AFRICAN JOURNAL OF SCIENCE, TECHNOLOGY AND SOCIAL SCIENCES

Journal website: https://journals.must.ac.ke

MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

A publication of Meru University of Science and Technology

Determinants of high blood pressure management among patients experiencing stroke: a case of Meru Teaching and Referral Hospital

Purity Kathambi Mathiu[1], Maryjoy Kaimuri[1], Peter N. Kailemia[1]

[1]*Meru University of Science and Technology, Meru, Kenya*

ARTICLE INFO

Keywords:

Hypertension

Stroke

Comorbidity

Healthcare delivery

Blood pressure management

ABSTRACT

Hypertension remains the most significant modifiable risk factor for stroke worldwide, accounting for nearly half of all stroke cases. In Kenya, hypertension prevalence has steadily increased, contributing to a high burden of stroke-related disability and mortality. This study investigated the determinants of high blood pressure management among patients with hypertension who developed stroke in MeTRH. Using a mixed-methods convergent design, data was drawn from 80 systematically sampled stroke patient records, 42 stratified sampled healthcare workers, and 10 purposively selected hypertensive stroke patients. Data collection employed medical record checklists, self-administered questionnaires, and interview guides. Quantitative data was analyzed using SPSS V25, and thematic analysis via NVIVO for qualitative interviews and integrated with quantitative findings. The findings revealed, prevalence of hypertension-stroke comorbidity was significantly higher among older adults (mean age= 58.6) and females (67.5%), with poor adherence to treatment and lifestyle modification serving as key risk factors. Healthcare system delivery was constrained by inadequate diagnostic resources, shortages of antihypertensive drugs, and limited provider expertise, with nearly half of healthcare workers reporting less than five years of experience in hypertension management, and only 18.4% identified correct definition of hypertension. No statistically significant association between healthcare delivery and blood pressure control (p=0.308). In conclusion, effective hypertension management is hindered by poor patient adherence, inadequate health system delivery, and insufficient provider experience. Strengthening counselling, standardizing care guidelines, and improving access to diagnostics and affordable medications are recommended. Improving both patient-level and system-level determinants of hypertension control is crucial to reducing stroke burden in resource-limited settings

Introduction

Hypertension is a global public health concern, affecting approximately 1.28 billion adults worldwide, with nearly two-thirds residing in low- and middle-income countries (World Health Organization, 2021). It remains the most important risk factor for cardiovascular diseases, particularly stroke, contributing to over 9.4 million deaths annually (*Adomako et al.*, 2021). Stroke is the second leading cause of death globally and the leading cause of disability, with 1 in 4 people expected to experience a stroke in their lifetime (*Feigin et al.*, 2021)

*Corresponding author: *Purity Kathambi Mathiu* Email: pkathambi@gmail.com

https://doi.org/10.58506/ajstss.v4i2.328

AFRICAN JOURNAL OF SCIENCE, TECHNOLOGY AND SOCIAL SCIENCES. ISSN:2958:0560

In Sub-Saharan Africa (SSA), the prevalence of hypertension among adults aged 25 years and older is estimated at 46%, the highest globally (Hussien et al., 2021). Alarmingly, more than half of hypertensive individuals remain undiagnosed or inadequately treated, exposing them to stroke and other complications (*Dzudie et al*., 2024). Evidence suggests that hypertension contributes to over 90% of stroke cases in SSA, often presenting at a younger age compared to high-income countries (*Akinyemi et al*., 2021).

In Kenya, hypertension affects an estimated 24–28% of the adult population, but less than 20% achieve adequate control (Pengpid & Peltzer, 2020). Stroke has emerged as a leading cause of mortality, accounting for 6.03% of all deaths, with an age-adjusted death rate of 92 per 100,000 population (World Health Organization, 2020). The cost of stroke care, both direct and indirect, continues to burden households and health systems. For instance, stroke survivors often require long-term rehabilitation, leading to productivity losses and financial hardship (World Stroke Day 2022, n.d.)

Internationally, progress in stroke prevention has been achieved through systematic screening, structured patient education, and strict adherence to hypertension treatment guidelines. In contrast, SSA faces a confluence of barriers, including weak health systems, limited diagnostic capacity, shortages of essential medicines, and cultural practices that affect lifestyle modification (Shu & Jin, 2023). Kenya, despite policy commitments to non-communicable disease (NCD) prevention under the Universal Health Coverage (UHC) agenda, continues to experience a growing burden of hypertension-related complications, particularly stroke. This context calls for empirical studies that assess both the patient-level and healthcare system-level determinants of hypertension control.

Globally, four out of five people with hypertension are not adequately treated, resulting in millions of preventable deaths annually (World Health Organization, 2023). The paradox of increasing access to healthcare facilities yet rising hypertension-related complications is particularly evident in Kenya. Despite the existence of national guidelines for cardiovascular disease management, stroke prevalence continues to rise, particularly in resource-limited counties such as Meru.

