

# Patient-level factors influencing hypertension control in adults in Accra, Ghana

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## Research article

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# Abstract

**Background** Effective control of blood pressure is necessary to avert the risk of cardiovascular diseases from uncontrolled hypertension. Despite evidence on the benefits of hypertension control, rates of control in Ghana remain low. **Objective** This study assessed the patient-level factors that influence hypertension control among adults in Accra, Ghana. **Methods** 360 patients from two hospitals in Accra, Ghana were enrolled into the study. Client socio-demographic characteristics were tabulated and associations between client characteristics and hypertension control were estimated using chi-square tests and logistic regression. **Results** Approximately 27.8% of clients were adherent to their antihypertensive medications. High pill burden predicted non-adherence [AOR=0.20 (95% CI 0.08; 0.48)] . The client's sex [AOR=3.13 (95% CI:1.48-6.62)], presence of a comorbidity [AOR=2.59 (95% CI 1.35; 4.96)] and adherence to medication [AOR=6.60(3.54-11.95)] predicted increased BP control among clients. An increased pill burden however reduced BP control [AOR=0.42(95% CI: 0.23-0.77)]. Majority of patients reported forgetfulness, side effects of medication and high pill burden as reasons for missing their medications. **Conclusion** There is the need for better implementation of hypertension treatment guidelines with emphasis on client education on hypertension, its management and reducing patient pill burden to improve adherence and hypertension control.

## Introduction

Hypertension is recognized as a public health issue worldwide. Despite global policy agenda set to address this challenge (1), blood pressure control remains elusive and hypertension is the leading cause of cardiovascular disease (CVD) worldwide(2). Although there is evidence to show that awareness, treatment and adherence to anti-hypertensive medication are essential for hypertension control(3) all three factors remain low across different countries and various settings (4). In sub-Saharan Africa, hypertension is the most rapidly increasing cardiovascular disease affecting over 20 million people and the most common cardiovascular cause of hospitalization and mortality(5).

Unlike more developed countries of the world, low and middle income countries (LMICS) continue to experience significant mortalities from infectious diseases. This is particularly influenced by socioeconomic determinants such as poverty, sex and gender norms, housing conditions and climate (6). The epidemiologic transition in developing countries nonetheless leaves in its wake a myriad of chronic diseases. The occurrence of CVDs in the presence of prevalent infectious diseases contributes to the increasing mortality, and places many developing countries into a situation of double burden of disease (7).

Africa, compared to the rest of the world, has the highest hypertension prevalence with 46% of adults above 25 years being hypertensive (8). In Ghana, the Ghana Health Service (GHS) 2014 Annual Report attributed the highest outpatient cases between 2011 and 2014 to hypertension. New outpatient cases of hypertension diagnosed within that same period, showed the Greater Accra and Ashanti region recording the highest number of cases of 152,545 and 140,947 respectively. In Ghana, 63% of women and 86% of

men who are hypertensive reported being unaware of their condition according to the Ghana Demographic Health Survey 2014 (9). More recently, 42.6-50% of persons with hypertension are aware of their condition (10). As a preventative measure, the number and proportion of facilities running NCD Clinics and providing screening services for hypertension and diabetes was increased (GHS, 2015).

Despite the existence of extensive evidence on the benefits of hypertension treatment, control has been unsatisfactory (2, 11, 12). Worldwide, assessments show less than 50% of treated hypertensive patients actually reach their BP goals; increasing their risk of suffering from hypertension-induced complications (13). Recent studies on hypertension control have shown that, client, clinician as well as the health environment/health system factors all influence the achievement of hypertension control (14). Client related factors include poor medication adherence, beliefs about hypertension and its treatment, the complexity of the regimen, pill burden, taking multiple drugs, medication side effects and patient beliefs (15, 16). Ogedegbe, (2008), posits that even though, several factors relating to patient, physician, and health-care system may be responsible for suboptimal control of hypertension, the most pertinent is medication adherence, given its centrality to the other factors.

