Original Research Article

Title: Determinants of medication non-adherence in hypertension management among patients seeking healthcare at a facility in Ghana

Abstract

Background: Globally, hypertension is spreading like a pandemic and is now a problem for every community. It is well established that it has negative impact on population, acting as a significant risk factor for cardiovascular disease with consequent multi-organ dysfunction. In this study, patients evaluating their healthcare at a hypertensive clinic at Volta River Authority Hospital, Akosombo, were assessed the determinants that were associated with poor adherence to anti-hypertensive medication.

Methodology: In order to gather primary data for this descriptive cross-sectional health facility based study, structured questions were used to recruit 235 participants using a simple random sampling technique. With the agreement of the participants data was collected in person and one on one with participants. After the data were coded and entered into Stata version 16, descriptive and inferentially data were analyzed and results were presented visually and in tables. A p-value less than 0.05 was regarded as statistically significant at a 95% confidence interval between the dependent and independent variables.

Results: The study found that 47.5% of poor adherence to anti-hypertensive medication among patients. Factors such as non–formal education [P=0.014], Alcoholic intake [P=0.038], inability to afford the cost of care [P=0.001] and verbal communication between provider and patient [P=0.010] had an increased odds of contributing to poor adherence of anti-hypertensive medication among patients.

Conclusion: Poor adherence to anti-hypertensive medication was high contributing to significant complications such as stroke and related organ damage. Factors such as non-formal education, alcohol intake, non-affordability of cost of services and verbal communication on medication prescription contributed to the poor adherence.

Keywords: Hypertension, Medication, Non-adherence, Determinant, Healthcare

Background

Most populations are progressively affected by the worldwide pandemic of hypertension which has contributed to the occurrence of cardiovascular diseases(1–3). Hypertension is clinically, termed as a systolic blood pressure greater than 140 mmHg and or a diastolic blood pressure less than 90 mmHg (4). Though hypertension is known to be one of the non-communicable diseases in both industrialized and developing countries constituting a serious threat to public health (2).The obstacles to managing hypertension arise from poor awareness, treatment, and control of hypertension particularly in Sub-Saharan Africa (5). Due to a complex interplay of circumstances, including a lack of knowledge about hypertension and beliefs that disagree with the accepted medical paradigm on etiology and therapy, people with hypertension have poor management(6). The inability of a patient knowing a medicine's usage and its adverse effects are common grounds for non-adherence to medication (2,7). As such low medication knowledge have been identified as a significant barrier to managing hypertension among hypertensive patients(5).

Medication adherence is "the degree to which a person's medicine-taking behaviour agree-upon expected medical norms(3). On the other hand, medication non-adherence is the degree at which patients actions

and behavior towards medication does not confirm to the directives of a health practitioner (8). Patients with high blood pressure who don't take their medications as prescribed run the risk of stroke, heart attack, renal failure, and blindness (1,5,9). This has negative impact on a workers' productivity and efficiency as well as rising socioeconomic burdens, reduced work output, and poverty in most developing countries(5). For instance available body of knowledge revealed that about 45.2% of hypertensive patients who do not adhere to medications suffer from serious complications (10,11) such as heart attack, stroke, heart failure, and kidney damage(12).

A prevalence of 27% of hypertension is recorded among the Ghanaian population with a one in every four Ghanaian adult patient being hypertensive, hence the persistence of hypertension non-medication adherence causing major hospitalization and hypertension-related morbidities and mortalities (13). Although lowering risk of disease complications through medication compliance would reduce the risk of these complications (5). However, anti-hypertensive medication ineffectiveness has been linked to poor adherence and treatment, poor socioeconomic status, and health care systems factors. As such planning a blood pressure control strategy to prevent risk of cardiovascular disease and related complications are paramount to hypertensive management (14,15)

Despite the wealth of literature available in the determinants of anti-hypertensive medication non-adherence, there are inadequate studies on the health related factors that contributes to medication non-adherence. Again, coupled with the paucity of data on medication compliance among hypertensive patients at the hospital. It is important to understand the full extent of how health system factors contribute to anti-hypertensive medication non-adherence among patients. Therefore, this study aimed at examining the determinants of poor-adherence to anti-hypertensive medication among patients at the hospital so that effective measures can be implemented to curtail the complications associated with medication non-adherence among patients.

Methods and Materials

Study Design

In order to identify the determinants of poor adherence to medication and the variables driving their non-adherence, this study employed a descriptive cross-sectional survey to enroll high blood pressure patients who sought medical care at the hypertensive clinic at the hospital.

