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**FACTORS INFLUENCING CONTROL OF BLOOD PRESSURE
LEVELS AMONG HYPERTENSIVE ADULT PATIENTS IN
SELECTED HOSPITALS, KAKAMEGA COUNTY, KENYA**



FACTORS INFLUENCING CONTROL OF BLOOD PRESSURE LEVELS AMONG HYPERTENSIVE ADULT PATIENTS IN SELECTED HOSPITALS, KAKAMEGA COUNTY, KENYA

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Abstract

Purpose: The study aimed to investigate the factors influencing blood pressure levels in hypertensive adult patients in Kenya's Kakamega County. The specific objectives were as follows: to assess patient factors that influence blood pressure levels among hypertensive adult patients in Kakamega County, examine health-care provider factors that influence blood pressure levels in hypertensive adult patients; determine institutional factors that influence blood pressure levels in hypertensive adult patients in Kakamega County based on the clinical recommendations for cardiovascular disease management from 2018.

Methodology: The researcher used a cross-sectional analytical study design. Patients and health care providers were requested to sign a written consent before data was collected using a questionnaire and an observation checklist. Quantitative data were evaluated using descriptive and inferential statistics, statistical package for social sciences version 22, with a statistically significant p-value of 0.05. The strength of the relationship between the variables and the patient's blood pressure level was tested using multiple regression.

Findings: The findings showed that the number of years a patient was told he or she had hypertension patient sensitization about the disease ($p = 0.04$), the patient's BMI ($p = 0.01$), BP stability at the time of admission (0.0001), having a treatment supporter to advise the patient when to take medications (0.04). The health care provider's age group and knowledge about the disease ($p = 0.02$) was all separately correlated with blood pressure control. According to the current analysis, in Kakamega County, being a male without adequate patient sensitization about the hypertension disease made patients to be more likely to have uncontrolled blood pressure levels.

Unique contribution to theory, practice and policy: The study recommends a model that combines patient and health-care system variables emphasizing on patient sensitization about the

hypertension disease, modifiable and modifiable risk factors should be created in attempt to have blood pressure controlled.

Key words: *Blood pressure control, hypertension, adult patients, kakamega county.*

1.0 INTRODUCTION

Hypertension is elevated blood pressure above 140mmHg systolic and 90 mmHg diastolic (Veglio *et al.*, 2013; Kilic *et al.*, 2016). Uncontrolled blood pressure levels result from patients having persistently high blood pressure values beyond the 140mmHg systolic and 90 mmHg diastolic despite being on medication (MOH, 2016). Uncontrolled blood pressure is the most common cause of death globally, accounting for 31% of all deaths (WHO,2017). By 2030, the annual number of deaths due to CVD is projected to increase from 17.3 million to 23.6 million. The global prevalence of hypertension is high at 31% in 2010, 28.5% in high-income countries, and 31.5% in low-income economies. Recent studies report that in 2015, more than 1.13 billion adults had hypertension, with over 19% of all deaths related to Uncontrolled blood pressure levels (Dzau & Balatbat, 2019). Uncontrolled blood pressure has also been associated with not adhering to clinical practice guidelines (Watine *et al.*, 2015). There is clear evidence that Governments' attempts to treat hypertensive patients with uncontrolled blood pressure hypertension have been unsuccessful (Dzau and Balatbat, 2019). Health care providers use the wrong cuff size or do too fast deflation of the cuff when measuring blood pressure(Watine *et al.*, 2015). In Kenya, the prevalence of hypertension has doubled from 6% in 2009 to 13 % in 2015 (Onyango *et al.*, 2017). Statistics indicate that, out of 10 deaths occurring at different healthcare system levels, hypertension is responsible for six (MOH, 2016). According to Watine, there was overwhelming evidence suggesting that health care providers do not adhere to clinical practice guidelines despite the known benefits of using clinical recommendations; hence, they deliver poor health outcomes to their respective patients (Watine *et al.*, 2015). Uncontrolled blood pressure continues to be a problem for more patients (Karuri, Wagacha, & Ochieng, 2014). Furthermore, Kenya's population continues to grow even as research shows that Kenyans are among the least physically fit, predisposing them to hypertension complications (Onywer *et al.*, 2016).

Hypertension affects 15% of Kakamega County's population of 1,867,579 people, with most patients with uncontrolled blood pressure receiving referrals, which is higher than the national average (MOH, 2016). Therefore, the current study aimed to investigate factors influencing the blood pressure control among hypertensive adult patients in Kenya: a Kakamega county case study

1.1 Specific Objectives

- i. To assess patient factors that influence blood pressure levels among hypertensive adult patients in Kakamega County.
- ii. To examine the health care provider factors that influence blood pressure levels among hypertensive adult patients in Kakamega county.
- iii. To determine institutional factors, influence blood pressure levels among hypertensive adult patients in Kakamega county based on clinical guidelines of 2018.

2.0 METHODS AND MATERIALS

The study used an analytical cross-sectional study design across the six research sites-hospitals in Kakamega County. The study was conducted in selected health facilities offering comprehensive hypertension care services in Kakamega County, selected using the simple random technique. The hospitals included Kakamega, Butere sub-county, Lumakanda, which are public hospitals, while, Mukumu, Nala hospital, and St Mary's Mumias were private. The study population comprised of Hypertensive patients and health care providers, including doctors, clinicians, and nurses. The sample size was 222 patients and 37 health care providers who were distributed using the sample proportionate distribution. A random sampling technique was used to pick thirty-percent (30%) of the twenty hospitals (Wayne,2016). Participants were identified using a systematic sampling method. A list of health care providers working in the medical-surgical wards of each hospital was obtained from the duty roster. Based on the sample size required in each hospital per cadre, an interval was calculated by dividing the number of healthcare providers in that cadre by the sample size (population size divided by sample size) in the same cadre at the selected Hospital. The health care provider whose name appeared at the nth number was selected. The questionnaire assessed the sociodemographic variables, lifestyle, presence of support systems like PSSGs. Besides, it had multiple-choice questions to test knowledge on the prognosis of hypertension. The research was pretested on 23 patients and four health care providers at Vihiga County Referral Hospital. The data was gathered over three months. Information on patient factors, health care provider factors, and institutional factors influencing blood pressure control among hypertensive adult patients was collected from the 3rd of February to the 16th of May 2020. Statistical Package for the Social Science program version 22 was used to compile and enter collected data into a computer for review. The statistical methods used were descriptive and inferential. The relationship of independent variables blood pressure levels in adult hypertensive patients in Kakamega county was investigated using multiple regression. Logistic regression analysis was used to analyze the relationship between an independent variable that included patient-specific factors, management factors, and associated health system factors. Statistical significance was identified as a p0.05 value. The study findings were presented in tables and figures.

3.0 FINDINGS AND DISCUSSIONS

3.1 To assess patient factors that influence blood pressure levels among hypertensive adult patients in Kakamega County

3.1.1 Patient socio-demographic characteristics

Table 1 presents socio-demographics of patients interviewed in the various health facilities across Kakamega County, where the study was conducted. More than half (58.6%) were females compared to 41.4% males. The mean age was 64 years and ranges between 38 and 95 years. Most of the respondents were married (44.6%), followed by widows (27.5%). More than three-quarters (87.8%) were Christians. Over one-third (38.7%) had attained secondary education while slightly more than a quarter (26.1%) had achieved primary level education. Almost half (49.1%) were unemployed, with one in five (21.6%) employed by either the government or non-governmental organizations (NGOs). In terms of residence and living arrangements, 57.7% of respondents lived

in rural areas, while 83.8 percent shared a home with family members. Only 3.6% live alone. About half (48.2%) had three family members living in the house apart from the spouse. Generally, family relations were fair (63.1%). Over three-quarters (78.8%) had a family member who died of hypertension, with a comparable proportion either being a mother (37.7%) or sibling (36.6%). These findings were similar with the study conducted in Ghana which showed respondents were mostly married with ages ranging from 27 to 94 years (Okai et al, 2020).