Meru County presents a unique case for studying hypertension and stroke. With a mix of rural and peri-urban populations, health-seeking behaviors are influenced by cultural beliefs, socioeconomic status, and accessibility of health facilities. MeTRH, as the largest referral hospital in the region, handles a substantial number of NCD cases. Yet it grapples with challenges typical of county-level hospitals in Kenya: inadequate staffing, stock-outs of essential drugs, limited diagnostic facilities, and insufficient specialized care. The high prevalence of stroke despite ongoing hypertension management at MeTRH reflects these systemic weaknesses.

Objectives.

The research focused on three objectives; to determine the prevalence of hypertension stroke comorbidity among patients attending NCD clinic at MeTRH, exploring patients experiences with self-management of hypertension, and evaluating the delivery of hypertension healthcare in MeTRH.

Methods

The research was carried out in Meru Teaching and Referral Hospital which is a level five hospital, located in Meru County, Kenya, serving a catchment population of 250,000 people. The study was carried out in different departments; outpatient, medical ward and NCD clinic, and medical records. A mixed-methods convergent design was employed to capture both quantitative and qualitative dimensions for comprehensive understanding of patients, healthcare workers, and structural determinants influencing hypertension management. Among the 3,648 patients diagnosed with hypertension the year 2023, the study target population was 386 hypertensive adult patients who developed stroke while under follow-up and management, not less than 6 months at Meru Teaching and Referral Hospital, and consented for the study, and their medical records for patients documented hypertension and subsequent stroke, 71 healthcare workers (physicians, clinical officers and nurses), who were involved in direct management of hypertensive patients and with more than six months experience. Incomplete patient records. Patients unable to participate in interviews due to severe disability or communication barriers, or have comorbidities, patients referred from other facilities and pregnant were excluded from the study. Quan-

titative sample size was derived from the population of 386 medical records and 71 Healthcare workers. Yamane formula *n=N/ (1+ N (e) ^2* was used to calculate the sample size for healthcare workers (42) and medical records (80) (*Oluigbo et al*., 2024), as it gives a statistically sound sample that represents the larger population without bias. The researcher utilized the principle of emergent and data saturation to determine the sample size, where analysis was done after every interview and data saturation was achieved with 10 patients when no new theme was recognized.

Systematic random sampling method was used for medical records. Sampling interval (k) was calculated (Population/sample size), using a population (N) of 386 and sample size of 80 (n), where K= N/ n=386/80= 4.8 ≈5. Random sampling was used to select the first file, and the subsequent files were picked by including every 5th record, until sample size of 80 was achieved. Stratified random Sampling was adopted to select 42 healthcare workers from various cadres (nurses, doctors, and clinical officers). Each cadre formed a stratum, and participants were randomly selected proportionate to size. Purposive sampling was utilized in qualitative sampling, where data was analyzed after every interview until saturation was achieved at 10th participant who were willing to participate.

Quantitative and qualitative data collection was done concurrently and integration done during analysis. Checklist was used to collect data for medical records to extract clinical data on hypertension management, for objective on prevalence and healthcare delivery. Self-administered questionnaire for healthcare workers, to capture knowledge, attitudes, and practices in managing hypertension, for objective on healthcare delivery. Qualitative data, the researcher developed topic for an in-depth interview guide from different studies, which had open ended question and was used to explore personal experiences with self-care and treatment challenges, for objective on self-care management experiences and healthcare delivery. The researcher visited the records department to check the files retrieved for the Hypertension stroke clinic the following day and found the eligible clients. The researcher met the clients in the clinic and explained the purpose for the interview, then clients chose the interview to be done in their homestead. The researcher audio recorded the interview to ensure accuracy in capturing the data, then transcribed later.

Phased data analysis was adopted by the researcher, where Quantitative data was analyzed first by coding and then entered into a statistical software package, SPSS version 25, and subjected to data cleaning. In Qualitative data analysis, thematic data analysis (Braun & Clarke, 2020) was used. The researcher read and re-read the data and transcribed the recorded interviews or discussions, making initial codes, initial notes and patterns that emerged main themes. Transcripts were coded using qualitative data analysis software NVivo version 15. Codebook was developed with initial codes, sub-themes and themes. Findings from both datasets were merged during interpretation to conclude converging and diverging patterns in determinants of hypertension management, and presented using tables. Then the researcher conducted a discussion with seamless integration of quantitative results with the qualitative insights, offering a comprehensive narrative that addressed the research questions and hypothesis.

Ethical Approval

Ethical approval was sought from Meru University of Science and Technology (MUST) Institutional Research Ethics Review Committee (MIRERC) approval number 056/2024. Approval to conduct the study was sought from Meru County Research Division, and Meru Teaching and Referral Hospital (MeTRH). Permit was sought from NACOSTI. License No: NACOSTI/P/25/417282. Respondents were taken through the informed consent, and informed the purpose of the study. Participants were assured of utmost confidentiality; their names were not included on the questionnaire. Participation was voluntary, informed consent was obtained, explaining clearly how data would be collected, stored and used after data collection.