Study setting

The Volta River Authority Hospital is located at Akosombo in the Eastern part of Ghana. The hospital serves as the major health facility in the municipality providing both outpatient and inpatients services to patients. In this study, all patients diagnosed with high blood pressure who enrolled at the hypertension clinic for medication between July 2022 to September 2022 at the Hospital constituted the study population. All adult patients with high blood pressure who received anti-hypertensive medication from the facility were included in the study. Recently diagnosed hypertensive patients on medication for more than three months were also included. Additionally, patients who voluntarily agreed to participate in the study were taken into account for enrollment. Patients who met the inclusion criteria but were very ill and mentally challenged were excluded. Aside from individuals who declined consent to participate in the trial, patients who had only recently registered or had been enrolled for less than three months were also excluded from the study.

Sampling and Data Collection procedures

This study enlisted 235 hypertensive patients on medication at the facility and considering the challenges of obtaining adequate sample size, a convenience sampling technique was employed in selecting consented and eligible participants into the study. A structured questionnaire was developed in relation to the study objectives and this was partitioned into three sections. Section A, which was made up of

nineteen questions comprised of the sociodemographic and clinical characteristics of participants influence of hypertension medication. Section B, also consisted of thirteen item scale that measured participants' hypertension medication status and Section C, consisted of eleven questions that measured the health system related factors that influence participants' medication non-adherence at the facility. The questionnaire was administered to participants at the hypertensive clinic after the participants have been attended to by a clinician and have been discharged to go home. The questionnaires were administered one on one with participants and a research assistant was trained to assist the study participants attend to the questions.

Data analysis

After data collection, data was managed by checking and removing inconsistent responses and codes were assigned to categorical variables before entering the data into Statistical Package for Social Sciences (SPSS) version 26 (Chicago) which was used to analyze the study data. Mean standard deviation was conducted for continuous variables with normal distribution while categorical variables were presented as frequencies and percentages. The connection between the dependent variable and the independent variables to anti-hypertensive medication non-adherence was conducted using the Pearson Chi-square testing. To ascertain the degree of relationship between the independent and dependent variables, a binary logistic regression was performed and a P-value less than 0.05 was regarded as statistically significant at a 95% confidence interval. Antihypertensive drug adherence was categorised as "Good adherence" and "poor adherence". Participants with scores below the anti-hypertensive medication mean score were labeled as having poor medication adherence, while those with scores above the mean score were classed as having good anti-hypertensive medication adherence.

Ethical considerations

The management of the hospital was consulted for study approval. Participants were given the opportunity to indicate their willingness to participate in the study by giving their informed consent. Before the study began, consent was gained from the hospital's health management team after copies of the research proposal and an introduction letter were delivered to them. Before each participant was enrolled, the informed consent form was read to them and explained in a language they could understand. Each study participant then signed the consent document or used their thumbprint to indicate their agreement to partake in the study.

Results

The study recruited 221 out of 235 and there was a 94.0% response rate. The mean age of participants was 56±11, (29-78) years. About 72(32.6%) of the were between the ages of 50-59 years while 68(30.8%) fell between 20=9-39 years. About 126(57.0%) were males while 95(43%) were females. Most 152(68.8%) were married compared to 54(24%) who were single. About 81(36.7%) were Akan, whilst 70(31.7%) and 41(18.6%) were Ewes and Ga's respectively. The majority 177(80.1%) were Christians while Moslems 22(10%) and traditionalists 22 (10.0%) shared the same proportions. About 90(40.7%) had three or more children, 76 (34.4%) had two children while 32(14.5%) had at least one child. About 78(35.3%), 55(24.9%) and 46(20.8%) respectively had tertiary education, non-formal education and secondary education. 89(39.4%) were employed compared to 55(24.9%) self-employed and 41(18.6%) unemployed participants. With regard to participants' family systems, the majority of 178(80.5%) had monogamous families whilst 43 (19.5%) had a polygamous family A little above average 125(56.6%) uses public transport whilst 96(43.4%) had private transport. Most 110(49.8%) had a far distance to a health facility whilst 74(33.5%) were close to a health facility. About 84(38.0%) had

hypertension between 1-5 years, 49(22.2%) had their 6-10 years and 57(25.8%) had more than ten years. About 126(57%) had no comorbidity whilst 95(43%) had one or more comorbidities. Again, 152(68.8%) had a family member diagnosed with hypertension whilst 69(31.2%) said otherwise.

Concerning the payment of participants' hospital fees, 135(61.1%) pay their health care costs whilst 56(25.3) are paid by participants' children. Most 189 (85.5%) do not use or smoke tobacco, 122(55.2%) do not take alcohol whilst 99(44.8%) drink alcohol. Additionally, about 124(56.1%) do not use herbal drugs as an alternative to anti-hypertensive medication whilst 97(43.9%) use them. The majority 194(87.8%) had been registered with one or more medical insurance organizations whilst 27 (12.2%) had not done that (Table1).