Table 1 Patient socio-demographic characteristics

Characteristics	Categories	n	%
Gender	Male	92	41.4
	Female	130	58.6
Mean age \pm SD (Range) in years	\leq 64.0	56.0 \pm 5.9 (38.0 – 64.0)	
	$>$ 64.0	73.6 \pm 7.3 (65.0 – 95.0)	
Marital status	Single	23	10.4
	Married	99	44.6
	Separated	39	17.6
	Widowed	61	27.5
Religion	Christian	195	87.8
	Muslim	18	8.1
	Other	9	4.1
Level of education	None	35	15.8
	Primary	58	26.1
	Secondary	86	38.7
	Diploma	34	15.3
	University	9	4.1
Employment status	Unemployed	109	49.1
	Self-employed	65	29.3
	Non-government	24	10.8
	Government	24	10.8
Income in KSh.	Below 11,000	115	51.8
	11,000 – 20,000	36	16.2
	21,000 – 30,000	40	18.0
	$>$ 30,000	31	14.0
Place of residence	Urban	94	42.3
	Rural	128	57.7
Living arrangement	Live alone	8	3.6
	Live with a family in the same house	186	83.8
	Live near family	28	12.6
Number of family members living in the house apart from spouse	1	54	24.3
	2	61	27.5
	3	107	48.2
Family relations	Good	65	29.3
	Not good	17	7.7
	Fair	140	63.1
A family member has died of hypertension	Yes	175	78.8
	No	10	4.5
	Do not know	37	16.7
Relationship with the dead family member	Father	45	25.7
	Mother	66	37.7

Sibling	64	36.6
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3.1.2 Patient hypertension history

Table 2 shows respondents' hypertension medical history. The majority (62.6%) had a history of hypertension lasting more than four years, with 28.8% having had the chronic illness for between 3 – 4 years. Fifty-five percent also presented with diabetes mellitus and 21.6% with stroke. Less than a third (31.1%) had controlled BMI while 22.1% fell in the overweight category and 14% obese. Over half (52.2%) went for a scheduled medical check-up, mostly monthly (51.7%).

Respondents were also asked about the type of environment in which they were receiving care. More than two-thirds (71.6%) perceived the care as somehow hostile, with less than one in ten (8.6%) agreeing that the care providers were friendly.

Table 2 Patient hypertension history

Characteristics	Categories	n	%
When the patient was told they had hypertension in years	< 1 year ago,	2	0.9
	1 – 2	17	7.7
	3 – 4	64	28.8
	> 4	139	62.6
Other health complaints	None	20	9.0
	Rheumatic heart fever	13	5.9
	Stroke	48	21.6
	Diabetes mellitus	123	55.4
	Kidney problem	18	8.1
BMI (Underweight)	< 18.5	73	32.9
BMI (Controlled)	18.5 – 24.9	69	31.1
BMI (Overweight)	25.0 – 29.9	49	22.1
BMI (Obese)	> 30.0	31	14.0
Goes for scheduled medical checkups	Yes	116	52.2
	No	76	34.2
	Do not know	30	13.5
Medical check-up frequency	Weekly	8	6.9
	Fortnightly	6	5.2
	Monthly	60	51.7
	Quarterly	42	36.2
Perception of care provided by care providers	Friendly	19	8.6
	Somehow hostile	159	71.6
	Cannot comment	41	18.5
	Other	3	1.3

3.1.3 Blood pressure levels and controls

At the time of admission, 17.6% of patients had blood pressure between optimal and average, rising to 28% when the study was performed. Grade 3 (severe hypertension) cases decreased from 29.3 percent at admission to 7.7 percent when data was collected (Figure 1).

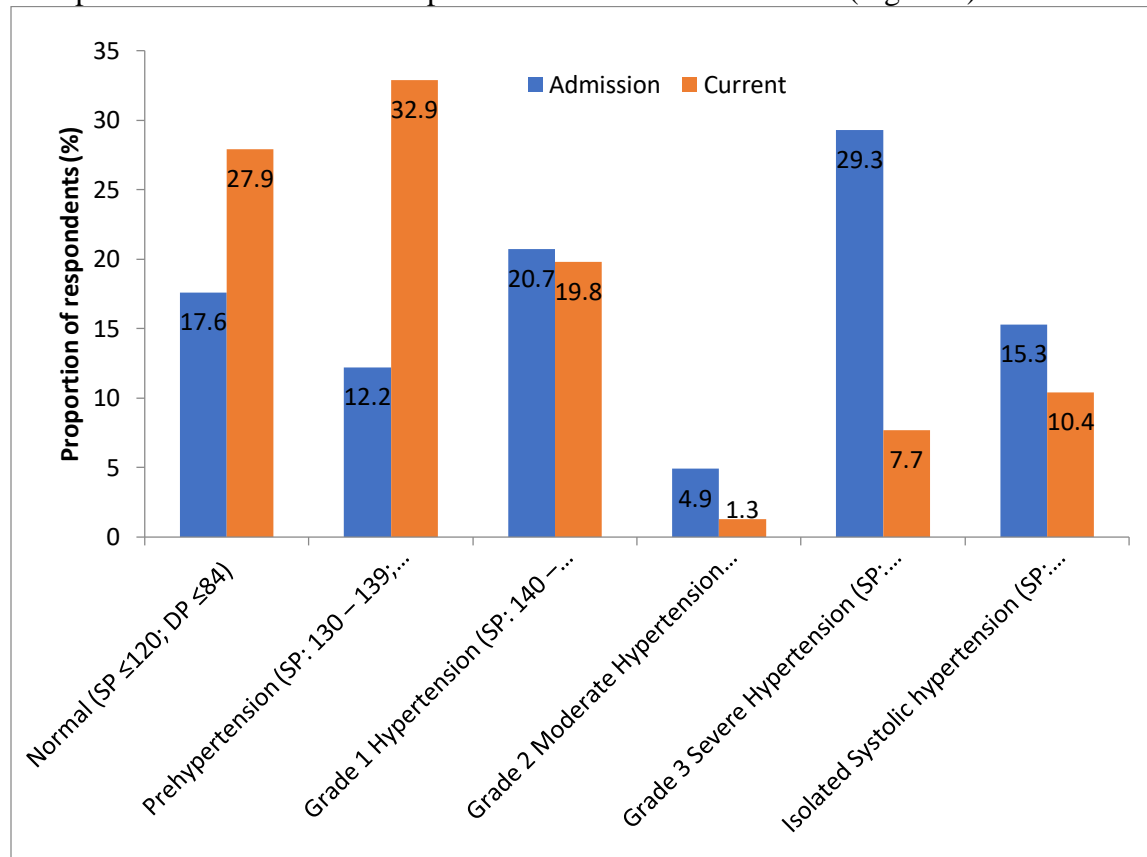


Figure 1 Blood pressure categories during admission and current values

3.1.4 Lifestyle practices

The study also examined lifestyle practices among the patients interviewed and the results presented in Table 3. Nearly all (97.3%) consumed iodized salt. Ninety-eight percent added salt at the table, with 60.8% adding between 3 – 4 teaspoons of salt per day. Again majority (96.4%) consumed processed food at least every day, with 49.1% eating whatever was available not paying attention to the composition of the diet. Just 4.5 percent of people did less than 60 minutes of moderate-intensity physical activity during the week. In the previous 12 months, one-fifth (19.8%) had smoked cigarettes.