Results

Demographic Characteristics

Out of 80 patient records reviewed, 54 (67.5%) were female and 26 (32.5%) male. The mean age was 58.6 years, with most patients, 43.8%(n=35), aged 60 years and above. Married individuals represented 67.5%(n=54) of the sample, while 32.5%(n=26) were single, widowed, or divorced. Regarding education, 45%(n=36) had only primary

education, 32.5%(n=26) had secondary education, and 22.5%(n=18) had tertiary education. Farmers and informal workers constituted the majority of occupations (41.3%, (n=33)).

Among the 42-healthcare sampled 38 were surveyed, registered Clinical Officers and nurses were the predominant professional groups among respondents, each comprising 45% (n=17) of the sample, medical officers and physicians each comprised of 5.3% (n=2). More than half 68.4%, (n=26) had less than five years of experience in hypertension management.

Demographic	Classification	Count	%
Gender	Male	26	32.5%
	Female	54	67.5%
	Total	**80**	**100%**
Age	21-30	2	2.5%
	31-40	9	11.3%
	41-50	14	17.5%
	51-60	20	25.0%
	60 and Above	35	43.7%
	Total	**80**	**100%**
Marital status	Single	6	7.5%
	Married	54	67.5%
	Widowed/widower	16	20.0%
	Divorced/Separated	3	3.8%
	Total	**80**	**100%**
Education status	Other	1	1.3%
	Secondary	24	30.0%
	Post-secondary	6	7.5%
	None	14	17.5%
	Total	**80**	**100%**
Employment status	Employed	5	6.3%
	Self employed	13	16.3%
	Unemployed	56	70.0%
	Other	6	7.5%
	Total	**80**	**100%**

Table 1: *Blood Pressure Control before Stroke Occurrence*

Prevalence of Hypertension-Stroke Comorbidity

Analysis of 80 medical records showed that hypertension-stroke comorbidity was highly prevalent among older adults, with a mean age of 58.6 years. Females constituted a higher proportion of stroke cases compared to males. Stroke was more prevalent among the married at 67.5% (n=54), and among the less educated, indicating an inverse relationship between education level and stroke prevalence. Prevalence was also increased among the unemployed, 70% (n=56), possibly linked to socioeconomic vulnerabilities that affect access to consistent care and lifestyle modification.

Blood pressure control before stroke.

Nearly 95%(n=76) of patients had uncontrolled blood pressure at the time of stroke occurrence, despite being on antihypertensive therapy. Non-adherence to medication, missed follow-up visits, and limited lifestyle modifications (low physical activity, high salt intake, smoking, and alcohol use) were reported as major contributing factors.

Bp Reading	1st Visit	2nd Visit	3rd Visit
High	74 (92.5%)	77 (96.3%)	76 (95%)
Normal	6 (7.5%)	2 (2.5%)	2 (2.5%)
Undocumented	0 (0%)	1 (1.2%)	2 (2.5%)
Total	**80 (100%)**	**80 (100%)**	**80 (100%)**

Table 2: *Blood Pressure Control before Stroke Occurrence*

These findings mirror national statistics, where only 6.5% of hypertensive patients achieve effective blood pressure control (Pengpid & Peltzer, 2020).

Self-management experiences

Participants shared different experiences in self-management of hypertension, where five themes emerged: hypertension health education, integration and people centricity of care, adherence to hypertension management plan, barriers and facilitators to self-management, and support systems. Participants cited receiving structured and un-structured health education, but lack depth.

"I was given teachings only once when I was waiting in the queue."…… "Sometimes the doctors are pressed by so many people. You can go and the doctor refuses to tell you what to do. So long as he has told you that you have BP, others want, so you see even the doctor lacks time to advice you" Participant 02

Others reported non-adherence challenges due to forgetfulness, financial constraints, work related issues, long ques and waiting time at the hospital, lack of drugs, and denial.

"I continued with the clinic and sometimes I was not able to go due to lack of time to go, other times you get patients are many and you are told your time passed (late for clinic time), and fare to go there I miss, so you

get I go to clinic once in a while, and even drugs I fail to take, I see I am degrading myself because of taking drugs every day every day" Participant 06.

Some felt that the care they received was not adequate as they missed drugs, diagnostic tests, some doctors were rude, the facility did not have equipment's to measure blood pressure, and shortage of healthcare workers forcing them to que the whole day.

"When you go to Meru Hospital thinking that drugs are there, you go and get there are no drugs. You get angry because you have used transport, time and queued looking (to get drug) for drug but you find there is no drug" Participant 08

Participants mentioned receiving support from family members, peers and support groups which might have helped in their health seeking behaviour, emotional support and overall health outcome. Others felt that they did not receive much of the support because of denial and failure to disclose, and also one cited that husband was a drunkard and no much support, which could have been the contributing factor to her developing stroke.