Table 1: Socio-demographic characteristics of participants

Variable	Category	N=221	Percentage (%)
Age (56±11 years)			
	29-39 years	68	30.8
	40-49 years	0	0.0
	50-59 years	72	32.6
	60-69 years	41	18.6
	70-79 years	40	18.1
Sex			
	Male	126	57.6
	Female	95	43.0
Marital status			
	Married	152	68.8
	Single	54	24.4
	Co-habiting	15	6.8
Ethnicity			
	Akan	81	36.7
	Ga	41	18.6
	Ewe	70	31.7
	Others	29	13.1
Religion			
	Christian	177	80.0
	Islam	22	10.0
	Traditional	22	10.0
Number of children			
	No child	23	10.4
	One child	32	14.5
	Two children	76	34.4
	Three and more	90	40.7
Education			
	Non-formal	55	24.9
	Basic	42	19.0
	Secondary	46	20.8

	Tertiary	78	35.3
Employment			
	Employed	87	39.4
	Retired	38	17.2
	Unemployed	41	18.6
	Self-employed	55	24.9
Family type			
	Monogamous	178	80.5
	Polygamous	43	19.5
Mode of transport			
	Private	96	43.4
	Public transport	125	56.6
Distance to the health facility			
	Near	74	33.5
	Far	110	49.8
	Not sure	37	16.7
Duration of HPT medication			
	<1 year	31	14.0
	1-5 years	84	38.0
	6-10 years	49	22.2
	>10 years	57	25.8
Presence of comorbidity			
	Yes	95	47.0
	No	126	57.0
Family history of hypertension			
	Yes	152	68.8
	No	69	31.2
Caters of the hospital bill			
	Self	135	61.1
	Children	56	25.3
	Family/friends	30	13.6
Tobacco use/ smoke			
	Yes	32	14.5
	No	189	85.5
Alcohol intake			
	Yes	99	44.8
	No	122	55.2
Use of herbal medicines			
	Yes	97	43.9
	No	124	56.1
Presence of medical insurance			
	Yes	194	87.8
	No	27	12.2

HPT: Hypertension

About 108(48.9%) indicated that they sometimes forget to take their medication whilst 79(35.7%) said none of the time and 28(12.7%) most of the time forget to take their anti-hypertensive medication. 98(44.3%) and 97(43.9%) of the participants revealed that none of the time and some of the time decide not to take high blood pressure medication respectfully. Additionally, about 111(50.2%) of the participants established that some of the time they eat salty foods. Most 130(58.8%) indicated that none of the time do they shake salt on food before eating. however, 72(32.6%) revealed they sometimes do. In addition, about 120(54.3%) none of the time eats fast food whilst 71(32.1%) sometimes consume fast food. About 76(34.4%) sometimes get the next appointment whilst 75(33.9%) all the time get the next appointment for medication. About118 (53.4%) of the participants sometimes miss the next appointment whilst 70(31.7%) none of the time miss next appointment. Almost half of 100 (45.7%) of the participants none of the time leave the facility without taking drugs whilst 98(44.3%) sometimes do leave the facility without taking drugs. About 108(48.9%) sometimes run out of high blood pressure pills, 81(36.7%) do not run out of pills and 24(10.9%) most of the time run out of blood pressure pills. 107(48.9%) of the participants sometimes miss their blood pressure pill one to three days before going to the health facility whilst 87(39.4%) do not run out of medications. However, about 18(8.1%) most of the time run out of blood pressure pills. Most 118(53.4%) of the participant's indicated that none of the time do they miss taking their high blood pressure pills when they feel better, 79(35.7%) sometimes do so and 14(6.3%) most of the time miss taking medication when they feel better. The majority 175(79.2%) of participants indicated none of the time do they take someone's drugs whilst 39(17.6%) sometimes take someone's high blood pressure pills. Adding to the above findings, 152(68.8%) of the participants revealed none of the time do they miss taking their high blood pressure pill when they feel care less whilst 57(25.8%) sometimes do miss taking high blood pressure pills when they care less (Table 2).

Table 2: Distribution of hypertensive medication (using Hill Bone Adherence scale)

How often do you	None of the time, n (%)	Some of the time, n (%)	Most of the time (%)	All of the time, n (%)	Mean (SD)
Forget to take HPT medication	79(35.7)	108(48.9)	28(12.7)	6(2.7)	1.85±0.75
Decide not to take HPT medication	98(44.3)	97(43.9)	25(11.3)	1(0.5)	1.68±0.69
Eat salty foods	84(38.0)	111(50.2)	21(9.5)	5(2.3)	1.76±0.71
Shake salt on food before eating	130(58.8)	72(32.6)	18(8.1)	1(0.5)	1.50±0.66
Eat fast foods	120(54.3)	71(32.1)	21(9.5)	9(4.1)	1.63±0.82
Get next appointment before hospital exit	22(10.0)	76(34.4)	48(21.7)	75(33.9)	2.79±1.02
Miss scheduled appointment	70(31.7)	118(53.4)	25(11.3)	8(3.6)	1.87±0.75
Leave the facility without taking medicine	100(45.2)	98(44.3)	17(7.7)	6(2.7)	1.68±0.73
Run out of HPT pills	81(36.7)	108(48.9)	24(10.9)	8(3.6)	1.81±0.77
Miss HPT medicine 1-3 days before hospital	87(39.4)	107(48.4)	18(8.1)	9(4.1)	1.77±0.77