Table 3 Lifestyle modification

Characteristics	Categories	n	%
Consumes iodized salt	Yes	216	97.3
	No	1	0.4
	Do not know	5	2.3
Adds salt at the table	Yes	218	98.2
	No	4	1.8
Amount of salt consumed per day	< one teaspoon	8	3.6
	1 – 2 teaspoons	59	26.6
	3 – 4 teaspoons	135	60.8
	> 4 teaspoons	20	9.0
Frequency of processed food consumption	At least every day	214	96.4
	Weekly	6	2.7
	Rarely	2	0.9
Composition of the majority of diet	Fruits and vegetables	0	0.0
	Fatty food	1	0.4
	Carbohydrates	112	50.5
	What was available	109	49.1
Engages in moderate-intensity physical activity throughout the week	Yes	10	4.5
	No	212	95.5
Frequency of carrying out moderate-intensity physical activity throughout the week	< 60 minutes	10	4.5
	60 – 120 minutes	0	0.0
	120 – 180 minutes	0	0.0
	No at all	212	95.5
Has been smoking cigarettes in the last 12 months	Yes	44	19.8
	No	178	80.2

3.1.5 Blood pressure check-up and clinical appointments

Table 4 shows results on blood pressure check-up and clinical appointments. Most of the respondents (82.4%) could not remember when last they had their BP checked. Among those who had gone for a check-up, 59.1% had Grade 1 hypertension. As expected, the majority (97.8%) had not honored the last three clinical appointments, the main reason being that they forgot (89.9%). A comparable proportion was currently on Nifedipine (49.1%) and Hydrochlorothiazide (50.9%). No health care provider explained to the patients how to take these drugs, with a minority (9.5%) having had treatment support to remind them to take medication. Unpredictably, 94.6% had ever noted adverse effects on the drugs. The most common adverse effects included swelling of limbs (20.9%), nausea and vomiting (20%), and cough (19.5%). Ninety-two percent had ever missed taking medication, the main reasons being the cost of medication (42.6%) and socio-cultural factors (40.2%).

Table 4 Blood pressure check-up and clinical appointments

Characteristics	Categories	n	%
When last checked, BP	< Three months ago,	5	2.2
	Three months ago,	19	8.6
	> More than three months	15	6.8
	Cannot remember	183	82.4
Reading of BP when went for check up	SP: 120 – 129 and DP: 80 - 84	0	0.0
	SP: 130 – 139 and DP: 85 - 89	18	40.9
	SP: 140 – 159 and DP: 90 - 99	26	59.1
Honored last three clinical appointments	Yes	5	2.2
	No	217	97.8
Reason for missed appointments	Working	13	6.0
	Forgot	195	89.9
	Sick	9	4.1
Current anti-hypertensive drugs	Nifedipine	109	49.1
	Hydrochlorothiazide	113	50.9
Explained how to take the drugs	Yes	0	0.0
	No	222	100.0
Has treatment support to remind the client to take medication	Yes	21	9.5
	No	201	90.5
Ever noted adverse effect on the drugs	Yes	210	94.6
	No	12	5.4
Type of adverse effect experienced	Swelling of limbs	44	20.9
	Cough	41	19.5
	Constipation	12	5.7
	Erecting problems	17	8.1
	Headache	38	18.1
	Nausea and vomiting	42	20.0
	Feeling nervous	16	7.6
Ever missed taking medication	Yes	204	91.9
	No	18	8.1
Reason for missing taking medication	Social/cultural factors	82	40.2
	Religious beliefs	15	7.3
	Cost of medication	87	42.6
	Use of herbal drugs	20	9.8

3.1.6 Comparison of blood pressure on admission and current readings: Paired t-test

The paired t-test was used to compare the mean values of patient blood pressure during admission and the study. The null hypothesis was that there was no difference between the two means. SBP and DBP both fell by a statistically significant amount ($p < 0.0001$). This indicates that when the

analysis was done, the mean SBP and DBP were substantially lower than the mean SBP and DBP at the entry time.

Table 5 Paired t-test: Comparison of the blood pressure difference between current values and at admission

Blood pressure	Lower CL Mean	Upper CL Mean	SD	df	T	P-value
Systolic difference	- 15.4	- 10.8	17.5	221	- 11.2	< 0.0001
Diastolic difference	- 9.1	- 5.1	15.3	221	- 6.9	< 0.0001

3.2 To examine the health care provider factors that influence blood pressure levels among hypertensive adult patients in Kakamega county.

3.2.1 Socio-demographic characteristics of health care providers

A total of 37 health care providers took part in the report. The mean age was 31 years, with a relative mean age of 28.3 for those up to 31 years and 39 years older than 31 years. The participants ranged in age from 23 to 63 years old. The majority of health care providers (46.9%) had 1–5 years of experience, with a minority having served for more than ten years (16.2 percent). More than two-thirds (68%) worked in the public health facility, with about half deployed in Level 4 health facilities (49.6%).

Table 6 Health care provider characteristics(n=37)

Characteristics	Categories	n	%
Gender	Male	15	39.6
	Female	22	60.4
Mean age \pm SD (Range) in years	\leq 31	28.3 \pm 2.0 (23.0 – 31.0)	
	> 31	39.0 \pm 6.2 (32.0 – 63.0)	
Years of experience	1 – 5	17	46.9
	6 – 10	14	36.9
	> 10	6	16.2
Type of health facility	Public	25	68.0
	Private	12	32.0
Level of health facility	Level 3	1	2.7
	Level 4	18	49.6
	Level 5	18	47.7

3.2.2 Health care providers' knowledge on hypertension and blood pressure control

To assess health care providers' knowledge on hypertension and blood pressure control, several areas were examined. These included knowledge on hypertension assessment, hypertension and uncontrolled blood pressure, hypertensive pharmacology, and various hypertension tests. A total of 27 questions were asked, and the answers were marked. scores were given in percentages, then grades awarded according to the nursing council grading system. (75 – 100% Distinction, 65-74% = credit, 50 - 64 =pass, 49 and below = Fail).Table 4.7 shows the scores. 4 out of 37 (10.8%) had a Distinction, 6 out of 37 (16.2) had a Credit, 15 out of 37 (40.5%) had a pass and 12 (32.5 %) out of 37 failed which is a considerable percentage

Table 7 Health care providers' knowledge on hypertension and blood pressure control

Grades	Categories	N	%
Distinction	75-100%	4	10.8
Credit	65-74%	6	16.2
Pass	50-64%	15	40.5
Fail	49 and below	12	32.5
TOTAL		37	100

3.2.3 Availability of clinical guidelines on the management of uncontrolled blood pressure

The existence of clinical recommendations for treating hypertension in the health facilities represented by the health care professionals interviewed is shown in Table 3.8. The vast majority (97.3%) of respondents said hypertension was among the top ten conditions in their respective facilities. More than half (54.1%) have clinical guidelines of 2018 on managing hypertension, with 90% agreeing that the guidelines are helpful. More than two-thirds (70.7%) record the clinical history of the patient. Based on reports from 44.6% of the respondents, 40% of patients in the health facilities have controlled BP compared to 50%, as reported by 40.5% of the respondents.

