-report tool, and therefore the measurements may be viewed as an approximation on a patient's true adherence to prescribed medications. However the tool used has been validated and utilized in assessment of medication adherence in multiple previous studies in diverse settings and populations.[17]

5. Conclusion and Implications for Translation

The findings from our study indicate that medication non-adherence is highly prevalent among hypertensive patients on follow-up in the two tertiary hospitals in Nyeri County, and therefore creating an urgent need for concerted efforts to address the problem. The factors associated with increased likelihood of non-adherence were poor knowledge about hypertension and having more complex treatment regimens. Such factors are largely modifiable and this therefore presents an opportunity for players in the healthcare delivery sector to formulate interventions to address the identified health problem. Health education based interventions can be developed and integrated in the care of hypertensive patients to enhance understanding on the various aspects of hypertension, especially the asymptomatic and chronic nature of the condition.

There is also need for policy makers to consider revising treatment guidelines to recommend where appropriate, the adoption of simpler treatment regimens comprising of single fixed drug combinations to enhance adherence.

Compliance with Ethical Standards

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Key Messages

- Non-adherence to antihypertensive medication is highly prevalent among hypertensive patients on follow-up in central Kenya and therefore, measures are urgently required to address the problem.
- Low level of hypertension related knowledge is a contributing factor for medication non-adherence among hypertensive patients, and thus educational interventions can be mainstreamed in the routine care of persons living with hypertension.
- Being on complex treatment regimens, comprising of two or more medications and receiving multiple daily doses, increases the likelihood of non-adherence to medications. Simplification of treatment regimens by selection of medications amenable to single daily dosing or use of fixed drug combinations, where appropriate, may be a possible strategy to ameliorate the challenge of antihypertensive medication non-adherence in Kenya.

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