Miss taking HPT drugs when better	118(53.4)	79(35.7)	14(6.3)	10(4.5)	1.62±0.79
Take someone's HPT pills	175(79.2)	39(17.6)	6(2.7)	1(0.5)	1.24±0.52
Miss taking HPT drugs when caring less	152(68.8)	57(25.8)	7(3.2)	5(2.3)	1.39±0.66

[N]: None of the time, [S]: Some of the time, [M]: Most of the time, [A]: All of the time

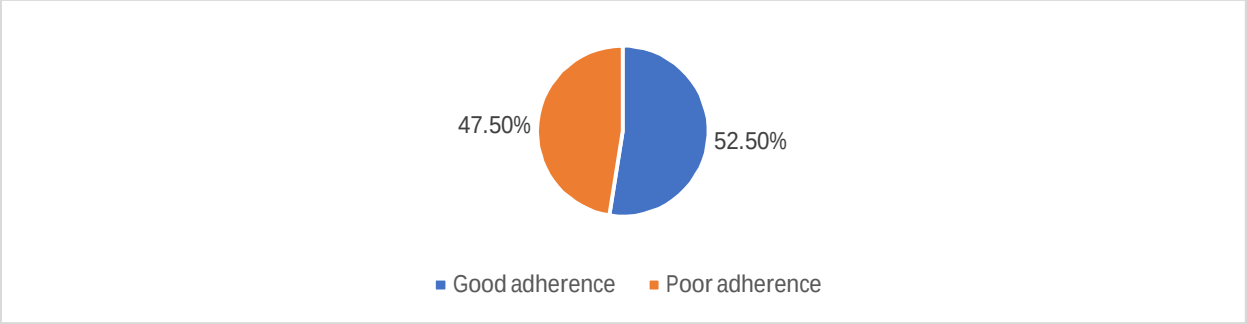

Figure1: Distribution of participants' anti-hypertensive medication

About 116(52.5%) of the participants established a good adherence to anti-hypertensive medication whilst about 105(47.5%) were found to poorly adhere to anti-hypertensive medication (Figure 1).

Most 214(96.5%) participants indicated that they trust the services of medical practitioners whilst 7(3.2) said otherwise. Most 194(87.8%) were satisfied with the consultation of practitioners which is evidenced by about 185(83.7%) establishing a good relationship with the clinicians. Most 165(74.7%) were able to afford the cost of care whilst 56(25.3%) encountered challenges. Most 187(84.6%) indicated they had access to available services. 170(78.9%) revealed they do not enter reimbursement problems whilst 51(23.0%) indicated otherwise. With the mode of communication with providers, about 133(60.7%) indicated verbal, 65(29.4%) said both verbal and written whilst 23(10.4%) said written. Most 188(85.1%) of the participants established that they were informed of their next appointment. Concerning the explanation of medication, about 168(76.0%) indicated they receive an explanation on medication. Moreover, 165(74.7%) revealed they do not fear coming to hospital whilst 56(25.3%) were afraid of accessing the hospital. Furthermore, 144(65.2%) revealed that they were informed of the consequences of missed appointments whilst 77(34.8%) indicated the opposite (Table 3).

Table 3: Distribution of hospital-related factors

Variable	Category	N=221	Percentage (%)
Trust for medical services			
	Yes	214	96.8
	No	7	3.2
Consultation satisfaction			

	Yes	194	87.8
	No	27	12.2
Relationship with physicians			
	Adequate	185	83.7
	Inadequate	36	16.3
Affordability of HPT Medication			
	Yes	165	74.7
	No	56	25.3
Availability and accessibility of service			
	Yes	187	84.6
	No	34	15.4
Lacks reimbursement for medication			
	Yes	51	23.0
	No	170	76.9
Mode of communication with providers			
	Written	23	10.4
	Verbal	133	60.2
	Both	65	29.4
Informed of next appointment			
	Yes	188	85.1
	No	33	14.9
Receive medication explanation			
	Yes	168	76.0
	No	53	24.0
Fear hospital			
	Yes	56	25.3
	No	165	74.7
Missed appointment consequences			