Table 8 Availability of clinical guidelines on the management of hypertension and blood pressure control

Characteristics	Categories	n	%
Hypertension among top ten conditions in your facility	Yes	36	97.3
	No	1	2.7
Availability of clinical guidelines 2018 on hypertension management	Yes	20	54.1
	No	17	45.9
if yes, are clinical guidelines 2018 on hypertension management helpful	Yes	18	90.0
	No	2	10.0
why do people feel guidelines are not helpful	Clinical guidelines (2018) decrease health care providers' autonomy	9	25.0
	Clinical guidelines (2018) are too rigid to apply to individual patients	3	8.3
	Clinical guidelines (2018) are unavailable	25	66.7
You record the clinical history of the patient	Yes	26	70.7
	No	11	29.3
From records, the percentage of patients that have controlled blood pressure levels	40%	15	40.5
	Above 50%	17	44.6
	Do not know	6	14.9

3.2.4 Causes and treatment of hypertension

As presented in Table 9, 91.9% of health care providers cited patient beliefs and behaviors as the main cause of uncontrolled BP. Nearly all the respondents agreed that they have defaulters in their facilities, with a minority (13.5%) providing adherence counseling to patients on the prescribed drugs. To mitigate defaulters, 81.5% give shorter return dates compared to 18.5% that send reminder texts. Regarding PSSGS for the client, only 13.5% affirmed the availability of such services. Asked about the availability of counseling services on a low salt diet to patients, 14.4% have such services, with another 13.5% advising patients about lifestyle modification on every visit. Less than one in five (13.5%) perform investigations on hypertensive patients, with 83.7% not mentioning any of the most common tests that they perform. The majority (89.2%) manage monthly follow-up on their patients.

Table 9 Causes and treatment of hypertension

Characteristics	Categories	N	%
Causes of uncontrolled blood pressure	Patient beliefs and behaviors	35	91.9
	Cultural norms	2	5.4
	Collaborating with the guidelines	1	2.7
Do you have defaulters of hypertension treatment in your facility?	Yes	35	94.6
	No	2	5.4
Provide adherence counseling to antihypertensive drugs	Yes	5	13.5
	No	32	86.5
How defaulters are managed	Sending reminder text	7	18.5
	Give shorter return dates	30	81.5
Have PSSGS for your client	Yes	5	13.5
	No	32	86.5
Counsel patients on a low salt diet	Yes	5	14.4
	No	32	86.5
Advise patients about lifestyle modification on every visit	Yes	5	13.5
	No	32	86.5
Perform investigations on hypertensive patients	Yes	5	13.5
	No	31	83.7
The most common test performed	CBC/FBC	4	10.9
	Urinalysis	1	2.7
	LFTS	1	2.7
How facility manages follow-up on patients	None	31	83.7
	Weekly	1	2.7
	Fortnightly	1	2.7
	Monthly	33	89.2
	Quarterly	2	5.4

3.2.5 Results of observation checklist for health care provider competence in taking BP

The competence of health care providers in measuring the BP was assessed by direct observation of preparation and measurement of patients' BP. The direct observation was made easier by using a checklist to track the 37 health care providers as they dealt with the 222 patients who were also interviewed. The checklist with 14 items included equipment preparation and specific procedures of BP measurement. A scoring system was used, with each practice receiving 1 point and each incorrect practice receiving 0 points. A mean score of 6 was determined in this case. Thus, the proportion of health care providers able to competently perform the required procedure was 6 out

of 14, 42.8% or 43%. The null hypothesis was that the proportion of health care providers competent in performing the procedure was 0.43 ($p = 0.43$).

In all 14 items studied, we measured a z-statistic that was greater than the critical value, 1.96 or less, and was correlated with a significance level of $= 0.05$. Better performance was reported in gathering equipment and measurement procedures which included: the first sound heard was the systolic pressure, continue to allow air to escape and watch manometer/needle gauge; at the last pulse sound heard, note reading on manometer; release remaining air in the cuff by opening valve completely and remove cuff; and document inpatient record, position, arm used, cuff size, blood pressure measurement to nearest two mmHg, any deviations from measurement protocols, all with highly statistically significant p values ($p < 0.0001$).

Negative z score values with p values < 0.05 signify poor performance. As a result, the null hypothesis was rejected for most of the items tested, indicating that the proportion of health care providers who are competent in taking blood pressure is significantly lower than the national average of 0.43. In 9 out of 14 items, the participating health care providers performed below average, the difference being statistically significant.

Table 10 Observation checklist for health providers competence in taking BP

	No.	%	95% CI	Z score	P-value
Equipment					
Gather required equipment	32	86.4	0.81 – 0.90	12.8	< 0.0001
Assess correct size cuff and squeeze all air out before applying to patient	11	29.7	0.24 – 0.36	- 3.8	< 0.0001
Measurement procedure					
Let patient rest for 5 minutes	4	10.8	0.06 – 0.13	- 10.1	< 0.0001
Arm preferably right was supported at the patient's heart level, the palm turned up	7	18.9	0.14 – 0.24	- 7.2	< 0.0001
Palpate brachial pulse, place cuff on bare arm	4	10.8	0.06 – 0.13	- 10.1	< 0.0001
Position diaphragm of stethoscope over brachial pulse site	5	13.5	0.08 – 0.16	- 9.3	< 0.0001
Close valve on bulb and inflate cuff	8	21.6	0.15 – 0.26	- 6.7	< 0.0001
Add 20-30 mmHg to SBP or 20-30 mmHg above the patient's-controlled BP reading.	10	27.0	0.22 – 0.34	- 4.5	< 0.0001
Deflate at 2-3 mmHg per second	13	35.1	0.28 – 0.40	- 2.6	0.004
The first sound heard was the systolic pressure	32	86.5	0.77 – 0.87	11.9	< 0.0001
At the last pulse sound heard, note reading on manometer	31	83.8	0.77 – 0.87	11.7	< 0.0001
Release remaining air in the cuff	27	73.0	0.67 – 0.78	8.9	< 0.0001

If needs to reinflate to check accuracy, completely deflate cuff	10	27.0	0.22 – 0.34	- 4.5	< 0.0001
Document inpatient record	27	73.0	0.66 – 0.77	8.6	< 0.0001

3.3. To determine health institutional factors, influence blood pressure levels among hypertensive adult patients in Kakamega county based on clinical guidelines of 2018.

3.3.1 institutional factors

Table 11 presents health system factors and patient perception about the system. The majority of the patients (82%) confirmed that they were not members of any psychosocial support group (PSSG). A smaller proportion (17.6%) could access health care providers whenever they needed them, with 72.5% not being satisfied with the service provided by the health care providers in the clinical appointments. More than a third (36%) were satisfied with waiting time while at the waiting bay, and 32% confirming the ready availability of prescribed drugs in the hospital pharmacy. Asked how long they will use antihypertensive drugs, 31.5% said 'for life' while 38.7% would use if BP rises and another 25.2% whenever sick. A third (33.8%) were covered by health insurance. Flyers were issued to 14.9%, with health providers have informed 51.3% of the importance of blood pressure control and another 33.8% stating that the cost of services offered was affordable.

