

Patients Related Factors Associated with Non-Adherence to Antihypertensive Medication among Patients at Chuka Referral Hospital, Kenya

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Abstract

Antihypertensive medication is one way to manage hypertension but many hypertensive patients do not optimize drug therapy to achieve blood pressure control. Hypertensive medication non-adherence continues to become a contributing factor to hypertensive complications like heart attacks, heart failure, stroke, kidney disease. Prevalence of non-adherence to antihypertensive treatment is not known but it's thought to be increasing. Associated factors of non-adherence are complex, are both internal and external to the patient but are difficult to extrapolate. This can partly be because the determinants of non-adherence to hypertensive may have a locality effect due to many factors such as culture and health system in a given locality. Hence, studies from one region may not have a cross-application. Therefore, there is the need to study the factors associated with non-adherence at a local scale. Descriptive study design was adopted to guide the implementation of the study. The population comprised of 575 people among doctors, pharmacists, nurses, record officers and hypertension patients. The respondents were identified through simple random sampling and a sample size of 81 patients was achieved and 10 health care providers including doctors, pharmacists, record officers and nurses were also interviewed through census method. Data was collected between the month of April and May 2019. Questionnaires were used as data collection tools for the patients while the interview schedule was conducted to health care providers through an interview guide. Descriptive and inferential statistics were used for data analysis, aided by SPSS. The study revealed a significant negative correlation ($r_{pb} = -0.227$, $p < 0.05$) between age and non-adherent, insignificant relationship with marital status ($r_{pb} = -0.129$), insignificant ($r_{pb} = -0.064$) correlation with patients' level of education and a

positive correlation with monthly income ($r_{pb} = 0.24$). A majority of patients stated that (64%) of the hypertensive patients had missed medication. Patient-related factors: cost of medication, religious beliefs, age of the patient, their education level, preference to traditional medicine, and sociocultural factors together were found to be significant predictors of non-adherence to hypertension medication, $\chi^2 = 17.14$, $df = 1$, $N = 81$, $p < 0.05$. However, it's only age ($p = 0.01$), religious beliefs ($p = 0.04$), and cost of medication ($p < 0.05$) that were individually, significant predictors to non-adherence. Non-adherence to hypertension medication is a major problem at Chuka Level Five Hospital. This was due to lack of funds, time, forgetfulness and patient thinking that they had healed thus continuous follow-ups to improve adherence, positive reinforcement to increase motivation in order to address forgetfulness, and supply of constant and subsidized hypertensive drugs to the hospital are necessary to prevent patients from missing the drugs. There is need to reduce out of pocket payment through establishment and strengthening of the community health insurance scheme. The study recommends that the hospital should set aside some resources for making patients' follow-ups especially those were treated and left to go home; discussions be made with patients on severity of non-adherence and importance of adherence; use of positive reinforcement to increase motivation and mechanism to be put in place to subsidize the cost of medication.

Keywords

Hypertension, Nonadherence, Medication, Inhibiting Factors, High Blood Pressure, Patients' Characteristics

1. Background Information

Hypertensive medication non-adherence continues to become the common cause of hypertensive complications, like heart attacks, heart failure, stroke and other complications [1]. One way of managing hypertension (HPT) to an optimal blood pressure control level is by the use of antihypertensive medication. The success of antihypertensive drugs is well recognized and has been measured in terms of reduction of overall relative risk of cardiovascular disease and other hypertensive complications, like stroke and as well as lower healthcare costs [2]. Hypertension condition has remained to be known as the main common reason of cardiovascular-related morbidity and deaths globally [3]. The definite prevalence of non-adherence to hypertensive medication is unknown. The available data propose that poor adherence could be more common than complete adherence to antihypertensive medication [4] [5].

Poor hypertension control results mostly due to non-adherence to medications. Approximately 45 - 81 percent of patients worldwide with hypertension have poor blood pressure control [6]. Despite the widespread availability of antihypertensive medications, national hypertensive guidelines for detecting and treatment, and reg-

ular interactions with the system in health, a significant number of detected hypertensive adults remain with poor controlled blood pressure [7]. This may be due to non-adherence to medication, diet and lifestyle causes, interfering medications, or underlying diseases. Compliance to hypertension drugs is a key factor to avoiding poor controlled hypertension and the possibilities of developing complications linked to hypertension, for example, renal failure, heart attacks, strokes and eye complications, which are dangerous and can lead to sudden death [8] [9]. Additionally, patients with unrecognized non-adherence most often go through numerous further investigative tests which are invasive and more costly some times, and in expert centers to detect causes of their poor response to antihypertensive therapy. Additionally, patients who do not adhere to antihypertensive therapy fail to achieve the confirmed benefits of BP lowering therapy and continue to be at high risk of cardiovascular complications [10] [11].

Antihypertensive medication non-adherence is a possible causative factor to the event of hypertensive complications. A number of analyses have found that in developed countries, not adhering to long term therapeutics including hypertension therapy in the population, has high prevalence [12]. [13] revealed that only 29% of patients under treatment had their BP contained in the recommended levels of <140/90 mmHg. Non-adherence to hypertensive medication in many hospitals is characterized by failure to refill the regimen, failing to honor appointments, patients stopping medication when they felt better or due to the side effects. Several approaches have been tried to explore the drugs taking behavior and the traditional methods like clinical reports, pill counts, and patients reported measures and prescription refills were examined. Studies identified income, age, gender and education as demographic factors leading to hypertensive medication non adherence [14]. Such demographic investigation are essential, but they have a tendency to limit comprehension of the multifaceted set of influences that in collaboration or on their own effect non-compliance in regards to termination of taking medication or omitting dosages [15].