	Yes	144	65.2
	No	77	34.8

The Pearson Chi-square set at a 95%confidence level was employed to determine the association between hospital factors and anti-hypertensive medication poor compliance at a p-value of <0.05 considered statistically significant in the bivariate model. The study found that marital status, ethnicity and Religious affiliation of participants were 11.2 times, 19.6 times, and 11.6 times associated with poor medication adherence and the such association was significant at p-value <0.05 (X^2 =11.2, P=0.004), (X^2 =19.6, P=0.0001), (X^2 =11.6, P=0.003), respectively. Again the number of children of participants, educational level and status of employment of participants respectively were 16.8 times, 47.10 times and 19.0 times associated with poor adherence to anti-hypertensive medication (X^2 =16.8, P=0.013), (X^2 =47.10, P=0.0001), (X^2 =19.0, P=0.001), and such was significant statistically. Moreover, participants' family system (X^2 =18.29, P=0.0001), transport to health facility ((X^2 =25.58, P=0.001), and distance travelled to access health care (X^2 =12.10, P=0.002), exhibited a strong association to their poor adherence to anti-hypertensive medication respectively and such association was significant statistically. Further, participants' family history of hypertension (X^2 =10.6, P=0.001), catering for health care costs (X^2 =25.34, P=0.001), and intake of alcohol (X^2 =8.8, P=0.003) were found to positively associated with participants non-adherence to anti-hypertensive medication and it was statistically significant in the bivariate model. To add to the above findings, the participants who uses alternative medicine to complement their anti-hypertensive medication were 32.26 times associated with anti-hypertensive medication poor adherence (X^2 =32.26, P=0.0001), Similarly, participants' status of health insurance shows a 6.45 times association to poor adherence to anti-hypertensive medication (X^2 =6.45, P=0.0001) (table 4).

Table 4: Association between Socio-demographic factors and HPT medication

Variable	HYPERTENSION MEDICATION		X^2 (P-Value)
	Good Adherence	Poor Adherence	
Age			2.0(0.57)
29-39 years	36(31.0)	32(30.5)	
50-59 years	42(36.2)	30(28.6)	
60-69 years	19(16.4)	22(21.0)	
70-79 year	19(16.4)	21(20.0)	
Sex			0.09(0.57)
Male	65(56.0)	61(58.1)	
Female	51(44.0)	44(41.9)	
Marital status			11.2(0.004)*
Married	90(77.6)	62(59.0)	
Single	23(19.8)	31(29.5)	
Co-habiting	3(2.6)	12(11.4)	
Ethnicity			19.6(0.0001)*
Akan	55(47.4)	26(24.8)	

Ga	25(21.6)	16(15.2)	
Ewe	24(20.7)	46(43.3)	
Others	12(10.3)	17(16.2)	
Religion			11.56(0.003)*
Christian	100(86.2)	77(73.3)	
Islam	12(10.3)	10(9.5)	
Traditional	4(3.4)	18(17.1)	
Number of children			10.8(0.013)*
No child	12(10.3)	11(10.5)	
One child	25(16.8)	7(15.2)	
Two children	39(33.6)	37(35.2)	
Three or more children	40(34.5)	50(47.6)	
Education			47.1(0.0001)*
Non-formal education	10(8.6)	45(42.9)	
Basic education	20(17.2)	22(21.0)	
Secondary education	25(21.6)	21(20.0)	
Tertiary education	61(52.6)	17(16.2)	
Employment			19.0(0.0001)*
Employed	57(49.1)	30(28.6)	
Retired	24(20.7)	14(13.3)	
Unemployed	12(10.3)	29(27.6)	
Self-employed	23(19.8)	32(30.5)	
Family type			18.29(0.0001)*
Monogamous	106(91.4)	72(68.6)	
Polygamous	10(8.6)	33(31.4)	
Mode of transport			25.58(0.001)*
Private	69(59.5)	27(25.7)	
Public transport	47(40.5)	78(74.3)	
Distance to the health facility			12.10(0.002)*
Near	51(44.0)	23(21.9)	
Far	48(41.4)	62(59.0)	
Not sure	17(14.7)	20(19.0)	
Duration of HPT medication			5.66(0.13)
<1 year	16(13.8)	15(14.3)	
1-5 years	51(41.0)	33(31.4)	
6-10 years	26(22.4)	23(21.9)	
>10 years	23(19.8)	34(32.4)	
Presence of comorbidity			3.49(0.06)
Yes	43(37.1)	52(49.5)	
No	73(62.9)	53(50.5)	
Family history of hypertension			10.6(0.001)*
Yes	91(78.4)	61(58.1)	
No	25(21.6)	44(41.9)	
Who caters for the hospital bill?			25.34(0.0001)*