Table 11 Institutional factors

Characteristics	Categories	n	%
Are you a member of any PSSG in this facility?	Smoking cessation	25	11.3
	Alcohol cessation	15	6.8
	No	182	82.0
Able to access health care providers whenever in need of them	Yes	39	17.6
	No	183	82.4
Are you satisfied with the service provided by health care providers in clinical appointments?	Yes	61	27.5
	No	161	72.5
Are you satisfied with the waiting time while at the waiting bay?	Yes	80	36.0
	No	142	64.0
Are drugs prescribed readily available in hospital pharmacies?	Yes	71	32.0
	No	151	68.0
For how long will you use antihypertensive drugs?	Whenever am sick	56	25.2
	For life	70	31.5
	When the BP rises	86	38.7
	Other	10	4.50
Are you covered by any health insurance scheme that caters to treatment bills	Yes	75	33.8
	No	147	66.2
What education materials does the hospital provide for hypertension	Flyers	31	14.9
	None	82	36.9
	Do not know	109	49.1

Have you been informed by health providers of the importance of blood pressure control	Yes	114	51.3
	No	108	48.7
Was the cost of services offered affordable	Yes	75	33.8
	No	147	66.2

3.5 Patient factors that influence control of the blood pressure levels

Bivariate analysis was used to look at the relationship between the patient's independent variables and the dependent variable, which was calculated as SBP and DBP during the survey period and was either monitored or unregulated (current BP). Controlled BP was considered as SBP < 130 and DBP ≤ 84. Sex and age were two variables that generated statistically significant results. Males had a 50% lower chance of having regulated blood pressure (OR: 0.5; 95 percent CI: 0.3–1.0; p = 0.04). Patients under the age of 64 were 40% less likely to have controlled blood pressure (OR: 0.6; 95 percent CI: 0.3–1.0; p = 0.05). Those with a family member who had died of hypertension were equally 50% less likely to have presented with controlled BP, with the p-value of 0.07 being considered as borderline (Table 12).

Though not statistically significant, single, separated, or widows were up to 2.5 times more likely to have had controlled BP. The same finding was found among those with none or primary education and the unemployed who were up to 2.8 and 2.3 times as likely to have had controlled BP compared to their counterparts.

Table 12 Patient factors that influence control of the blood pressure levels

Characteristics	Categories	N	Blood pressure status		OR	95% CI	P-value
			Control led (%)	Uncontrol led (%)			
Gender	Male	92	20.7	79.3	0.5	0.3 – 1.0	0.04
	Female	130	33.1	66.9			
Age	< 64 years	109	22.0	78.0	0.6	0.3 – 1.0	0.05
	≥ 64 years	113	27.9	66.4			
Marital status	Single, Separated, widow	123	30.9	69.1	1.4	0.8 – 2.5	0.3
	Married	99	24.2	75.8			
Level of education	None, Primary	93	33.3	66.7	1.6	0.9 – 2.8	0.1
	Secondary,	129	24.0	76.0			
	Tertiary						
Employment status	Unemployed	109	30.3	69.7	1.2	0.7 – 2.3	0.4
	Employed	113	25.7	74.3			
Income in KSh.	Below 11,000	115	28.7	71.3	1.1	0.6 – 1.9	0.8
	≥ 11,000	107	27.1	72.9			
Living arrangement	Live with family in same house	186	26.3	73.7	0.6	0.3 – 1.3	0.2
	Live alone or Live near family	36	36.1	63.9			
Number of family members living in the house apart from spouse	1 or 2	115	30.4	69.6	1.3	0.7 – 2.3	0.4
	≥ 3	107	25.2	74.8			
Family relations	Good	65	21.5	78.5	0.6	0.3 – 1.2	0.2
	Not good/Fair	157	30.6	69.4			
A family member has died of hypertension	Yes	175	25.1	74.9	0.5	0.3 – 1.1	0.07
	No/Don't know	47	38.3	61.7			
Relationship with the dead family member	Father/Mother	111	26.1	73.9	1.2	0.6 – 2.4	0.7
	Sibling	64	23.4	76.6			

3.6 Patients' medical factors that influence control of the blood pressure levels

Further analysis was carried out to assess patient medical factors influencing the clinical management of hypertension. Table 13 shows that patients with a lower BMI (25 kg/m²) had a two-fold higher chance of being monitored than those with an uncontrolled BMI (OR: 1.9; 95 percent CI: 1.0–3.7; p = 0.05). Patients with managed blood pressure at the time of admission have

a higher odd of 6 having controlled blood pressure than patients with uncontrolled blood pressure (OR: 6.1; 95 percent CI: 2.9–12.8; p 0.0001). Patients with hypertension diagnosed more than five years earlier and those with diabetes mellitus as a co-morbidity were up to 3.1 and 2.8 times more likely to have regulated blood pressure, respectively, even though the results were non-statistically significant.

Table 13 Patients' medical factors that influence the clinical management of hypertension

Characteristics	Categories	n	Blood pressure status		OR	95% CI	P-value
			Control led (%)	Uncontrol led (%)			
When patient was told hypertension in years	> 5 years ago,	139	31.6	68.4	1.8	0.9 – 3.1	0.1
	≤ 5 years ago,	83	21.7	78.3			
Co-morbidity	Diabetes mellitus	123	31.7	68.3	1.5	0.8 – 2.8	0.2
	Others	99	23.2	76.8			
BMI	< 25.0	142	32.4	67.6	1.9	1.0 – 3.7	0.05
	≥ 25.0	80	20.0	80.0			
Goes for scheduled medical checkups	Yes	116	27.6	72.4	1.0	0.5 – 1.7	0.9
	No	106	28.3	71.7			
Medical checkup frequency	1 week – 1 month	74	23.0	77.0	0.7	0.4 – 1.3	0.2
	> 1 month	148	30.4	69.6			
Perception of care provided by care providers	Somehow hostile	159	27.7	72.3	1.0	0.5 – 1.8	0.9
	Friendly	63	28.6	71.4			
BP at admission	Controlled	39	61.5	38.5	6.1	2.9 – 12.8	<0.0001
	Uncontrolled	183	20.8	79.2			

3.7 Relationship between patient's lifestyle and control of blood pressure levels

Table 14 presents results on the relationship between the patient's lifestyle and clinical management of hypertension. None of the results were statistically significant. Interestingly, patients who consumed iodized salt were up to 4.3 times more likely to have controlled BP. Similarly, clients who were consuming processed foods every day engaged in moderate-intensity physical activity throughout the week were up to 23.2 and 4.4, respectively more likely to have controlled BP than their counterparts.