"No unless my husband, when I went to Nkubu I was asked why my husband has never stopped taking alcohol, I told them unless the God stops him, some secrets I can tell you, me I am seeing as those thoughts. As you can see now the child is in school, there is no money to take him back, and some might be caused by those thoughts" Participant 03

Healthcare System Delivery in Hypertension Management

Responses from 42 healthcare workers and observational data highlighted systemic barriers to optimal hypertension management at MeTRH. Only 18.4%(n=8) of healthcare workers correctly identified the updated definition of hypertension, revealing gaps in clinical knowledge. More than half 68.4% (n=26), had less than five years of experience in managing hypertension. Limited access to essential tests such as lipid panels, ECG, and renal function assessments hindered comprehensive risk stratification.

Laboratory and Diagnostic tests	Done	Not Done
Lipid profile	23(28.7%)	57(71.3%)
Blood Sugar (fasting/ Random)	21(26.3%)	59(73.7%)
Urinalysis	24(30.0%)	56(70.0%)
Renal Function tests (electrolytes, creatinine)	40(50.0%)	40(50.0%)
ECG	18(22.5%)	62(77.5%)

Table 3: *Laboratory and Diagnostic Tests*

67.5% (54) of the respondents did not have their blood pressure measured in both arms upon diagnosis, while 97.5% (78) had their blood pressure measured before development of stroke. Overall, 95% (n=76) of respondents had uncontrolled blood pressure before stroke onset, suggesting poor blood pressure management may have contributed to stroke occurrence. 99% (79) of the respondents did not have their blood pressure classified, which could have been a guide on the desired treatment mode. There was no standardized hypertension management guideline at the facility level, with healthcare workers utilizing various external references based on personal preference. There was no patient assessed on hypertensive crisis, which could have guided on management to prevent stroke occurrence. Counselling on lifestyle modification was minimally done; on hypertension management, only 2.5% (2), stopping alcohol and tobacco use 1.3% (1), diet and exercises 37.5% (30), and adherence to medication only 11.2% (9). Only 32.5% (26) were assessed on medication adherence, and 5.0% (4) on presence of drug side effects.

Patients cited that at times they miss the investigations and other times the tests get lost in the laboratory:

"Most times in the hospital,…… we see someone has used fare and is coming from far, drugs are missing, investigations do not come well (some missing), now you get it is not the doctor with problems but maybe our government,…because the doctor is working" Participant 01

Stock-outs of antihypertensive drugs were frequent. This forced reliance on expensive alternatives, affecting treatment continuity. Patients echoed this concern, with one stating:

"No, most of them I was told to buy. I think I was getting one type only, the rest I was being told to go and buy, or I get even there is no type I have seen/gotten" Participant 06

Patient tracking and recall mechanisms were weak. There was no electronic medical record system dedicated to chronic disease follow-up, leading to poor adherence and frequent loss to follow-up. Most patients cited skipping clinic follow-up due to work related issues, long ques at the hospital, long waiting times and financial constraints.

Although 94.7% of healthcare workers reported offering counselling on lifestyle modification, patients described these sessions as brief and inconsistent. A patient shared:

"I was given teachings only once when I was waiting in the queue."……."Sometimes the doctors are pressed by so many people. You can go and the doctor refuses to tell you what to do. So long as he has told you that you have BP, others want, so you see even the doctor lacks time to advice you" Participant 02

Healthcare Delivery and Blood Pressure Control

To assess whether variations in healthcare delivery influenced blood pressure control, Fisher's Exact Test was applied, given that more than 50% of cells had expected counts below five. The null hypothesis (Ho) stated that there was no statistically significant association between healthcare delivery (categorized into five levels) and the outcome of blood pressure control.

	Value	Exact Sig.(2-sided)
Fisher's Exact Test	2.469	.308
N of Valid Cases	80	

Table 4: *Healthcare Delivery and Blood Pressure Control*

The test produced a p-value of 0.308, which exceeded the conventional significance threshold of 0.05. This result indicates that there was no statistically significant association between healthcare delivery and blood pressure control among the sampled patients. Consequently, the null hypothesis was not rejected, suggesting that differences in healthcare delivery, as measured in this study, did not significantly affect blood pressure outcomes at Meru Teaching and Referral Hospital.