Control rates of hypertension vary widely across and within populations. Various studies have reported rates of 32.9%, 49%, 42.3% and 34% among similar population groups (2, 5, 16, 17). In Ghana however, control rates are relatively lower and range from 4% to 12% (8, 10). Available studies that have established the high prevalence of uncontrolled hypertension in Ghana, however, provide little information on the factors that influence hypertension control in the Ghanaian setting (8, 11, 18).

There exists an unequivocal body of evidence about the effectiveness of pharmacological treatment of blood pressure in reducing cardiovascular events (19). The Seventh Report of the Joint National Committee (JNC 7) recommends that all patients be classified as normal (120/90), pre-hypertensive (120-80 – 139/89), or hypertensive based on the level of the systolic and/or diastolic Blood Pressure (BP). Hypertension control is therefore achieved when a hypertensive individual attains blood pressure targets of less than 140/90 mmHg. For patients with diabetes and/or CKD, targets are set even lower at < 130/80 mmHg for beneficial treatment outcomes (20).

Target 6 of the nine endorsed global NCDs targets, call for member states to achieve a 25% reduction in elevated blood pressure within their specific settings (21). Reducing hypertension related mortality therefore requires that the proportion of clients with controlled hypertension increases. This study therefore focuses on patient-level factors, particularly, adherence to hypertension medication in hypertensive adults in the Greater Accra Region of Ghana. Data from this study will support calls to develop and implement comprehensive policies which will inch the country closer to achieving the global targets of control of the condition and reducing the resulting mortalities.

## Methods

### Study Design

This was a cross-sectional survey of adult hypertensive patients attending two hospitals in the Greater Accra Region of Ghana.

## Participants

A total of 360 participants were interviewed in this study. Only adult (18 years and above) subjects were included in the study.

Inclusion criteria: Hypertensive patients who have been on treatment for not less than a year.

Exclusion criteria: Pregnant women, patient who were taking drugs that could increase blood pressure as well as those diagnosed with psychiatric conditions were excluded from the study.

## Sampling procedure

Clients were selected through simple random sampling on clinic appointment days in the two health facilities from 7<sup>th</sup> May – 29<sup>th</sup> June 2018. The sample from each health facility was proportional to the case load.

## Data collection Method/ Technique and Tools

Data was collected using a structured questionnaire composed of seven (7) different sections. The first section of the questionnaire recorded a minimum of two (2) and a maximum of five (5) BP readings inclusive of previous visits to the hospital. This section was completed after accessing this information from the individual patient folders. The BP readings recorded were taken by the healthcare provider as part of the clinic routine. Blood pressure readings were taken in the non-dominant arm using an automated sphygmomanometer with the patient in an upright sitting position after having rested for at least 10 minutes.

The second section consisted of questions on the socio-demographics of participants including age, sex, marital status, level of education, income level, religion, occupation, and area of residence. Section three examined patients' knowledge about hypertension, its causes and complications as well as comorbidities and the associated medications. Information about the taking of non-prescribed drugs was also obtained. A final knowledge score was obtained for each respondent out of 13. The respondents were scored on their knowledge of a normal adult blood pressure and the number of causes and complications of hypertension they had knowledge of. A score of 9 -13 was considered as having "Good knowledge", scores of 5 -8 were categorized as "Moderate knowledge" and scores of 1 – 4 were termed "Poor knowledge".

The fourth section consisted of questions measuring medication adherence. The Morisky 8 Item Measurement Adherence Scale (MMAS) was adopted (22). With seven questions requiring either “YES” with a score of 0 or “NO” with a score of 1. The last question is a 5-point Likert scale response option; (A) Never/Rarely (B) Once in a while (C) Sometimes (D) Usually (E) All the time. Where (A) corresponds to a score of 1 and a score of 0 is given for the answers B to E. Question five (5) was however peculiar and “YES” was scored as 1 while “NO” was scored as 0, since the question assessed a positive adherence behaviour and not the negative like the other questions in the scale.