Studies involving anti-hypertensive have been conducted in developed countries [16] and very few in developing countries and it has been found that medication non-adherence is multifactorial [12]. A study by Mathenge demonstrated that the associated factor to non-adherence surrounds patients and health care systems [13]. The WHO acknowledged that inadequacies and complexity with healthcare systems contributes to obstacles in optimum adherence to medication (WHO, 2012). Health system related factors, according to [1], includes, quality of health care services, distance, physician patient relationship and stocks out, guideline for management cost of drug and distance. Patients associated factors includes social economic status, patients beliefs, race/ethnicity, health literacy, and others. Studies have been conducted on patients related factors which have revealed that age influences adherence of hypertensive medication [17] [18]. Education status has also been shown as a significant factor for non-adherence to antihypertensive medication [19] [20], however other studies oppose the re-

sults finding [21]. [22] revealed that patient's beliefs should also be well-thought-out to give a comprehensive depiction of non-adherence.

Despite the more knowledge and various advances through compliance/adherence research, non-adherence rate have continued unchanged in the last decade [23] [24]. On contrary, [25] found out that lack of knowledge and established facts is a reason for medications non-adherence and thus most hypertensive patients do not achieve optimal blood pressure control and fails to reap maximum benefit of medical treatment.

The development of a sustainable, systematic healthcare system in Kenya is designed to benefit all the country citizens, including prevention of common health issues and disease-related complications, and to ensure public wellbeing is the focus of the healthcare service. The government in Kenya is intent upon creating mechanisms to improve and implement comprehensive health service programmes through the Ministry of Health (MOH), as well as other related health organizations [26]. Accordingly, the MOH has adopted a number of programmes and health policies designed to prevent, detect, evaluate and treat non-communicable diseases, one of which is hypertension [27].

Healthcare system sustenance to patients with hypertension has a substantial role in improving adherence to hypertension therapy. Support related to patients with hypertension in relation to adherence activities contemplates elements of providing information that is supporting or helpful in regards to the recommended medications. Successful management of hypertension relies on comprehension, endurance of hypertension care, and link with health education. The chief focus of provision of information resources or educational support is to benefit patient with hypertension to follow medical instruction on drugs and highlight the significance of performing health examinations and screening periodically [28]. Providing educational sessions or educational material through conduction of educational interventions provided patients with information regarding their health condition and medications which lead to increased hypertension medication compliance. Physician communication is a helpful predictor of adherence to medication thus if physician communication is poor can result to non-adherence to medication [29]. A study by [30] also found that good communication between patient and clinicians led to good patient-client relationship which is a significant predictor increasing adherence to medications.

Non adherence outcome places the burden to economy which affects the decision on how to make use of the scarce health resources can lead to absenteeism or low work productivity or even can lead to premature deaths. Non-adherence outcome on health by not complying to treatment properly can result to drug resistance, progression of disease, treatment failure, tolerance to drugs and drug related morbidity [31].

This study was thus expected to identify some of these factors influencing non-adherence to antihypertensive medication at local level due to some differences in cultural background or effects of the health system and thus would ena-

ble the clinicians to focus more on those subgroups at higher risk of low adherence. Interventions will be tailored towards those found to be at risk of poor adherence and will impact positively in improving adherence levels to hypertension treatment. Reports from Chuka Referral Hospital records showed that hypertension was amongst the top leading causes of both outpatient and in-patient morbidities and mortalities. In 2016, 560 hypertensive patients attended Chuka referral Hospital with hypertension, 140 with hypertensive complications out of which 16 died due to hypertension complications [32].

2. Theoretical Framework

This study was grounded on behavior change theory known as Theoretical Domains Framework (TDF), model development described by Cane *et al.* [33] (Figure 1). The TDF was chosen because it incorporates 33 behavior change theories and has related tools to support the application of behavior change interventions. Guideline from council of medical research acclaims that evidence and applicable theory should be acknowledged to enlighten the progress of an intervention [34] because many adherence interventions to date have not been effective [35]. Intervention which is effective have often involved a level of difficulty that has been too expensive and challenging to apply in practice [35] and thus clarifications and models of medication adherence/non-adherence have changed over the years. Previous studies focused on the part of patient and doctor statement and its outcome on satisfaction of patient, comprehension and forgetfulness as main factors of succeeding adherence to treatment [36]. Though, research in health behavior has reliably proven that the delivery of facts alone is not an actual means to modification of behaviour, and thus studies have now progressed