Self	88(75.9)	47(44.8)	
Children	22(19.6)	34(32.4)	
Family/ friend	6(5.2)	24(22.9)	
Tobacco use/ smoke			0.47(0.49)
Yes	15(12.9)	101(87.1)	
No	17(16.2)	88(83.8)	
Alcohol intake			8.8(0.003)*
Yes	41(35.3)	58(55.2)	
No	75(64.7)	47(44.8)	
Use of herbal medicines			32.3(0.0001)*
Yes	30(25.9)	67(63.8)	
No	86(74.1)	38(36.2)	
Presence of insurance			6.45(0.011)*
Yes	108(93.1)	86(81.9)	
No	8(6.9)	19(18.1)	

***<0.05: statistically significant, HPT: Hypertension. X^2 (Chi-square)**

Pearson Chi-square set at a 95% confidence interval was applied to determine the association between hospital factors and participants' poor adherence to anti-hypertensive medication. The p-value was set at <0.05 and any association with an alpha level below 0.05 was considered statistically significant. Participants who were able to establish a relationship with care providers were 6.3 times associated with poor adherence to medication (X^2 =6.3, p=0.012). Participants who could afford the cost of their medication were also 29.0times associated with poor adherence to medication (X^2 =29.0, p=0.0001). Moreover, participants who had other means of communicating with care providers were 29.85 times more associated with anti-hypertensive adherence (X^2 =29.85, p=0.0001). Participants who were informed of the consequences of missing medication were 7.1 times associated with poor adherence to medication (X^2 =7.1, p=0.008) (Table 5)

Table 5: Association between hospital-related factors and Hypertensive medication

Variable	**HYPERTENSION MEDICATION**		**X^2 (P-Value)**
	Good Adherence	**Poor Adherence**	
Consultation satisfaction			0.71(0.37)
Yes	104(89.7)	90(88.7)	

Non	12(10.3)	15(14.3)	
Relationship with physicians			6.33(0.012)*
Adequate	104(89.7)	81(77.1)	
Inadequate	12(10.3)	24(22.9)	
Affordability of Medication			29.0(0.0001)*
Yes	104(89.7)	61(58.1)	
No	12(10.3)	44(41.9)	
Availability and accessibility of service			2.06(0.15)
Yes	102(87.9)	85(81.0)	
No	14(12.1)	20(19.0)	
Lacks reimbursement for medication			2.79(0.09)
Yes	32(27.6)	19(18.1)	
No	84(72.4)	86(81.9)	
Communication with providers			29.9(0.0001)*
Written	18(15.5)	5(4.8)	
Verbal	50(43.1)	83(79.0)	
Both	48(41.4)	17(16.2)	
Informed of next appointment			2.66(0.10)
Yes	103(88.8)	85(91.0)	
No	13(11.2)	20(9.0)	
Receive medication explanation			0.79(0.37)
Yes	91(78.4)	77(73.3)	
No	25(21.6)	28(26.7)	
Fear hospital			0.25(0.62)
Yes	31(26.7)	25(23.8)	
No	85(73.3)	80(76.2)	
Missed appointment consequences			7.1(0.008)
Yes	85(73.3)	59(56.2)	

No	31(26.7)	46(43.8)

***<0.05: statistically significant, X^2 (Chi-square).**

The association between socio-demographic characteristics that exhibited a significant association in the bivariate model were included in the multivariate model. After controlling for confounding variables at a 95% confidence interval at a p-value of <0.05 considered statistically significant, participants who had attained non formal education had an increased odds of poorly adhering to their prescribed medication and was statistically significant [AOR=6.41(1.46-28.11), P=0.014]. Moreover, participants who drinks alcohol were more likely to non-adhere to anti-hypertensive medication [AOR=2.34 (0.19-3.17), P=0.038] Table (table 6).

Table 6: Relationship between Socio-demographic factors and Adherence to Medication

Variable	COR(95CI)	P-Value	AOR(95CI)	P-Value
Marital status				
Married	0.17(0.047-0.64)	0.008	0.27(0.04-1.82)	0.18
Single	0.34(0.09-1.33)	0.12	0.48(0.67-3.48)	0.47
Co-habiting	Reference		Reference	
Ethnicity				
Akan	0.33(0.14-0.80)	0.01	0.54(0.14-2.1)	0.37
Ga	0.45(0.17-1.19)	0.45	0.05(0.11-1.98)	0.31
Ewe	1.35(0.56-3.29)	0.50	1.63(0.43-6.04)	0.47
Others	Reference		Reference	
Religion				
Christian	0.17(0.06-0.53)	0.002	1.43(0.30-6.77)	0.65
Islam	0.19(0.05-0.73)	0.016	0.43(0.07-2.66)	0.37
Traditional	Reference		Reference	
Number of children				
No child	Reference		Reference	
One child	0.31(0.09-0.99)	0.05	0.28(0.06-1.38)	0.12
Two children	1.04(0.41-2.63)	0.94	0.84(0.19-3.73)	0.82
Three or more	1.36(0.55-3.44)	0.51	0.46(0.10-2.11)	0.32