Using the Morisky scale, an overall adherence score was obtained from the sum of scores for the 8 items with a possible range of 0 to 8, where higher scores indicate higher adherence. A score of eight (8) was categorized as high adherence, scores of six (6) or seven (7) were moderate adherence while scores below six (6) were considered as low adherence. When adherence was dichotomised, patients with scores from 7 to 8 were considered as being adherent to their medication, while those who scored 6 and below were considered as being non-adherent.

Section five (5) assessed patients’ perceptions about the control status of their hypertension as well as their perception about the efficacy of antihypertensive medications being taken. Finally, the sixth section, sought to assess factors influencing client adherence to anti-hypertensive medication were asked. These include questions on the adverse effects experienced from use of antihypertensive medication, high pill burden /polypharmacy, cost of medications, forgetfulness, and belief in divine intervention or belief in being cured of hypertension among others.

## Data Analysis

Cross-tabulations of client socio-demographic variables, factors influencing adherence, factors influencing hypertension control were undertaken. Simple descriptive analysis was conducted using Pearson’s  $\chi^2$ . Hypertension control status of each client was determined by calculating the average of all SBP and DBP readings recorded. Student’s T-test was used to test the association between systolic and diastolic levels and adherence. Simple logistic regression was conducted on socio-demographic and client level factors to determine their influence on adherence as well as predictive strength on hypertension control. All analyses were conducted in STATA and statistical significance was set at 95% confidence interval.

## Ethical Considerations

Ethical clearance was sought from the Ghana Health Service Ethical Review Committee with approval number (GHS-ERC: 037/12/17). Permission to conduct research at Ghana Health Service facilities was also sought from the Regional Directorate of Ghana Health Service, Greater Accra region and subsequently from the Municipal Directorates of both facilities.

# Results

# Socio-demographic Characteristics of Respondents

A total of 360 clients participated in the study. By sex, 105 males and 255 females were interviewed with the mean age of 61.9 ( $\pm 10.7$ ) with ages ranging from 27 to 94 years. More than half of respondents were aged over 61 years. Respondents were mostly married, and few had attained tertiary education (4.7%) (Table 1 in the Supplementary Files).

## Adherence levels of respondents.

The mean MMAS-8 score was 5.6 ( $\pm 1.4$ ) with minimum and maximum scores of 1 and 8 respectively. Out of the 360 clients studied, 155 (43.1%) indicated low adherence, 185 (51.4%) showed moderate adherence while 20 (5.6%) indicated high adherence. When adherence was dichotomized, 72.2% respondents were found to be non-adherent while 27.8% were adherent to their antihypertensive medications.

Table 2 (in the Supplementary Files) shows the association of socio-demographic characteristics and medication adherence of respondents in the study. Adherence to antihypertensive medication did not significantly differ between male and female respondents, even though more women recorded higher levels of adherence in bivariate analysis. An association between respondent's age and their level of adherence however was identified ( $p < 0.001$ ). Among patients aged 27-45 years, 5.3% showed high level of adherence to their antihypertensive medications. Among older clients (46-60 years), 7.0% had high adherence while 4.5% of those 61+ years showed high adherence. Detailed distribution of the level of adherence by other socio-demographic factors can be found in Table 2.

### Characteristics of adherent and non-adherent hypertension patients

Table 3 (in the Supplementary Files) displays characteristics of hypertension patients by adherence. Patients who were adherent to their medications had a significantly lower blood pressure SBP and DBP compared to those who were not ( $p < 0.001$ ).

### Respondents' knowledge about hypertension

Approximately 73.3% of respondents showed poor knowledge of hypertension, 25.6% showed moderate knowledge and only 1.1% showed good knowledge of hypertension (Results not shown).

### Reasons for low level/non-adherence among respondents

Table 4 (in the Supplementary Files) presents reported reasons for low or non-adherence among the respondents. Majority of respondents (70.5%) cited forgetfulness as the reason for missing their medication. Another reason that was prominently cited was the high pill burden.