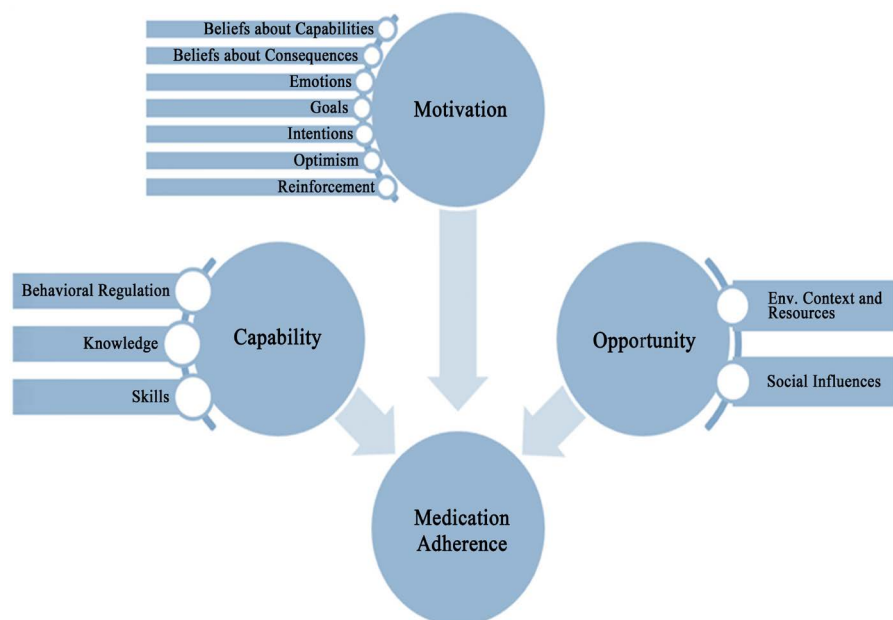


Figure 1. An Illustration of the theoretical domains framework. Adapted from Cane *et al* [33].

onto models and approaches which concentrate on beliefs of patients' planning abilities and motivation as the main descriptive variables. The models include self-regulatory models and social cognition models which put emphasis on the importance of the opinions that the persons have in regard to their ailment and management as well as their own capability to track the advice and treatment recommended [37]. Growth in behavior change comprises also of participants who records and monitors their behavior [38] and these interventions were found to be more effective and significantly at supporting healthy eating and physical activity more than interventions that the technique was not included [39].

The growth of classification of behavior change techniques lead to new techniques of theorizing the factors which determine or explain persons' health associated behaviors and at the central of this new methodology is a psychological model for explanation of human behavior that is wished to include the array of technique that will be included in change [39]. The classifications include Capability, Opportunity and Motivation (COM) B behavior. These classifications were established with quotation to current theories of behavior change. A consensus meeting was held by behavioural theorist in united State of America, which reflected the fundamentals for the enactment of an identified volitional behavior [13]. They proposed that classifications were set as a preliminary in directive to select interventions that were more effective [13].

The model postulates that there are relations amongst 3 models to include Capability, Opportunity and Motivation (COM) which results to the enactment of Behavior (B) thus this can also offer a justification for reasons of not engaging in acclaimed behavior. To effectively accept and proceed with long-term treatment regimen like hypertensive regimen, behavior change is required and hence behavior change ideologies can be used to hasten the acceptance of medication adherence. The effectiveness of behavior-changing interventions, aimed to each individual stage of change has been established in numerous health behavioral areas and interventions include monitoring devices, reminder techniques and rewards. Which are very significant for patients in advanced stages of behavior change, but patients in earlier stages require interventions that are consciousness-raising aimed on consciousness of the advantages of treatment.

According to [33] behavior change is crucial to promoting hypertension adherence and improving the health outcomes for example: Behaviors may be those of healthcare providers such as evidenced based practice implementation, of patients, such as adhering to medication or of the general population, such as cessation of smoking and increasing physical activity. In spite of high-level noble work to promote execution of evidence-based practice by developing field of implementation in science and Clinical Effectiveness Research Agenda Group. Execution remains variable, with various individual and organizational factors influencing healthcare providers' behavior. These factors includes the accessibility of evidence, relevance to exercise, the distribution of guideline and evidence, motivation of individual, clarity of roles and practice, culture of specific health-

care practices and the ability to preserve current changes [40].

Hypertensive medication adherence can be attained through changing health care workers behavior, managers, other health professionals and administrators [41]. If interventions are based on principle of change of behavior, changing is easy but if there are no principles guiding change of behaviour then change of behaviour is not easy [42]. The principles that guide change of behaviour form part of many theories of behavior change, but are rarely drawn on in assessing execution of intervention or even in designing and there is some evidence that behavior change interventions informed by theory are more effective than those that are not [43]. TDF is a theoretical framework rather than a theory thus does not suggest testable relations between components but delivers a theoretical lens through which factors influencing behavior are viewed, these include; the affective, cognitive, social, and environmental effects on behavior.

According to [39], Capability' is divided into physical capability which is the ability to be involve in required physical processes and psychological capability which is the ability to be involved in the required thought processes. Psychological capability includes the understanding of the illness and its therapy, cognitive functioning such as the thinking, capacity for judgment, or memory as well as exclusive function for example ability to strategize. Physical capability is ability to get used to lifestyle changes such as a social behavior or diet [44].

Opportunity is divided into social and physical opportunity. Social opportunity is given by the cultural milieu that directs the way we think about things, it includes the fear of disclosure of the disease, stigma of the disease and religious or cultural beliefs while physical opportunity is explained by what the environment provides for example complexity, the cost, or accessibility to services [33].

Motivation is divided into automatic and reflective processes. Automatic processes involve impulses and emotions that arise from associative learning, cues or stimuli for action, as well as mood state or mood disorder such as depression and anxiety. Reflective processes involve evaluation and plans which entails the perception of the illness beliefs and treatment. For instance, experience of using medical equipment like use of digital blood pressure machine will improve physical capability to continue measuring the BP even at home and this will improve adherence to drugs so as to maintain the BP under control. Example in improving Opportunity is that when there is good patient/physician relationship the care provider is motivated to counseling the patient more on adherence to medication. COM-B offers a more comprehensive explanation of non-adherence/adherence than existing models where initially it takes into account of automatic processes such as habits then, it openly includes factors at a systems level lastly; it permits a defined explanation of the association between person's determinants and adherence, making it easier to recognize suitable interventions.