Table 14 Relationship between patient's lifestyle and clinical management of hypertension

Characteristics	Categories	N	Blood pressure status		OR	95% CI	P-value
			Control led (%)	Uncontrol led (%)			
Consumes iodized salt	Yes	216	27.8	72.2	0.8	0.1 – 4.3	0.3
	No	6	33.3	66.7			
Amount of salt consumed per day	1 – 2 teaspoons	67	25.4	74.6	0.8	0.4 – 1.6	0.6
	> 2 teaspoons	155	29.0	71.0			
Frequency of processed food consumption	Everyday	214	28.5	71.5	2.7	0.3 – 23.2	0.2
	Weekly/Rarely	8	12.5	87.5			
Composition of the majority of diet	Carbohydrates	112	30.4	69.6	1.3	0.7 – 2.3	0.4
	Others	110	25.4	74.6			
Engages in moderate-intensity physical activity throughout the week	Yes	10	30.0	70.0	1.1	0.3 – 4.4	0.3
	No	212	27.8	72.2			
Smoked cigarettes in last 12 months	Yes	44	22.7	77.3	0.7	0.3 – 1.5	0.4
	No	178	29.2	70.8			

3.7.1 Relationship between patient's clinical check-up appointments and clinical management of uncontrolled blood pressure

Table 15 shows the relationship between patient's clinical check-up appointments and clinical management of hypertension. There was a significant relationship between a patient having treatment support to remind him/her to take medication and clinical management of hypertension. Patients who had such support systems were 2.6 times more likely to have controlled BP than those who did not have the support (OR: 2.6; 95% CI: 1.0 – 6.4; p 0.03), with the results being statistically significant. Patients on Nifedipine were 40% less likely to have controlled BP, unlike patients who stated that they would be on anti-hypertensive treatment for life with a higher likelihood of 1.6 of having controlled BP than those who would be taking treatment whenever they were sick. However, the results for both cases were not statistically significant.

Table 15 Relationship between patient's clinical check-up appointments and control of blood pressure

Characteristics	Categories	N	Blood pressure		OR	95% CI	P-value																																																																																																								
			Control led (%)	Uncontrol led (%)																																																																																																											
When last checked BP	Cannot remember	183	29.0	71.0	1.4	0.6 – 3.1	0.5																																																																																																								
	Less than one to more than six months	39	23.1	76.9				Honored last three clinical appointments	Yes	5	20.0	80.0	0.6	0.1 – 5.8	0.4	No	217	28.1	71.9	Reason for missed appointments	Forgot	195	29.2	70.8	1.8	0.7 – 5.0	0.2	Working, sick	27	18.5	81.5	Current anti-hypertensive drugs	Nifedipine	109	22.9	77.1	0.6	0.3 – 1.1	0.1	Hydrochlorothiazide	113	32.7	67.3	Expected duration of using anti-hypertensive drugs	For life	70	34.3	65.7	1.6	0.8 – 2.9	0.1	Whenever sick / when BP rises	152	25.0	75.0	Has a treatment support to remind client to take medication	Yes	21	47.6	52.4	2.6	1.0 – 6.4	0.03	No	201	25.9	74.1	Ever noted adverse effect on the drugs	Yes	210	28.6	71.4	2.0	0.4 – 9.4	0.2	No	12	16.7	83.3	Type of adverse effect experienced	Swelling of limbs, Constipation, Headache, Feeling nervous	110	25.5	74.6	0.7	0.4 – 1.3	0.3	Cough, Erectile problems, nausea, and vomiting	100	32.0	68.0	Ever missed taking medication	Yes	204	28.9	71.1	2.0	0.6 – 7.3	0.3	No	18	16.7	83.3	Reason for missing taking medication	Cost	87	32.2	67.8	1.3	0.7 – 2.4	0.4
Honored last three clinical appointments	Yes	5	20.0	80.0	0.6	0.1 – 5.8	0.4																																																																																																								
	No	217	28.1	71.9				Reason for missed appointments	Forgot	195	29.2	70.8	1.8	0.7 – 5.0	0.2	Working, sick	27	18.5	81.5	Current anti-hypertensive drugs	Nifedipine	109	22.9	77.1	0.6	0.3 – 1.1	0.1	Hydrochlorothiazide	113	32.7	67.3	Expected duration of using anti-hypertensive drugs	For life	70	34.3	65.7	1.6	0.8 – 2.9	0.1	Whenever sick / when BP rises	152	25.0	75.0	Has a treatment support to remind client to take medication	Yes	21	47.6	52.4	2.6	1.0 – 6.4	0.03	No	201	25.9	74.1	Ever noted adverse effect on the drugs	Yes	210	28.6	71.4	2.0	0.4 – 9.4	0.2	No	12	16.7	83.3	Type of adverse effect experienced	Swelling of limbs, Constipation, Headache, Feeling nervous	110	25.5	74.6	0.7	0.4 – 1.3	0.3	Cough, Erectile problems, nausea, and vomiting	100	32.0	68.0	Ever missed taking medication	Yes	204	28.9	71.1	2.0	0.6 – 7.3	0.3	No	18	16.7	83.3	Reason for missing taking medication	Cost	87	32.2	67.8	1.3	0.7 – 2.4	0.4	Other	117	26.5	73.5								
Reason for missed appointments	Forgot	195	29.2	70.8	1.8	0.7 – 5.0	0.2																																																																																																								
	Working, sick	27	18.5	81.5				Current anti-hypertensive drugs	Nifedipine	109	22.9	77.1	0.6	0.3 – 1.1	0.1	Hydrochlorothiazide	113	32.7	67.3	Expected duration of using anti-hypertensive drugs	For life	70	34.3	65.7	1.6	0.8 – 2.9	0.1	Whenever sick / when BP rises	152	25.0	75.0	Has a treatment support to remind client to take medication	Yes	21	47.6	52.4	2.6	1.0 – 6.4	0.03	No	201	25.9	74.1	Ever noted adverse effect on the drugs	Yes	210	28.6	71.4	2.0	0.4 – 9.4	0.2	No	12	16.7	83.3	Type of adverse effect experienced	Swelling of limbs, Constipation, Headache, Feeling nervous	110	25.5	74.6	0.7	0.4 – 1.3	0.3	Cough, Erectile problems, nausea, and vomiting	100	32.0	68.0	Ever missed taking medication	Yes	204	28.9	71.1	2.0	0.6 – 7.3	0.3	No	18	16.7	83.3	Reason for missing taking medication	Cost	87	32.2	67.8	1.3	0.7 – 2.4	0.4	Other	117	26.5	73.5																				
Current anti-hypertensive drugs	Nifedipine	109	22.9	77.1	0.6	0.3 – 1.1	0.1																																																																																																								
	Hydrochlorothiazide	113	32.7	67.3				Expected duration of using anti-hypertensive drugs	For life	70	34.3	65.7	1.6	0.8 – 2.9	0.1	Whenever sick / when BP rises	152	25.0	75.0	Has a treatment support to remind client to take medication	Yes	21	47.6	52.4	2.6	1.0 – 6.4	0.03	No	201	25.9	74.1	Ever noted adverse effect on the drugs	Yes	210	28.6	71.4	2.0	0.4 – 9.4	0.2	No	12	16.7	83.3	Type of adverse effect experienced	Swelling of limbs, Constipation, Headache, Feeling nervous	110	25.5	74.6	0.7	0.4 – 1.3	0.3	Cough, Erectile problems, nausea, and vomiting	100	32.0	68.0	Ever missed taking medication	Yes	204	28.9	71.1	2.0	0.6 – 7.3	0.3	No	18	16.7	83.3	Reason for missing taking medication	Cost	87	32.2	67.8	1.3	0.7 – 2.4	0.4	Other	117	26.5	73.5																																
Expected duration of using anti-hypertensive drugs	For life	70	34.3	65.7	1.6	0.8 – 2.9	0.1																																																																																																								
	Whenever sick / when BP rises	152	25.0	75.0				Has a treatment support to remind client to take medication	Yes	21	47.6	52.4	2.6	1.0 – 6.4	0.03	No	201	25.9	74.1	Ever noted adverse effect on the drugs	Yes	210	28.6	71.4	2.0	0.4 – 9.4	0.2	No	12	16.7	83.3	Type of adverse effect experienced	Swelling of limbs, Constipation, Headache, Feeling nervous	110	25.5	74.6	0.7	0.4 – 1.3	0.3	Cough, Erectile problems, nausea, and vomiting	100	32.0	68.0	Ever missed taking medication	Yes	204	28.9	71.1	2.0	0.6 – 7.3	0.3	No	18	16.7	83.3	Reason for missing taking medication	Cost	87	32.2	67.8	1.3	0.7 – 2.4	0.4	Other	117	26.5	73.5																																												
Has a treatment support to remind client to take medication	Yes	21	47.6	52.4	2.6	1.0 – 6.4	0.03																																																																																																								
	No	201	25.9	74.1				Ever noted adverse effect on the drugs	Yes	210	28.6	71.4	2.0	0.4 – 9.4	0.2	No	12	16.7	83.3	Type of adverse effect experienced	Swelling of limbs, Constipation, Headache, Feeling nervous	110	25.5	74.6	0.7	0.4 – 1.3	0.3	Cough, Erectile problems, nausea, and vomiting	100	32.0	68.0	Ever missed taking medication	Yes	204	28.9	71.1	2.0	0.6 – 7.3	0.3	No	18	16.7	83.3	Reason for missing taking medication	Cost	87	32.2	67.8	1.3	0.7 – 2.4	0.4	Other	117	26.5	73.5																																																								
Ever noted adverse effect on the drugs	Yes	210	28.6	71.4	2.0	0.4 – 9.4	0.2																																																																																																								
	No	12	16.7	83.3				Type of adverse effect experienced	Swelling of limbs, Constipation, Headache, Feeling nervous	110	25.5	74.6	0.7	0.4 – 1.3	0.3	Cough, Erectile problems, nausea, and vomiting	100	32.0	68.0	Ever missed taking medication	Yes	204	28.9	71.1	2.0	0.6 – 7.3	0.3	No	18	16.7	83.3	Reason for missing taking medication	Cost	87	32.2	67.8	1.3	0.7 – 2.4	0.4	Other	117	26.5	73.5																																																																				
Type of adverse effect experienced	Swelling of limbs, Constipation, Headache, Feeling nervous	110	25.5	74.6	0.7	0.4 – 1.3	0.3																																																																																																								
	Cough, Erectile problems, nausea, and vomiting	100	32.0	68.0				Ever missed taking medication	Yes	204	28.9	71.1	2.0	0.6 – 7.3	0.3	No	18	16.7	83.3	Reason for missing taking medication	Cost	87	32.2	67.8	1.3	0.7 – 2.4	0.4	Other	117	26.5	73.5																																																																																
Ever missed taking medication	Yes	204	28.9	71.1	2.0	0.6 – 7.3	0.3																																																																																																								
	No	18	16.7	83.3				Reason for missing taking medication	Cost	87	32.2	67.8	1.3	0.7 – 2.4	0.4	Other	117	26.5	73.5																																																																																												
Reason for missing taking medication	Cost	87	32.2	67.8	1.3	0.7 – 2.4	0.4																																																																																																								
	Other	117	26.5	73.5																																																																																																											