Education				
Non-formal	16.2(6.76-38.6)	0.0001	6.41(1.46-28.1)	0.014*
Basic education	3.95(1.76-8.87)	0.001	1.88(0.52-6.82)	0.33
Secondary education	3.01(1.37-6.65)	0.006	1.79(0.59-5.44)	0.29
Tertiary education	Reference		Reference	
Employment				
Employed	Reference		Reference	
Retired	1.11(0.50-2.45)	0.79	0.50(0.14-1.76)	0.28
Unemployed	4.59(2.50-10.27)	0.0001	0.55(0.15-2.06)	0.38
Self-employed	2.64(1.32-5.29)	0.006	1.52(0.58-3.99)	0.39
Family system				
Monogamous	Reference		Reference	
Polygamous	4.86(2.25-10.47)	0.0001	3.04(0.89-10.3)	0.078
Transport system				
Private transport	Reference		Reference	
Public transport	4.24(2.39-7.53)	0.0001	1.79(0.69-4.70)	0.233
Distance to facility				
Near	Reference		Reference	
Far	2.86(1.34-5.32)	0.001	1.82(0.77-4.30)	0.175
Not sure	2.61(1.57-5.88)	0.021	1.69(.036-3.35)	0.868
Family history of HPT				
Yes	0.38(0.21-0.69)	0.001	0.92(0.37-2.24)	0.85
No	Reference		Reference	
Payment of bills				
Self	0.13(0.05-6.35)	0.0001	0.55(0.14-2.22)	0.40
Children	0.39(0.14-1.09)	0.07	1.33(0.34-5.23)	0.68
Family /friends	Reference		Reference	
Alcohol intake				

Yes	2.26(1.34-3.88)	0.003	2.14(0.05-2.22)	0.038*
No	Reference		Reference	
Herbal medicine				
Yes	5.05(2.84-8.99)	0.0001	1.32(0.56-3.17)	0.54
No	Reference		Reference	
Insurance				
Yes	0.34(0.14-0.60)	0.014	0.63(0.19-2.14)	0.46
No	Reference		Reference	

COR: Crude odds ratio, AOR: Adjusted odds ratio, *(p<0.05), HPT: Hypertension

The relationship between the hospital-related factors that showed significant association in the bivariate model was included in the multivariate model at a 95% confidence level and an alpha level of less than 0.05 was considered statistically significant. After controlling for confounding variables in the model, participants who could not afford the services of medical practitioners were more likely to record poor adherence to anti-hypertensive medication [AOR=3.63(1.69-7.79), P=0.010] and such was statistically significant. In addition, participants whom prescribers communicate verbally concerning their anti-hypertensive had an increased odds of poor anti-hypertensive medication adherence [AOR=4.15(1.41-12.26, P=0.010] and the difference was statistically significant (Table 7).

Table 7: Relationship between hospital factors and medication poor adherence

Variable	COR(95%CI)	P-Value	AOR(95%CI)	P-Value
Afford medical services				
Yes	Reference		Reference	
No	6.25(3.07-12.74)	0.0001	3.63(1,69-7.79)	0.001*
Mode of communication				
Written	Reference		Reference	
Verbal	5.98(2.1-17.1)	0.001	4.15(1.4-12.3)	0.01*
Both	1.23(0.41-3.97)	0.675	1.37(0.43-4.36)	0.59
Informed of consequences of a missed appointment				
Yes	0.47(0.26-0.82)	0.008	0.67(0.36-1.27)	0.220
No	Reference		Reference	

COR: Crude odds ratio, AOR: Adjusted odds ratio, *(p<0.05), HPT: Hypertension

Discussion

This study sought to assess the determinants of anti-hypertensive medication among patients accessing healthcare at the hypertensive clinic at the Volta River Authority Hospital. The study indicated that almost half (47.5%) of participants had poor anti-hypertensive medication non-adherence. In addition, it was shown that socio-demographic factors such as non-formal education, had an increased odds of poor adherence to medication. Again, it was established that participants who consume alcohol, had an increased odds of poorly complying with anti-hypertensive medication. Moreover, hospital-related factors such as patients who do not have the trust of medical practitioners had an increased odds of medication non-adherence. Furthermore, participants who were verbally communicated on how to take anti-hypertensive had an increased odds of poorly adhering to their medication. This current study found that about 47.5% of participants recorded a poor adherence to high blood pressure medication. Comparing this present finding to the report of previous studies, literature had revealed that about 45.2% of hypertensive patients do not adhere to their medication as such the finding is consistent to this current study (11). It is also reported that about 71% of the high blood pressure patients had poor compliance with their prescribed medication and therefore does not fall in line with this recent finding (16). Similarly, available evidence had indicated that, about 48.6% of high blood pressure patients had poor adherence to their prescribed anti-hypertensive therapy and as such support the findings of this recent poor adherence to anti-hypertensive medication (17). This present study found that, socio-demographic factors for instances, non-formal education established an increased odds of poor adherence to medication. Comparing this new finding to the report of a cross-sectional study conducted in China, it was established that, education plays a pertinent role in increasing knowledge of patients concerning their medication. Therefore outcome does not associate well with the outcome of this present research(8). What could have accounted for the differences in findings could be ascribed to the differences of participant's level of education.