In COM-B, the factors of medication non-adherence are Capability, Opportunity and Motivation, some of which are intentional and others unintentional, thus non-adherence is associated to the behavior itself for example not using medication at the right period, right time, right manner and right quantity.

3. Conceptual Framework

The goal of hypertension treatment is to control blood pressure. This is because high blood pressure is associated with morbidity and mortality arising from complication of hypertension. Non-adherence to hypertension medication is a problem in most of the public hospitals Chuka Level Five included. There are many determinants responsible for non-adherence ranging from health professionals, the health care system, the community and the patients related. The patient related include: people who have social support from family, friends, or caregivers to assist with medication regimens have better adherence to treatment. Others include unstable living environments, limited access to health care, and lack of financial resources and cost of medication. Physical impairments and cognitive limitations may also increase the risk for non-adherence in older adults. Lack of knowledge about the disease and the reasons medication is needed, lack of motivation, low self-efficacy, and substance abuse are associated with poor medication adherence.

A good relationship between the patient and health care provider, which features encouragement and reinforcement from the provider, has a positive impact on adherence. Poor or lack of communication concerning the benefits, instructions for use, and side effects of medications can also contribute to non-adherence, especially in older adults with memory problems. Long term drugs administration for many chronic illnesses and adherence to such treatment regimens often declines significantly over time. This often happens when patient have few or no symptoms and the absence of them is a barrier for people to take their medication. It is important for the patient to understand the illness and what will happen if it is not treated. The complexity of the medication regimen, which includes the number of medications and number of daily doses required; duration of therapy; therapies that are inconvenient or interfere with a person's lifestyle and side effects have been associated with decreased adherence.

4. Purpose and Objectives

The study was intended to gather data that would deepen the understanding of demographic and patient related factors that are associated with non-adherence to hypertension medication.

The research objectives were:

- 1) Describe the association between patients' characteristics and non-adherence to hypertension medication.
- 2) Describe patients-related factors that are associated with non-adherence to hypertension medication at Chuka Referral Hospital.

5. Research Hypothesis

H0: there was no statistically significant association between patient-related factors and non-adherence to anti-hypertensive medication among patients followed at Chuka Referral Hospital.

6. Material and Methods

6.1. Study Population

The study was conducted at Chuka Referral Hospital in Tharaka Nithi County. Chuka referral Hospital is a Government health facility located in Chuka town in Tharaka-Nithi County. The county borders Meru county to the north and north-east, Kitui County to the east and south east, Embu County to the south and southwest. The division lies between latitudes 0°15'0" and longitudes 37°1'45". Descriptive design was chosen to collect data concerning non-adherence to hypertension medication in order to draw a valid conclusion from the facts discovered [45]. The study population comprised of 575 people among them doctors, pharmacists, nurses, record officers and hypertension patients, who had been using antihypertensive treatment and attending Chuka Hospital hypertension clinics. **Table 1** presents the distribution of population that the study targeted.

The study used simple random sampling to select study sample size for hypertensive patients and census taken for health workers that include: doctors, pharmacists, record officers and nurses attached to the medical outpatient clinic because they are too few to sample. The sample size was derived according to Nassiuma [46]. The study population included all hypertensive patients on follow up at the hospital medical clinics. Patients aged 18 years and above were eligible to participate in this study. Enrolment of study participants was carried out at the beginning of each clinic day. This was done at the registration desk where all patients report for their appointments. The study used simple random sampling to select a subsample of the patients from a population of 560. A list of accessible patients was prepared and then the number to be interviewed was determined from the attendance list. Every client was given a number which was placed in a container and then the number was picked randomly, the patient corresponding to the number picked was included in the sample.

6.2. Sample Size

The sample size was derived at according to Nassiuma [46] whereby a coefficient of variance at most is 30% of the population which is considered adequate for most surveys.

Table 1. Distribution of the target population by category (N = 575).

Population	Frequency
Patients	560
Doctors	3
Pharmacists	5
Nurses	2
Record officers	5
Total	575

Source: Chuka Referral Hospital Registry.

$$\text{Sample size } n = \frac{NC^2}{C^2 + (N-1)e^2}$$

where

n = sample size,

N = population from which sample is obtained,

C = coefficient of variance 30%,

e = standard error 0.02.

$$n = \frac{560(0.3)^2}{(0.3)^2 + (560-1)(0.02)^2} = 161 \text{ patients}$$

A census was taken for the Key Informants at the Chuka Level 5 Hospital. This included 5 pharmacist, 3 doctors, 2 nurses and 5 record officers. The total number of respondents was 174 in total who participated in the study.

6.3. Data Collection and Analysis

A semi-structured questionnaire that was review for face and content validity by peers and expert in the Department of Nursing at the university. Pilot study data aided instrument improvement and reliability analysis. The reliability coefficient of the variables was 0.7 and thus the instrument was considered reliable (Nunnally, 1978). Logistic regression was conducted to assess if demographic characteristics and patients related factors are significant predictors of the likelihood of hypertensive patients not to adhere with medication. Logistic regression is the most popular regression technique that is used for modelling categorical dependent variables [47]. The overall model significance for the binary logistic regression was examined using the χ^2 omnibus test of model coefficients (Stevens, 2009). The Nagelkerke R^2 was examined to assess the percent of variance accounted for by the independent variables [47]. Predicted probabilities of an event occurring was determined by Exp (β). The Wald statistic was used to assess the contribution of individual predictors or the significance of individual coefficients in a given model [48].