Integration of Findings

Convergence was noted where participants reported minimal education from healthcare workers, and learned much from peers which matched with minimal documentation on counselling of participants. Participants mentioned receiving structured health education by was inconsistent and lacked depth, which was in concurrence with healthcare workers where 81.61% (31) mentioned counseling patients every encounter and often. Participants mentioned lack of enough time with the doctor, which tallied with minimal documentation on counselling, 95% not assessed on drug side effects, as well as only 47.5% of HCW cited they offer counselling every encounter. Some participants mentioned their weight was not assessed daily, as well some of the barriers mentioned for healthcare accessibility was long ques, lack time, financial constraints, where it concurred with low documentation of BMI, and 23% of healthcare workers cited healthcare accessibility as a challenge to blood pressure management. Non-adherence to medication and follow-up was mentioned by participant, which agreed with HCW where they cited non-adherence as a barrier to hypertension management. Inadequate drugs, equipment's and diagnostics, shortage of HCW, was strongly mentioned by the participants which was also emphasized by the HCW as in-adequate resources which hinder hypertension management. Divergence arose in counselling quality where participants mentioned that they received minimal education from HCW, inconsistent and lacked depth; while 81.61% (31) HCW emphasized giving counselling at every visit and every encounter. Participants mentioned they missed follow-up visits due to long waiting time and financial constraints, whereas in documentation 97.5% follow-up visits were recorded. Divergence of quantitative data was highlighted where there was minimal documentation on counseling of patients, but 82.6% HCW reported frequent counselling. There was limited documentation on assessment of Body Mass Index (BMI), risk factors and hypertensive crisis, whereas HCW have good knowledge on risk factors, and 87% use guidelines in management of hypertension. Integration highlighted that both individual and system-level factors jointly shape outcomes.

Discussion

Prevalence of Hypertension-Stroke Comorbidity

The study found out that 10.5% if hypertensive patients on follow-up in MeTRH developed stroke. However, the proportion observed at MeTRH slightly

exceed the 7-9 prevalence reported in some urban Kenyan hospitals (*Otieno et al*., 2023), possibly reflecting the referral hospital case mix and delayed detection in rural catchment areas. Overall, 95% (n=76) of respondents in MeTRH had uncontrolled blood pressure before stroke onset. The high prevalence of hypertension-stroke comorbidity among MeTRH patients aligns with findings from other SSA contexts, where up to 80% of stroke patients report uncontrolled hypertension (*Fatima et al*., 2022), Kenyan data reporting 50-80% history of uncontrolled hypertension among stroke patients (World Stroke Day 2022, n.d.), and align with global estimates that up two thirds of stroke patients have hypertension. High prevalence among females 67.5%, and older adults above 60 years (43.7%), reflects global and regional trends, showing stroke increase with age and gender specific, and agree with Feigin et al. (2021), who noted increasing stroke risk with age and higher vulnerability among post-menopausal women due to hormonal changes and longer life expectancy. Sex remain non-modifiable risk factor, patient-level determinants such as medication adherence and lifestyle modification significantly influence outcomes.

Socioeconomic correlates were also evident; 70% of patients were unemployed, and 45% had only primary education, suggesting socioeconomic barriers to effective hypertension management (*Naanyu et al*., 2019). Similar associations between low socioeconomic status, limited health literacy, and poor hypertension control have been described in Sub-Saharan Africa (*Dzudie et al*., 2024), underscoring the need for targeted community screening and creating awareness.

Patients experiences with self-management programs

Both qualitative and quantitative data revealed gaps in self-care, including non-adherence to antihypertensive medications, follow-up, and lifestyle modifications. Non-adherence rates in Kenya remain high, with studies reporting up to 50% of patients defaulting on medication within one year (*Abbas et al*., 2020), which compares with the study where most patients cited nonadherence to drugs, lifestyle modifications and follow-up due to work related issues, denial, financial constraints and cultural barriers as well as HCW mention non-adherence by patients as the biggest challenge, only 11% of records documented regular adherence counselling, and only 27.5% documented assessment of follow-up on medication adherence. These findings are consistent with studies identifying drug cost and forgetfulness as key barriers (*Ongosi et al*., 2020);(*Otieno et a*l., 2023). Non-adherence can be deeply influenced by both internal motivation and external support. Lack of proper counselling of participants contributes to erratic medication use.

Lifestyle modifications such as reduction in salt, regular exercise were infrequently sustained, echoing the reports of low adherence to Dietary Approaches to Stop Hypertension (DASH) diet and physical activity in low-and-middle income countries (LMIC) (*Unger et a*l., 2020). Participants had mixed experiences on hypertension health education, where they mentioned the doctor had no time for them, hence lacked consistency and depth. This may hinder self-management, confirming studies by (*Pahria et a*l., 2022) that found limited knowledge is a barrier to hypertension control. Healthcare professionals' guidance by promoting and monitoring lifestyle changes, providing clear guidance and encouragement, results in better adherence among their patients (*Tsiampalis et al*., 2023). Although most patients understood medication routines, lifestyle changes, and follow-up clinic dates, patients seemed to face implementation challenges often due to inadequate reinforcement or support from healthcare staff and family members. This gap aligns with findings that adherence improves with continuous reinforcement and structured programs (*Irwan et al*., 2022), as well as this supports evidence that lifestyle interventions, though effective, must be supported by social and environmental structures to be sustainable (*Charchar et al*., 2024). Participants reported valuable encouragement from family members and peers, which underscores the multifaceted nature of self-management, which is not solely dependent on the patient's individual will but is deeply influenced by socioeconomic factors and social support.