Available body of knowledge had indicated that the non-adherence to high blood pressure medication was attributed to patient's knowledge level. The study further discovered that being hypertensive with non-formal education had a higher probability of poorly adhering to their prescribed anti-hypertensive medication and this agrees well with the outcome of this current study. (18) Found a high blood pressure patients with non-formal education had a strong association with poor adherence to anti-hypertensive medication and this also agree well with the findings established in this current study. Similarly, in Nigeria, it was found that non-formal education was a significant predictor of anti-hypertensive medication adherence and this finding support the outcome of this present study (19). This present study found that hospital-related factors such as patients' non-trust in practioners' care were more likely to increase their rate of poor medication non-adherence. Moreover, verbal means of health practitioners communicating to patients on medication use also increase their odds of non-adhering to high blood pressure pills. The study also found that participants' inability to afford the cost of health care had an increased odds of influencing their medication poor adherence. This means that when patients are unable to take care of the cost of their health care services they are more likely to non-comply with anti-hypertensive medication non-adherence. Comparing this current outcome to other studies reported in the literature, it was discovered that, the inability of patients to afford the cost of health care services had been found to significantly contribute to poor adherence to anti-hypertensive medication non-adherence which associates well with the outcome of this current study(20). Similarly, evidence has revealed that non-affordability of medical drugs has significantly influenced high blood pressure medication non-compliance and this also falls in line with the outcome of this present study. Moreover, (18) established that the cost of health care prevents most patients from accessing quality health care hence their inability to report to a health facility. Therefore their inability to comply with medication adherence. In Nepal, a cross-sectional study revealed that the cost of care is a contributor to anti-hypertensive medication non-adherence and this also agrees well with the outcome of this recent study. This present study also indicated that verbally communicating with patients increasingly promotes poor medication adherence. The available body of knowledge had found that patients who are communicated verbally tend to forget what is been said, especially medication concerning their diagnosed condition such as hypertension (20). The numerous activities patients engage themselves with creates tiredness and as such may result from

many of the patients not reminding themselves of taking their medication, particularly when such patient tend to forget what was communicated to them concerning how to take the medication. The poor adherence of participants coupled with the associated factors among a community of high blood pressure patients may contribute to poor blood pressure control with subsequent morbidities and mortalities (20). In addition. Poor adherence to hypertensive increases patient's risk of cerebrovascular diseases(17,21). However, poor adherence has been known to contribute to medication failure with numerous associated complications including heart attack and acute renal shutdown with subsequent increased mortality(21). Further literature had found that poorly adhering to anti-hypertensive medication increases the risk of sexual weakness, particularly among men with subsequent impotency (8). Aside from these complications, it is also reported that patients who poorly adhere to their anti-hypertensive medication increase their risk of hemorrhagic and ischemic stroke(22). Poorly complying with medication has also been found to result in myocardial infarction among high blood pressure patients (23). It also has the potential of affecting socio-economic activities contributing to a loss of production and income, hence impeding macro-economic growth (24).

Conclusion and recommendations

This study sought to determine the determinants of anti-hypertensive medication non-compliance among high blood pressure patients accessing healthcare at the Volta River Authority Hospital in the Eastern Region of Ghana. The study concluded that poor adherence to anti-hypertensive medication was high among high blood pressure patients who accessed service at the time of the study. Therefore, immediate interventions are required in order to reduce, the surge of associated complications of high blood pressure non-compliance among patients. Again, sociodemographic characteristics of participants such as non-formal education was a significant predictor of poor adherence to anti-hypertensive medication. In addition, participants who were alcoholics contributed to poor compliance with anti-hypertensive therapy. Moreover, the inability of patients to afford medical services coupled to prescriber's verbal communication on medication use influences their medication non-adherence. The study recommends that health policy makers to initiate measureable indicators that can monitor the progress of patients adherence to medication. The health authorities' at the hospital should create a common electronic platform that could remind and track-patients progress with medication. Health education should be intensified in addition to providing effective counselling to patients particularly those into alcoholism amidst medication. The study is further recommended for qualitative enquiry to holistically comprehend the determinants of poor adherence to anti-hypertensive medication at the facility.

Data and material availability

Data and materials for the study are available upon request from the corresponding authors

Consent for publication

Not applicable

Approval and consent to participate

The study was approved by the management of the facility before its commencement. Eligible participants also gave informed consent to participate in this study by signing or thumb-printing the consent form.

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