6.4. Study Limitation

This study was conducted in government referral Hospitals in Tharaka Nithi County and did not include patients who attended private Hospitals. Therefore results cannot be generalized to all hypertension patients in county. However, the results have important insights for same hospitals within the same characteristics.

Self-reporting of the questionnaire could introduce recall bias by either over reporting or under reporting depending on patient's behaviour on the recent past. However the researcher was clarifying the questions when asking participants.

7. Results and Discussions

The study achieved a response rate was 50% ($n = 81$) where a majority of the pa-

tients ($n = 56$, 68%) were female while 32% ($n = 25$) were male. The respondents' ages ranged between 20 and 90 years although, most of them 57.6% ($n = 42$) were aged over 50 years. Elderly people have been found to be more non-adherent to medication than young people. Regarding education, the study found that most of the patients (75.3%) knew how to read and write, hence capable of following doctor's directions and adhering to hypertension medication. There is paucity of information on the relationship between education level and adherence to medication. Over half of the patients 58% ($n = 47$) were self-employed, surprisingly, less than 10% ($n = 8$) of the patients were government employees.

7.1. Non-Adherence to Hypertension Medication

The study sought to describe the level of non-adherence to hypertension medication at Chuka Referral Hospital. As reported in **Figure 2**, over half (64%) of the B.P patients had missed medication. A significant majority (55.7%) of respondents cited lack of funds as the major reason for non-adherence, 16.4% stated that they forgot, 24.6% cited lack of time and 3.3% thought they had healed. This shows that a majority of the hypertensive patients at Chuka Hospital were not adherent to hypertension medication

When asked to indicate whether belonged to a health insurance scheme that caters for the medication bills, 48.1% of the respondents stated that they had invested in the scheme while 51.9% had no insurance. Further, the respondents (30.9%) confirmed that they did not get family support in managing the condition. On availability of services, 84% of the respondents confirmed that the care providers were readily available to attend to them, explained the importance of B.P (64.1%), taken through the schedule of medication (81.5%) although, only a few (27.2%) benefitted from written patient health educational materials on hypertension. The respondents (60.5%) further stated that most of the drugs prescribed by the doctors were unavailable in the hospital pharmacy hence making the patients source them from external chemists at exorbitant prices. **Figure 3** illustrates the other responses from participants.

7.2. Patients' Characteristics and Non-Adherence to Medication

The first objective sought to describe the association between genders, age, marital status, education level and non-adherence to hypertensive medication. Research revealed no significant association ($r_{pb} = 0.13$, $p = 0.26$) on the contrary. The

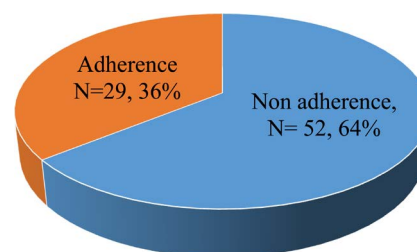


Figure 2. Distribution of respondents by non-adherence (N = 81).

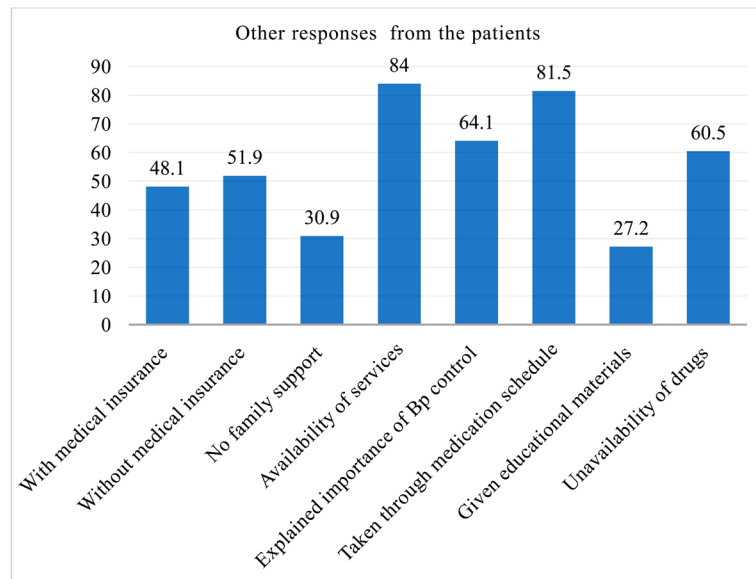


Figure 3. Other responses from the patients (N = 81).

findings contradicts the results of Courtenay (2000) and Tadesse, *et al.* (2017), who found in their study that non-adherence to antihypertensive medications is 1.3 times higher in male than in female patients. There was a negative negligible association between marital status and adherence to medication ($r_{pb} = -0.12$, $p = 0.25$) a finding that contradicts those of previous studies. A study by Chung, *et al.* [49] examined mediation between marital status and outcomes in patients with heart failure. It was found that unmarried patients with heart failure had a higher risk of cardiac events than married patients.