Delivery of Hypertension Healthcare at MeTRH

Systemic bottle necks identified in MeTRH like inconsistent drug supply, shortage of HCW, long ques, missing diagnostic and equipment's, discouraged participants frequent hospital visits. The healthcare delivery findings resonate with broader evidence from LMICs. (Shu & Jin, 2023) emphasize that system-level gaps including lack of medicines,

diagnostics, and staff training undermine effective hypertension control. The shortage of antihypertensive drugs at MeTRH reflects national procurement challenges, where irregular supply chains often disrupt continuity of care (World Health Organization (WHO), 2021).

Comparisons with high-income countries highlight the role of structured systems. In Europe, the use of electronic health records, adherence monitoring, and guideline-driven practice has significantly improved hypertension control (*Diallo et al*., 2024). Policy implications are equally significant. The Kenyan Ministry of Health has committed to reducing premature NCD mortality to 25% by 2025, in line with the WHO Global Action Plan. However, in this study, data from healthcare workers showed a lack of standardized guideline use; 13.2% did not use any formal guideline, 67.5% of patients were not measured BP on the two arms and 99% did not do BP classification. This aligns with African data showing guideline implementation gaps due to limited training and resources (*Dzudie et al*., 2024). WHO's "Best Buys" for NCD prevention such as ensuring availability of essential medicines, implementing patient registries, and community education campaigns are directly applicable to MeTRH's context (World Health Organization (WHO), 2023) .

There were strengths observed where 97.5% of patients had regular BP monitoring, and 95%of staff reported screening during every visit, comparing to best practice benchmarks in regional referral hospitals (*Akinyemi et al*., 2021). Absence of structured counseling, irregular drug availability, and weak hospital community linkages noted by patients, limit effectiveness. This aligns with documentation of similar system barriers, drug stock-outs, insufficient counselling time, staff shortage, and lack of multi-disciplinary care, are consistently documented in Sub Saharan hypertension programs (*Hussien et al*., 2021).

Advanced Practice Nurse (APNs) were central to care, reflecting global evidence that APN led management improves blood pressure control (Schober, 2020). However, inconsistent guideline use and low knowledge to target BP (11.8%) highlight the need for continuous professional development and adoption of unified national protocols.

The absence of a statistically significant association between healthcare delivery levels and blood pressure control is noteworthy. While system weaknesses such as drug shortages and limited diagnostics were evident, they did not demonstrate measurable differences in patient outcomes within this dataset. This may reflect the overriding impact of patient-level determinants, including adherence behaviors, cultural practices, and socioeconomic barriers. The non-significant result does not imply that healthcare delivery is unimportant; rather, it underscores the complexity of hypertension management, where health systems and patient behaviors interact. Future interventions should combine reliable drug supply and structured counselling with adherence monitoring, community support programs, and socioeconomic assistance for vulnerable patients.

Integration of findings: Convergence of patient level challenges like financial constraints, (low health literacy), provider factors (inconsistent counselling, knowledge gaps, poor communication), and system related factors (lack of consistent guideline use, inconsistent drug supply) explains the high stroke burden despite ongoing follow-up. Divergence: Between healthcare workers reports of counselling during every encounter and often, and patients experiences of citing health education lacked depth and was inconsistent, highlights the necessity of routine documentation and patient-centered communication.

Conclusion

The mixed-method study established that uncontrolled hypertension remain the biggest contributor of stroke across patients at MeTRH, particularly among older adults and women despite the availability of screening, counselling, and pharmacological treatment. Despite ongoing management, poor adherence and inadequate lifestyle changes contribute to uncontrolled blood pressure. Analysis of 80 patients' medical records, and 42 HCW showed more than half of the healthcare workers had limited hypertension management experience of less than 5 years, and only 18.4% correctly identified the correct hypertension definition. Although 94.7% reported regular blood pressure screening and lifestyle counselling, patient adherence to medication and lifestyle modification was poor, influenced by limited diagnostics, stock-outs of essential medications, inadequate follow-up systems, work schedules, and insufficient provider expertise. Together, these gaps perpetuate stroke occurrence even among patients

under care. Although descriptive findings highlight system-level weaknesses, inferential analysis suggests that healthcare delivery variations did not significantly affect blood pressure outcomes (p=0.308) in this sample, underscoring that knowledge gaps and adherence barriers are critical determinants of poor outcome. Integrated approaches addressing both health system and patient-level factors are required to reduce the burden of stroke. Highlighting the need for structured, continuous hypertension counselling at every clinic visit, standardized management guideline, and routine training of healthcare workers to bridge knowledge gaps. More so creating supportive family and community structures to enhance lifestyle change, adherence and long-term blood pressure control. By identifying these determinants and their impact on stroke occurrence, this study provides actionable evidence for clinicians, policy makers, and community health programs to reduce stroke risk and improve hypertension outcomes in similar resource-limited settings.