### Determinants of medication adherence

Several client factors that influence adherence were assessed and shown in table 5 (in the Supplementary Files). Taking a higher number of antihypertensive pills was associated with a reduced adherence to medication AOR=0.20 [95% CI: 0.08, 0.48]. The odds of being adherent in respondents who took 3-4 antihypertensive pills per day compared to 1-2 pills per day was reduced. This was statistically significant in both crude and adjusted analysis.

### Hypertension control among respondents

Various socio-demographic characteristics were assessed against hypertension control. By sex, among female respondents, 69 (27.1%) had achieved hypertension control and 15 (14.3%) of male respondents had achieved hypertension control. This association was found to be significant ( $p<0.009$ ). Table 6 (in the Supplementary Files) contains further details on hypertension control across various socio-demographic factors.

### Associations between client factors and hypertension control

Assessing patients by comorbidity showed that 18% of patients who had no comorbidities had achieved hypertension control. However, more patients with some comorbidity had achieved hypertension control (23.3%). Hypertension control was nonetheless lower among patients who suffered from CKD and dyslipidaemia. No respondent who also suffered from CKD had hypertension control while 24.3% of those who did not suffer from CKD had controlled hypertension ( $p<0.035$ ). Among patients with dyslipidaemia, 8.9% had controlled hypertension ( $p<0.006$ ). Table 7 (in the Supplementary Files) has further details of factors associated with hypertension control.

### Determinants of hypertension control

Table 9 (in the Supplementary Files) shows the determinants of hypertension control among clients. Females were 3.13 times more likely to have their BPs controlled compared to men. A 70% reduction in the odds of having controlled hypertension was identified among patients who suffered from dyslipidaemia as a comorbidity, compared to those who did not suffer this comorbidity [AOR=0.27 (95% CI 0.09, 0.84)].

Taking a higher number of antihypertensive pills per day was also associated with reduced likelihood of attaining hypertension control. Given that a respondent took 3-4 antihypertensive pills per day, the odds of having a controlled BP was reduced by 58% [AOR=0.42 (95% CI 0.23, 0.77)] compared to those who took 1 to 2 pills. (Table 9 in the Supplementary Files).

## Discussion

The findings of this study suggest large variations in antihypertensive medication adherence among clients. The discovery that only 27.8% of clients studied showed high adherence to medication is a worrying finding in the presence of local and global targets for blood pressure control. It is nonetheless, higher than estimates from earlier studies (10, 23). It is plausible that the setting for this study, being in a

health facility, may position clients to have more frequent visits or appointments with their physicians and thus be prompted more regularly about adherence to treatment regimens. These subtle reminders could have influenced adherence compared to clients in the community that may have less contact with facilities or providers. A similar study conducted in a facility in Nigeria using the MMAS-8 also reported high adherence in 7.5% of patients, similar to rates observed in this study (5).

Factors that were significantly associated with increased BP control were sex, the presence of a comorbidity and adherence to medication. The absence of significant associations between other socio-demographic factors and adherence is at odds with other studies that identified poor socio-economic status, unemployment and illiteracy to be risk factors for poor adherence (22).

Females achieved BP control more than their male counterparts, a finding which may be associated with poorer health seeking habits of men compared to women. Medication adherence was associated with the presence of a comorbidity. Building on the fact that more clients in this study with comorbidities had achieved BP control than those without comorbidities, it is plausible, that among comorbid clients, improved adherence to antihypertensive medications may be the result of patients being increasingly aware of the risks associated with their conditions. This awareness of higher risk may have resulted in the increased adherence to the therapy prescribed, thus the consequent attainment of BP control. This finding gain traction from studies that suggest that patients who are prescribed multiple pills are more motivated to take medication because of the perceived severity of their condition and are less likely to have missed doses (24).