The study also revealed an insignificant ($r_{pb} = -0.06$, $p = 0.57$) correlation between patients' level of education and adherence to hypertension medication. However, there was a weak negative correlation between income and non-adherence to hypertension medication ($r_{pb} = -0.24$, $p = 0.04$). This suggests that low levels of income are associated with high levels of non-adherence. Antihypertensive medications are long term medications that need continual replenishing. One of the barriers in adherence to medications is the cost which hinders the continuity of treatment for patients with low incomes [50]. The main explanation for the current result is that not all medications are provided for free in the hospital and therefore patients have difficulties managing the cost of medications. Research has previously indicated that cost-related poor medication adherence may inform the definition of need and provide a justification for prescription drug non adherence [51].

The study found a low negative correlation between age ($r_{pb} = -0.27$), monthly income ($r_{pb} = -0.24$), and non-adherence to medication. Elderly people have been found to be more non-adherent to medication than young people. The findings of the study revealed a negative correlation ($r_{pb} = -0.27$, $p = 0.02$) between age and non-adherent to medication. This implies that young ages relates with high levels of non-adherence. This can be interpreted to mean that elderly

patients were more likely to miss drugs than young people. The findings confirm the results of the previous studies. A more recent study compared adherence and persistence across six chronic medication classes (Lucca, *et al.*, 2015). The findings further suggested that low levels of income are associated with high levels of non-adherence. Antihypertensive medications are long term medications that need continual replenishing. One of the barriers in adherence to medications is the cost which hinders the continuity of treatment for patients with low incomes [50].

Patient Related Factors Associated and Non-Adherence

Objective two sought to determine patient related factors associated with non-adherence to antihypertensive medication in patients followed at Chuka Referral Hospital. **Table 2** presents three inferential statistical tests for overall model evaluation. Logistic regression was conducted to assess if cost of medication, religious beliefs, age of the patient, their education level, preference to traditional medicine, and sociocultural factors were significant predictors of the likelihood of hypertension patients to adhere to medication. The Hosmer-Lemeshow test was used to goodness-of-fit of the model, $\chi^2 = 9.11$, $df = 8$, $p = 0.33$, which was insignificant ($p > 0.05$), suggesting that the model was fit to the data well. According to Field [52], Hosmer and Lemeshow's measure (R^2) was calculated as follows [53]:

$$R_L^2 = \frac{(-2LL(\text{baseline})) - (-2LL(\text{new}))}{-2LL(\text{baseline})} = \frac{92.709 - 77.172}{92.709} = 0.170$$

Hosmer and Lemeshow statistic ($R^2 = 0.17$) indicates the model accounts for 17% of the variation on non-adherence to hypertension medication as presented in **Table 3**. Nagelkerke R^2 estimate indicated that 26% of the variance in non-adherence to hypertension medication can be predicted by patient related factors (cost of medication, religious beliefs, age of the patient, their education level, preference to traditional medicine, and sociocultural factors). Cox & Snell R^2 showed that the six factors can account for 18% of the variation. The patient related factors; cost of medication, religious beliefs, age of the patient, their education level, preference to traditional medicine, and socio cultural factors together are significant predictors of non-adherence to hypertension medication, $\chi^2 = 17.14$, $df = 1$, $N = 81$, $p < 0.05$.

Table 2. Association between patients' characteristics and non-adherence to medication (N = 81).

Characteristics	Non-adherence (t_{pb})
Gender	0.127
Age	-0.271*
Marital status	0.129
Education Level	-0.064
Monthly income	-0.241*

* $p < 0.05$.

Table 3. Overall logistic regression model evaluation and goodness-of-fit statistics of predicting likelihood of non-adherence to medication (N = 81).

Test	R^2	χ^2	df	P
Overall model		17.144	1	0.000
Hosmer & Lemeshow	0.170	9.114	8	0.333
Cox & Snell	0.175			
Nagelkerke	0.256			

According to the results in **Table 4**, religious beliefs ($p = 0.038$) and cost of medication ($p = 0.01$) were significant predictors of non-adherence to hypertension medication. The odds ratios of the two significant predictors were 11.55 (95%, 1.14 - 116.93) and 6.887 (95%, 2.02 - 23.49). The odds of predicting the likelihood of patients not adhering to medication increases by 11.55 for each unit increase of religious beliefs and by about 6.89 for every unit increase in cost of medication. Atinga *et al.* [17] in their study found that patients resorted to herbs due to high cost of the prescribed medications and thus felt economically weak to continue buying the drugs, others simply did not want to get used to the medications which they cannot afford. For them, herbal medicines are cheaper, affordable and available, hence the earlier they started with them the better.

It is generally explained in a behavioral context where rituals and other related symbolic activities such as meditations, prayers, fasting, reading religious scripts, attendance at services are practiced by individuals according to their specific beliefs and modes of social organization. All of which are likely to influence adherence to medication. Medication non-adherence places a significant cost burden on healthcare systems. An improvement in hypertensive medication adherence will not only reduce the cost of treating the disease but also reduce the expense of managing the complications arising from non-adherence. The other factors; age of the patient, their education level, preference to traditional medicine and socio-cultural were insignificant predictors ($p > 0.05$) of non-adherence to medication. However, the six factors together were significant ($\beta = 1.05$, Wald's $\chi^2 =$

Table 4. Coefficients of the model predicting non-adherence to medication (N = 81).