Convergence between patient and HCW perspectives validates systemic challenges: medication costs, inadequate follow-up, financial constraints, and inadequate resources. Divergence, however, highlights perceptual gap, HCWs' belief in frequent counselling contrasts with patient reporting counselling as insufficient, and lack depth, reflecting quality rather than frequency concerns. This discrepancy suggests that effective hypertension counselling requires more depth, structure, and patient-centered approaches.

Recommendations

The hospital to implement regular CPDs for the nurses, clinical officers, medical officers and physicians on updated hypertension management guidelines, with emphasis on individualized care plans, lifestyle counselling and effective follow-ups. The policy makers to develop and enforce policies that support capacity building, task shifting, and expanded scope of practice for trained Advanced Nurse Practitioners, use of standardized treatment protocols and availability of essential hypertension medicines. Healthcare workers should implement structured and documented counselling sessions and integrate them as a standard component for every patient with hypertension visit to the NCD clinic, outpatient and medical wards. Researchers and scholars to explore more on gender specific barriers and cultural beliefs influencing hypertension management. The government to strengthen community health worker networks and peer-support groups for lifestyle modification.

References

Abbas, H., Kurdi, M., de Vries, F., van Onzenoort, H. A. W., Driessen, J. H. M., Watfa, M., & Karam, R. (2020). Factors associated with antihypertensive medication non-adherence: a cross-sectional study among lebanese hypertensive adults. Patient Preference and Adherence, 14, 663–673. https://doi.org/10.2147/PPA.S238751

Adomako, N. O., Marfo, A. F. A., Opare-Addo, M. N. A., Nyamekye, N., & Owusu-Daaku, F. T. (2021). Blood Pressure Control, Accessibility, and Adherence to Antihypertensive Medications: Patients Seeking Care in Two Hospitals in the Ashanti Region of Ghana. International Journal of Hypertension, 2021. https://doi.org/10.1155/2021/9637760

Akinyemi, R. O., Ovbiagele, B., Adeniji, O. A., Sarfo, F. S., Abd-Allah, F., Adoukonou, T., Ogah, O. S., Naidoo, P., Damasceno, A., Walker, R. W., Ogunniyi, A., Kalaria, R. N., & Owolabi, M. O. (2021). Stroke in Africa: profile, progress, prospects and priorities. Nature Reviews Neurology, 17(10), 634–656. https://doi.org/10.1038/s41582-021-00542-4

Braun, V., & Clarke, V. (2020). Thematic Analysis BT - Encyclopedia of Quality of Life and Well-Being Research (F. Maggino (Ed.); pp. 1–7). Springer International Publishing. https://doi.org/10.1007/978-3-319-69909-7_3470-2

Charchar, F. J., Prestes, P. R., Mills, C., Ching, S. M., Neupane, D., Marques, F. Z., Sharman, J. E., Vogt, L., Burrell, L. M., Korostovtseva, L., Zec, M., Patil, M., Schultz, M. G., Wallen, M. P., Renna, N. F., Islam, S. M. S., Hiremath, S., Gyeltshen, T., Chia, Y. C., … Tomaszewski, M. (2024). Lifestyle management of hypertension: International Society of Hypertension position paper endorsed by the World Hypertension League and European Society of Hypertension. Journal of Hypertension, 42(1), 23–49. https://doi.org/10.1097/HJH.0000000000003563

Diallo, B. A., Hassan, S., Kagwanja, N., Oyando, R., Badjie, J., Mumba, N., Prentice, A. M., Perel, P., Etyang, A., Nolte, E., & Tsofa, B. (2024). Managing hypertension in rural Gambia and Kenya:

Protocol for a qualitative study exploring the experiences of patients, health care workers, and decision-makers. NIHR Open Research, 4, 1–23. https://doi.org/10.3310/nihropenres.13523.3

Dzudie, A., Dehayem, M., Kuate, L. M., Ndom, M. S., Ouankou, C. N., Ebasone, P. V., Ngongang, A. D., Njume, E., Kamdem, F., Choukem, S. P., Essomba, N. E., Ateudjieu, J., Folefack, F. K., Obada, E. N., Nono, A., Kitio, B., Tchendjou, P., Thienemann, F., Boombhi, J., … Mbanya, J. C. (2024). Ten Recommendations for Accelerating Hypertension and Diabetes Control to Reduce Stroke, Heart, and Renal Disease with the Aim to Save Lives in Cameroon Through Partnerships and Collaborations. Advances in Therapy, 41(11), 3996–4007. https://doi.org/10.1007/s12325-024-02960-4

Fatima, N., Salman, M., Hashim, H., Ambreen, A., Sayed, T. M., & Waheed, S. (2022). Prevalence of Newly Diagnosed Hypertension in Stroke Patients Presented to Tertiary Care Hospitals in Rawalpindi. Pakistan Journal of Medical and Health Sciences, 16(9), 826–828. https://doi.org/10.53350/pjmhs22169826