3.7.2 Health care provider factors that influence the clinical management of uncontrolled blood pressure level

Table 16 shows the factors that affect the clinical treatment of hypertension by health care providers. Patients in Levels 3 and 4 were 50% less likely than those in Levels 5 and above to have regulated blood pressure (OR; 0.5; 95 percent CI: 0.3–0.9; $p = 0.03$). Similarly, patients in private health facilities were 50% less likely than those in public health facilities to have regulated blood pressure, with the relationship being statistically important (OR: 0.5; 95 percent CI: 0.3–1.0; $p = 0.06$).

Besides, the proportion of patients aged less than 31 years who had controlled BP was higher (33.3%) than those who were older (22.8%). Equally, a higher proportion of patients who were counseled on low salt diet (40.6%) had controlled BP than their colleagues who were not counseled (25.8%). However, the evidence in both relationships was insufficient to reject the null hypothesis of no relationship between age group, counseling of patients on low salt diet, and clinical management of hypertension assessed through blood pressure changes. Results also indicate that health care providers with clinical guidelines were up to 3 times had more patients (32.5%) with controlled BP than those without (22.6%) with a non-significant p -value of 0.1. The proportion of patients with controlled BP among health care providers who recorded clinical history of patients was higher (31.2%) than that of patients with uncontrolled BP whose health care providers were not recording patient history (20%), results being non-statistically significant. Of importance but with no significant outcomes, Health care professionals that offered adherence therapy (33.3 percent vs. 27.1 percent), had psychosocial support groups (40 percent vs. 26 percent), instructed patients about behavioral modification on any visit (36.4 percent vs. 26.5 percent), and conducted investigations on patients had a higher proportion of patients with managed BP than those with uncontrolled BP (38.5 percent vs. 25.7 percent). The opposite was true regarding health care provider competence and blood pressure outcome as a measure of good clinical management of hypertension. The proportion of patients with controlled BP among nurses who correctly gathered the correct equipment and those who correctly performed the procedures are much lower, with non-significant results reinforcing the previous results with negative z score values with p values < 0.05 , signifying poor performance.

Table 16 Relationship between health care provider factors and control of blood pressure

Characteristics of the health care provider	Categories	n	Blood pressure status		OR	95% CI	P-value
			Control led (%)	Uncontrol led (%)			
Gender	Male	15	23.9	76.1	0.7	0.4 – 1.3	0.3
	Female	22	30.6	69.4			
Age group in years	< 31	18	33.3	66.7	1.7	0.9 – 3.1	0.08
	≥ 31	19	22.8	77.2			
Years of experience	1 - 5	17	26.0	74.0	0.8	0.5 – 1.5	0.5
	≥ 6	20	29.7	70.3			
Type of health facility	Private	12	19.7	80.3	0.5	0.3 – 1.0	0.06
	Public	25	31.8	68.2			
Level of health facility	3 or 4	19	21.6	78.4	0.5	0.3 – 0.9	0.03
	Five and above	18	34.9	65.1			
Have clinical guidelines	Yes	21	32.5	67.5	1.6	0.9 – 3.0	0.1
	No	16	22.6	77.4			
Records the clinical history of patients	Yes	26	31.2	68.8	1.8	0.9 – 3.6	0.09
	No	11	20.0	80.0			
Percentage of patients with controlled BP	Above 50%	16	32.3	67.7	1.5	0.8 – 2.7	0.2
	40% or Don't know	21	24.4	75.6			
Provide adherence counseling	Yes	5	33.3	66.7	1.3	0.6 – 3.1	0.5
	No	32	27.1	72.9			
Have PSSGS for patients	Yes	5	40.0	60.0	1.9	0.8 – 4.2	0.1
	No	32	26.0	74.0			
Counsel patients on a low salt diet	Yes	5	40.6	59.4	2.0	0.9 – 4.3	0.08
	No	32	25.8	74.2			
Advise patients about lifestyle modification on every visit	Yes	6	36.4	63.6	1.6	0.7 – 3.5	0.2
	No	31	26.5	73.5			
Performs investigations on patients	Yes	7	38.5	61.5	1.8	0.9 – 3.7	0.1
	No	32	25.7	74.3			
Gathers the right equipment and assess for correct size	Yes	35	27.4	72.6	0.5	0.1 – 2.3	0.4
	No	2	42.9	57.1			

Correctly performed procedures	Yes	36	27.2	72.8	0.2	0.04	–	0.1
	No	1	60.0	40.0		1.52		

3.7.3 Institutional factors influencing clinical management of uncontrolled blood pressure

Table 17 shows bivariate analysis results on health system factors influencing clinical management of hypertension. None of the results were statistically significant. Despite that, there were important findings that may need further consideration. The proportion of patients with controlled BP was higher where access to health care providers whenever patients were in need (30.8%), among patients who expressed satisfaction with services provided by health care providers whenever patient had clinical appointment (34.4%) or institutions with readily available prescribed drugs in hospital pharmacy (32.4%).