	β	SE (β)	Wald's χ^2	Df	P	e^{β} (OR)	95% C.I.	
							Lower	Upper
Age	-0.37	0.29	1.55	1	0.21	0.69	0.39	1.23
Traditional medicine	-1.04	0.96	1.16	1	0.28	0.35	0.05	2.34
Religious beliefs	2.45	1.18	4.29	1	0.04	11.55	1.14	116.93
Social/cultural factors	-0.74	0.77	0.93	1	0.33	0.48	0.11	2.15
Cost of medication	1.93	0.63	9.50	1	0.00	6.89	2.02	23.49
Education level	-0.20	0.29	0.55	1	0.46	0.82	0.49	1.39
Constant	-2.96	1.50	3.89	1	0.05	0.05		

17.14, $df = 1$, $p \leq 0.05$, $OR = 0.35$). The overall correct prediction, 76.5% shows an improvement over the chance level which was 74.1%.

7.3. Challenge Facing the Medical Staffs

The study further sought to find out the challenges facing the medical staff at the clinic and four main challenges emerged as presented in **Table 5**.

Table 5 shows distribution of responses by health care providers on challenges they face at the medical clinic in regard to hypertension patient follow-up.

When asked to indicate the major challenges faced while undertaking their duties, 40% stated that stock outs of essential medicine for hypertensive patients, 10% felt that they had too many patients to handle, 10% cited low knowledge levels of patients on hypertension and 40% mentioned ignorance of patients. They pointed out that some patients sometimes go without taking drugs for days or take partial dosages.

Findings of this study on stocks outs of antihypertensive medicines collaborate evidence from Tanzania where review of availability of hypertensive drugs in year 2012-2013 pointed out stock outs [54]. Access to essential medicines still remains a challenge. Unavailability of hypertensive medicines disproportionately impacts poorer patients because most often they cannot afford to travel in search of cheaper medicines due to the high cost of transportation, for example. Poorer patients are also more likely to be unable to send relatives to purchase medicine in other towns/cities. As a result, they have to purchase the medicines at the closest private pharmacy, which commonly is the most expensive option because it may be the only pharmacy in Chuka town. Patients explained that medicines were often cheaper and sometimes given out at no cost at the government healthfacilities. Because the government facilities do not always have the medicines available and patients resorted to private pharmacies, the majority of patients lamented that medicines were very expensive.

The primary patient related barrier was the asymptomatic nature of hypertension with combination of low knowledge or unawareness of hypertension [55]. The findings of this study are consistent with the results which revealed low knowledge on hypertension. Correct knowledge on hypertension, its treatment and management creates understanding and prevents confusion. A study from Pakistan and Gaza demonstrated that patients who were aware of their disease and treatment had better adherence compared to those who did not [56]. However,

Table 5. Challenges facing medical staff at the hypertensive clinic (n = 10).

Challenges	Frequency	Percent
Stock outs of essential medicine for hypertensive patients	4	40.0
Low knowledge levels of patients on hypertension	1	10.0
Handling too many patients	1	10.0
Ignorance of patients on drug compliance	4	40.0

in contrast to these findings studies from developed world indicated no association between knowledge and adherence [57] [58].

A study done in Western Kenya on barriers and facilitators to nurse management of hypertension nurses reported that there was inadequate training and excessive workload. They expressed concern on overwhelming workload in the context of current duties and fear about additional duties related to hypertension management [55]. The result of this study reviewed that health care workers had too many patients to handle. Health care workers play a vital role in delivery of health care. The shortage of health care workers is partly due to migration of health personnel's in search of better standards of living, higher salaries, access to advanced technology and failure of counties to replace those who left the institutions. The shortages are multifaceted problem and improvement are needed if reduction of hypertension related morbidity is to be achieved.

A study which was set out to investigate hypertensive patients self-reported reasons for adhering to or ignoring medical advice regarding antihypertensive medication revealed that non-adherence was an active decision partly based on misunderstanding of the condition and general disapproval of drugs [59]. This confirms the results of this study where 40% of health providers felt ignorance was associated with non-adherence to antihypertensives.

7.4. Reasons for Non-Adherence by Medical Staffs

Health providers were asked what makes their patients miss drugs. According to the practitioners, the patient missed drugs because of ignorance (40%), polypharmacy (10%), denial (10%), lack of transport (10%), un-affordability of laboratory investigations and drugs (20%), and intolerance to side effect of the hypertension drugs (10%).

Cost of drugs and laboratory investigation are some of the reasons why patients did not adhere to hypertensive drugs, this is in line with a study done by Rajesh *et al.* [55] on barriers and facilitators to nurse management in hypertension. It revealed that there was un-affordability of hypertensive medications. Concerns about cost of chronic disease care went beyond the cumulative cost of life-long medications, to include the costs associated with consultation, laboratory testing, and transportation.

Health providers reported that side effect is a contributing factor to non-adherence. Fear of side effects by patient is that they may do more harm than good. Side effects experienced personally or by others and concern regarding potential side effect influences behavior. When patient are forced to choose between controls of an asymptomatic disease and side effect it's not surprising that patient may intentionally non-adhere [60].

Polypharmacy was a concern to some health care providers which is consistent with a study by Palterson and others who found out that patient with chronic medical conditions are most susceptible to poly pharmacy due to taking more medication for their other medical disorders [61].

7.5. Measures to Adopt to Curb Non-Adherence

When asked to state the measures that can be adopted to improve adherence to medication, majority of the medical staff (70%) felt that providing counseling services to patients would improve adherence to hypertension drugs. Effective counseling entails improving health status with adherence, providing information on adverse effects and contraindications, and promoting healthy behaviors.