Hussien, M., Muhye, A., Abebe, F., & Ambaw, F. (2021). The role of health care quality in hypertension self-management: A qualitative study of the experience of patients in a public hospital, north-west ethiopia. Integrated Blood Pressure Control, 14, 55–68. https://doi.org/10.2147/IBPC.S303100

Irwan, A. M., Potempa, K., Abikusno, N., & Syahrul, S. (2022). Self-Care Management for Hypertension in Southeast Asia: A Scoping Review. Journal of Multidisciplinary Healthcare, 15(August), 2015–2032. https://doi.org/10.2147/JMDH.S367638

Naanyu, V., Vedanthan, R., Kamano, J. H., Rotich, J. K., Lagat, K. K., Kiptoo, P., Kofler, C., Mutai, K. K., Bloomfield, G. S., Menya, D., Kimaiyo, S., Fuster, V., Horowitz, C. R., & Inui, T. S. (2019). Barriers Influencing Linkage to Hypertension Care in Kenya: Qualitative Analysis from the LARK Hypertension Study. Journal of General Internal Medicine, 31(3), 304–314. https://doi.org/10.1007/s11606-015-3566-1

Oluigbo, C. U., Ngozi, E. C., & Ohaegbu, P. M. N. . (2024). Determination OF SAMPLE SIZES IN RESEARCH USING TARO YAMANE FORMULA: AN OVERVIEW. Annual Faculty of Science International Conference, January 2024, 1–10. https://www.researchgate.net/publication/390947646

Ongosi, A. N., Wilunda, C., Musumari, P. M., Techasrivichien, T., Wang, C. W., Ono-Kihara, M., Serrem, C., Kihara, M., & Nakayama, T. (2020). Prevalence and risk factors of elevated blood pressure and elevated blood glucose among residents of kajiado county, kenya: A population-based cross-sectional survey. International Journal of Environmental Research and Public Health, 17(19), 1–22. https://doi.org/10.3390/ijerph17196957

Otieno, P., Agyemang, C., Wainaina, C., Igonya, E. K., Ouedraogo, R., Wambiya, E. O. A., Osindo, J., & Asiki, G. (2023). Perceived health system facilitators and barriers to integrated management of hypertension and type 2 diabetes in Kenya: a qualitative study. BMJ Open, 13(8), 1–12. https://doi.org/10.1136/bmjopen-2023-074274

Pahria, T., Nugroho, C., & Yani, D. I. (2022). Factors Influencing Self-Care Behaviors in Hypertension Patients With Complications. Vascular Health and Risk Management, 18(June), 463–471. https://doi.org/10.2147/VHRM.S366811

Pengpid, S., & Peltzer, K. (2020). Prevalence, awareness, treatment and control of hypertension among adults in Kenya: Cross-sectional national population-based survey. Eastern Mediterranean Health Journal, 26(8), 923–932. https://doi.org/10.26719/emhj.20.063

Schober, M. (2020). Guidelines on Advanced Practice Nursing. In ICN Regulation series. https://www.icn.ch/system/files/documents/2020-04/ICN_APN Report_EN_WEB.pdf

Shu, J., & Jin, W. (2023). Prioritizing non-communicable diseases in the post-pandemic era based on a comprehensive analysis of the GBD 2019 from 1990 to 2019. Scientific Reports, 13(1), 1–17. https://doi.org/10.1038/s41598-023-40595-7

Tsiampalis, T., Kouvari, M., Belitsi, V., Kalantzi, V., Androutsos, O., Bonoti, F., Panagiotakos, D. B., & Kosti, R. I. (2023). Physicians' Words, Patients' Response: The Role of Healthcare Counselling in Enhancing Beneficial Lifestyle Modifications for Patients with Cardiometabolic Disorders: The IACT Cross-Sectional Study. Healthcare (Switzerland), 11(22). https://doi.org/10.3390/healthcare11222982

Unger, T., Borghi, C., Charchar, F., Khan, N. A., Poulter, N. R., Prabhakaran, D., Ramirez, A., Schlaich, M., Stergiou, G. S., Tomaszewski, M., Wainford, R. D.,

Williams, B., & Schutte, A. E. (2020). 2020 International Society of Hypertension Global Hypertension Practice Guidelines. Hypertension, 75(6), 1334–1357. https://doi.org/10.1161/HYPERTENSIONAHA.120.15026

WHO. (2020). Stroke in Kenya. Global Life Partners. https://www.worldlifeexpectancy.com/kenya-stroke

World Health Organization (WHO). (2021). Worldwide trends in hypertension prevalence and progress in treatment and control from 1990 to 2019: a pooled analysis of 1201 population-representative studies with 104 million participants. Lancet (London, England), 398(10304), 957–980. https://doi.org/10.1016/S0140-6736(21)01330-1

World Health Organization (WHO). (2023). Global Report on Hypertension.

World Stroke Day 2022. (n.d.). Retrieved July 18, 2024, from https://www.who.int/srilanka/news/detail/29-10-2022-world-stroke-day-2022