Though statistically insignificant, almost three-quarters of the patients felt that the medication cost was too high, with 70% having uncontrolled blood pressure readings for lack of the necessary drugs.

Table 17 Relationship between health facility factors and control of blood pressure

Characteristics of the health care provider	Categories	n	Blood pressure status		OR	95% CI	P-value
			Controlled (%)	Uncontrolled (%)			
Membership of PSSG in the facility	Smoking cessation	25	23.9	76.1	1.2	0.5 – 3.1	0.6
	Alcohol	197	30.6	69.4			
	Others						
Access to health care providers whenever in need of them	Yes	39	30.8	69.2	1.2	0.6 – 2.5	0.7
	No	183	27.3	72.7			
Satisfaction with services provided by health care providers whenever the patient has a clinical appointment	Yes	61	34.4	65.6	1.5	0.8 – 2.9	0.2
	No	161	25.5	74.5			
Satisfaction with the waiting time whenever the patient was at the waiting bay	Yes	80	23.7	76.3	0.7	0.4 – 1.3	0.3
	No	142	30.3	69.7			
Ready availability of prescribed drugs in hospital pharmacy	Yes	71	32.4	67.6	1.4	0.7 – 2.5	0.3
	No	151	25.8	74.2			
Health insurance coverage	Yes	75	22.7	77.3	0.7	0.3 – 1.3	0.2
	No	147	30.6	69.4			
Education materials provided by the hospital	Yes	31	19.3	80.7	0.6	0.2 – 1.5	0.2
	No	191	29.3	70.7			
Informed by health providers of the importance of BP control	Yes	114	25.4	74.6	0.8	0.4 – 1.4	0.4
	No	108	30.6	69.4			
Cost of the services affordable	Yes	75	24.0	76.0	0.7	0.4 – 1.4	0.3
	No	147	29.9	70.1			

3.8 Multiple logistic regression on factors associated with the blood pressure levels for the patients

Multiple logistic regression was performed with all the independent variables with $p \leq 0.1$ as explanatory variables and binary outcome – controlled or uncontrolled BP as a measure of clinical management of hypertension. The model used was to determine which explanatory variable influences clinical management of hypertension and could then be used to predict the outcome. These results indicate that the number of years a patient was told that he/she has hypertension ($p = 0.04$), patient's BMI ($p = 0.01$), control of BP at the time of admission (< 0.0001), having treatment supporter to remind patient when to take drugs (0.04) and age group of health care provider ($p = 0.02$) are independently linked to the clinical treatment of hypertension and blood pressure control in patients. More than five years earlier, patients diagnosed with hypertension were 2.3 times more likely to have their blood pressure under control. Those with controlled BP were 2.9-fold more likely to have had controlled BP at the time of admission. Patients admitted with controlled BP were 5.6 times more likely to have controlled BP while those with treatment supporter or being cared for by a younger health care provider were 3.2 and 2.5 times, respectively more likely to have had controlled BP. Male patients ($p=0.06$), patients younger than 64 years ($p=0.07$), and a family member who died from hypertension were all negative predictors of marginal p values ($p 0.06$).

Table 18 Multiple logistic regression on factors associated with control of blood pressure

Independent variable	Categories	Estimate	OR	95% CI	P-value
Patient factors					
Gender	Male vs Female	- 0.7	0.5	0.2 – 1.0	0.06
Age group in years	< 64 vs ≥ 64	- 0.7	0.5	0.2 – 1.1	0.07
Level of education	None/Primary vs Secondary and above	- 0.1	0.9	0.4 – 2.0	0.8
A family member died due to hypertension	Yes, vs No	- 0.8	0.4	0.2 – 1.0	0.06
When patient was told that he/she had hypertension	> 5 years vs ≤5 years ago	0.8	2.3	1.0 – 5.2	0.04
BMI	< 25.0 vs ≥25.0	1.1	2.9	1.2 – 6.7	0.01
Controlled BP during admission	Yes, vs No	1.7	5.6	2.2 – 13.3	< 0.0001
Type of anti-hypertensive used	Nifedipine vs Hydrochlorothiazide	- 0.5	0.6	0.3 – 1.2	0.1
Has treatment supporter to remind patient to take medication	Yes, vs. No	1.2	3.2	1.0 – 10.0	0.04
Health care provider					
Age group in years	< 31 vs ≥ 31	0.9	2.5	1.2 – 5.3	0.02
Type of health facility	Private vs Public	- 0.4	0.7	0.2 – 2.0	0.5
Availability of clinical guidelines	Yes, vs No	0.2	1.2	0.5 – 2.8	0.7
Records the clinical history of the patient	Yes, vs. No	0.3	1.3	0.5 – 3.9	0.6
Have PSSG for patients	Yes, vs No	- 0.7	0.5	0.1 – 2.7	0.4
Counsel patients about low salt diet	Yes, vs No	1.0	2.7	0.5 – 15.6	0.3
Performs investigations on hypertensive patients	Yes, vs No	0.7	2.0	0.3 – 12.8	0.5

4.0 Conclusions and Recommendations

4.1 Conclusion

The study results showed that the patient's age and gender directly impact the clinical treatment of hypertension (status of the blood pressure of the patient-controlled or uncontrolled). An overwhelming majority of health care providers confirmed hypertension being among the top ten conditions in the respective facilities. However, more than half (54.1%) have clinical guidelines of 2018 on hypertension management, with 90% agreeing that the guidelines are helpful, with only more than two-thirds (70.7%) record the patient's clinical history. More than 30% did not have adequate knowledge of hypertension and blood pressure control

The patients with controlled BP are higher where access to health care providers whenever patients were in need (30.8%), among patients who expressed satisfaction with services provided by health care providers whenever patient had clinical appointment (34.4%) or institutions with readily available prescribed drugs in hospital pharmacy (32.4%). More so, the patients who understood the prognosis of the disease had controlled BP.

4.2 Recommendations

In an attempt to improve a patient's Physical activity, nonmodifiable variables like gender and age should be considered as they were statically significant in the current study. Health care providers should get frequent, continuous education on patient-friendly services for better management of hypertension and blood pressure levels

The ministry of health should Provide hypertension clinical management recommendations to health care professionals and use them when delivering comprehensive treatment to hypertensive patients.

Refresher training opportunities for health care professionals delivering comprehensive services to hypertensive patients on blood pressure monitoring and other evaluation skills

Health facilities should conduct frequent health talks on the prognosis of hypertension disease within and outside the hospital for hypertensive patients to improve patient awareness. Health facilities should ensure proper planning and procurement of hypertensive medications to minimize stockouts and control artificial shortages of drugs

According to the current report, males in Kakamega County had higher rates of uncontrolled blood pressure than females. As a result, there was a need for further studies with a large sample size for both patients and healthcare providers.

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