It is crucial to emphasize controlling blood pressure and to list the risks of medication non-adherence. Patients need to be informed about what to do if they miss a dose. Encourage patients to keep an up-to date record of their blood pressure numbers. They also need to be explained that knowing their blood pressure levels is important, even when they're feeling fine. If their blood pressure is normal, they can work with their health care team to keep it that way. If their blood pressure is too high, treatment may help prevent damage to their body's organs. Make sure patients understand the concept of HPT a commonly used example likens blood pressure to water in a garden hose; blood pressure is the force of blood against the artery walls.

Educate patients on systolic/diastolic pressure and what constitutes a normal blood pressure reading. Health care counselors need to emphasize the implications of poor adherence, how to manage side effects, as well as stress the lifelong need for adherence. In particular, patients can be encouraged to utilize their social network as high level of social support can be associated with better adherence. Adherence to medication would be a suitable strategy to minimise the cost of treatment since it minimises the cost of dealing with side-effects resulting from non-adherence [62].

They also (20%) felt that availability of more hypertension diagnostic equipment would aid in better diagnosing the secondary hypertension. A significant number of patients with hypertension have multiple cardiovascular risk factors at the time of presentation [63]. Diagnosing and treating hypertension plays an important role in minimizing the risk of cardiovascular disease and stroke. Both routine and specialized biochemical investigations are paramount for investigation of patients and subsequent management. The test helps in identifying the individuals who are higher risk of dsglycemia, dyslipidemia, renal impairment, target organ damage and to exclude identifiable cause of hypertension [63].

MOH Cardiovascular guideline recommends that a referral hospital should have, echo machines, blood analysis machines, cardiac catheterization lab, facilities for telemedicine and critical care unit among other equipment in other levels of care [27]. Health care providers felt that the equipment would help them in risk screening, assessments and management of hypertensive patients.

Other (10%) felt that the nurses should use mobile phone for making follow ups. Use of mobile phones has spread among the communities [64]. Mobile phones are said to be the fastest adopted technology in low and high income countries [64]. New approach of model of health through phones is increasingly being used. Rapid adoption of smart phone technology creates a promising and

interesting platform to overcome medication non-adherence by providing drug intake reminders, offering healthy lifestyle education or keeping records of biometric measurements [64]. This strategy once adopted will overcome medication non adherence by providing drug intake reminders and clinic follow-ups.

8. Conclusions

Non-adherence to hypertension medication is a major problem at Chuka Level Five Hospital. More than half of the patients diagnosed with hypertension have been missing medication. This is due to lack of funds, time, forgetfulness and patient thinking that they had healed. Most of the drugs prescribed by the doctors were unavailable in the hospital pharmacy hence making the patients source them from external chemists at exorbitant prices. To practitioners, non-adherence to hypertension medication resulted from stock out and ignorance on the part of the patients. Unavailability of hypertensive medicines disproportionately impacts poorer patients because most often they cannot afford to travel in search of cheaper medicines due to the high cost of transportation. Poorer patients are also more likely to be unable to send relatives to purchase medicine in other towns/cities.

Patient related factors including cost of medication, religious beliefs, age of the patient, their education level, preference to traditional medicine, and sociocultural factors were together found to be significant predictors of non-adherence to hypertension medication at Chuka Hospital. Among the patient related factors, religious beliefs and cost of medication emerged as the most influential factors to non-adherent to hypertension medication. It was evident that elderly patients and those with low income levels are more likely to be non-adherent to hypertension medication than young and those with high monthly income. Education level did correlate with non-adherence of hypertensive medication. However, many of the patients knew how to read and write, hence capable of following doctor's directions and adhering to hypertension medication. Most of the patients had managed the diseases for a period not less than three years and such many are at the second stage of hypertension taking two or more hypertensive drugs.

Most of the patients catered for the hospital bills through personal medical insurance schemes and family support. Despite the high levels of non-adherence, the care providers were readily available to attend to them, explained to them the importance of B.P, took them through the schedule of medication and gave health educational materials on hypertension to some.

The study identified three strategies that can be adopted to minimize if not to eradicate non-adherence. First, effective counseling should be adopted to change the behavior of the patients. This would entail improving health status with adherence, providing information on adverse effects and contraindications, and promoting healthy behaviors. Secondly, availability of more hypertension medication equipment would also help to reverse the situation and lastly facilitating the practitioners to make adequate, regular and sustained follow-ups.

9. Recommendations

In order to address the high levels of non-adherent to hypertension medication, the study made the following recommendations:

1) There is a need for continuous supply of hypertension medications for the hospital to prevent patients from missing the drugs especially those who cannot afford to purchase them from private chemists.

2) The hospital should set aside some resources for making patients' follow-ups especially those are treated and left to go home. Community health workers should be deployed to follow up with elderly patients who are likely to forget their medication. Mobile phone text messages could be sent to the patients to remind them of taking drugs as scheduled.

3) Discussions with patients during routine practices are crucial to this process as they provide an opportunity for nurses to offer advice about behaviour change. Ultimately, nurses are key players in motivating adherence.

4) Forgetfulness which emerged as a reason for non-adherence may be due to personal beliefs that strict timing of prescription regimens isn't necessary. Under such circumstances, nurses can use positive reinforcement to increase motivation. For example, sharing and highlighting evidence of health improvements made because of their compliance could encourage and motivate them to remain compliant and achieve other health targets.

5) Patient education has been demonstrated to improve medication compliance and persistence across a broad range of conditions and disease severity and should therefore be adopted by the clinic managers as an integral part of hypertension disease management program.

6) There is a need for the government to subsidize all hypertension medication to make them affordable to all especially those with low-income levels.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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