Among clients who report taken 3-4 pills per day, the observed reduction in adherence and control may be a result of the stress of a high pill burden. Similar results from more developed settings showed that patients who were on three or more antihypertensive pills were likely to miss their medication or have a treatment gap compared to those who were being treated on two pills (25). Adherence among such patients could be improved with the use of fixed dose combination (FDC) poly-pills to simplify treatment and improve adherence (26-28).

No significant association between the duration of hypertension and medication adherence was found in this study. The mean duration of hypertension also did not vary between adherent and non-adherent respondents, similar to results of Olowe & Ross (29). Intriguingly, although our findings on duration of hypertension are at odds with those of Dennis et al., (7), the relatively higher SBP and DBP readings recorded among non-adherent patients, are comparable with those obtained from this study.

Knowledge of hypertension is critically low among hypertensive patients in Ghana. These low levels of knowledge are comparable to levels recorded in South Africa where only 0.3% of respondents were found to have good knowledge (29). Surprisingly whereas others have found significant associations between knowledge of hypertension and hypertension control (22, 30), no significant association between knowledge and hypertension control was observed in this study.



The reported reasons for missed medications highlighted forgetfulness as the major culprit. For adult patients, it is plausible that forgetfulness is due to competing psychosocial demands of daily life. Medication side effects, high pill burden, cost of medication, belief in divine intervention, belief that one is cured, and distrust of orthodox medicine were reasons given by respondents for non-adherence. These reasons are nonetheless similar to those identified in a Nigerian study on hypertension medication adherence (5).

There is evidence to show the strong association between medication adherence and BP control(31). This study reports half of respondents who were adherent to their antihypertensive medications, were found to have attained BP control compared to the few non-adherent clients who attained control.

## **Conclusion**

The study concludes that levels of medication adherence are low among hypertensive patients with only about a third of patients adhering to their medications. The study also highlights that the presence of a comorbidity, dyslipidaemia and high pill burden influence levels of adherence and consequently BP control. This study adds to the growing body of evidence that expatiates on the consistently low rates of hypertension control in Ghana over the last decade(32).

Non-adherence among respondents was largely due to forgetfulness, high pill burden and side effects. Furthermore, despite the absence of any association between knowledge and hypertension control, this study shows that knowledge of hypertension is critically low among hypertensive patients.

## **Recommendation**

As evident from this study, patients' adherence to medication significantly influences their control of their BPs. Physician-patient communication on the importance of adherence to treatment, improvement in condition or otherwise must also be encouraged to foster awareness and adherence. There is also need for treatment guidelines with emphasis on the use of polypills to reduce pill burden and improve adherence.

## **List Of Abbreviations**

BP Blood pressure

CVD Cardiovascular disease

LMICS Low and middle income countries

GHS Ghana Health Services

NCDs Non-communicable diseases

LEKMA Ledzokuku Krowor Municipal assembly

BP Blood Pressure

CI Confidence Interval

CKD Chronic Kidney Disease

CVD Cardiovascular Disease

DBP Diastolic Blood Pressure

FDC Fixed dose combination

SBP Systolic Blood Pressure

## **Declarations**

### **Ethics approval and consent to participate**

Ethical clearance was sought from the Ghana Health Service Ethical Review Committee with approval number (GHS-ERC: 037/12/17). Permission to conduct research at Ghana Health Service facilities was also sought from the Regional Directorate of Ghana Health Service, Greater Accra region and the Municipal Directorates of both facilities. Informed consent was obtained from all participants after the objectives, procedures and potential risk and benefits of the study had been thoroughly explained to them.

### **Consent for publication**

All Personal identifiers were excluded from the data before analyses were performed.

### **Data Availability**

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

### **Competing interests**

The authors declare that they have no competing interests.

### **Authors Contributions**

DEO, KT and AM conceptualized the research topic. DEO analyzed the data. DEO, AM, EMA, AL, JA and KT were major contributors in writing the manuscript. All authors read and approved the final manuscript.

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## Tables

Due to technical limitations, tables 1 through 9 are only available as a download in the supplemental files section.

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

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