Journal of Clinical and Diagnostic Medicine Africa
Vol. 1 No. 1 (2026): August 2026 Issue
https://doi.org/10.51168/k11rx269
Original Study

Serum electrolyte abnormalities among hypertensive patients aged 30 years and above attending Bombo Military Hospital in Luweero District. A cross-sectional study.

Patric Abaho*, Anthony Ssekitoleko, Francisco Semuwemba, Hasifa Nansereko, Jane Frank Nalubega
Mildmay Institute of Health Sciences

Abstract

Background

Hypertension is one of the leading causes of illness and death worldwide. The study aims to determine the prevalence of serum sodium, potassium, and calcium abnormalities among hypertensive patients aged 30 years and above attending Bombo Military Hospital in Luweero District.

Methodology

The study adopted a retrospective cross-sectional study design. Extracted data were cross-checked for completeness and accuracy before being entered into Microsoft Excel, where cleaning was performed by identifying and correcting inconsistencies and missing values. The cleaned data were exported to Stata version 14, where descriptive statistics were used to generate frequencies and percentages for demographic characteristics and to determine the prevalence of serum sodium, potassium, and calcium abnormalities based on standard reference ranges.

Results

The largest proportion of patients were aged 60 years and above, 46(30.7%). The majority, 110(73%), had normal serum sodium levels 40(27%) had sodium abnormalities. Among those with abnormalities, 30(20.0%) had low serum sodium levels; 10(7%) had elevated serum sodium levels. 86(57%) had normal serum potassium levels, 64(43%) had potassium abnormalities. Among those with abnormalities, 50(33%) had low potassium levels, 14(10%) had high potassium levels (hyperkalemia). The majority had normal serum calcium levels 109(73%), 41(27%) had calcium abnormalities. Among those with abnormalities, 33(22.0%) had low calcium levels (hypocalcemia), while 8(5%) had high calcium levels.

Conclusion

Serum sodium abnormalities existed among hypertensive patients, with hyponatremia being the most common sodium abnormality identified. Serum potassium abnormalities were the most prevalent electrolyte abnormalities among hypertensive patients, with hypokalemia being the most commonly identified potassium abnormality. Serum calcium abnormalities were also present among hypertensive patients, with hypocalcemia being more common than hypercalcemia.

Recommendations

Routine screening for serum calcium levels should be incorporated into the management of hypertensive patients, and nutritional counseling should be provided to address possible deficiencies contributing to hypocalcemia.

Keywords: *Serum sodium abnormalities, Calcium levels, Potassium levels, Bombo Military Hospital, Hypertensive patients.*
Submitted: *June 28, 2026* ***Accepted:*** *July 12, 2026* ***Published:*** *August 20, 2026*

Corresponding Author: Corresponding Author: *Patric Abaho*
Mildmay Institute of Health Sciences

Background

Hypertension is one of the leading causes of illness and death worldwide. It is estimated that about 1.28 billion adults aged 30–79 years are living with hypertension, with the majority found in low- and middle-income countries.(Organisation, 2023). Many of these individuals are either unaware of their condition or are not adequately controlled, which increases the risk of serious complications such as stroke, heart disease, and kidney failure. The growing burden of hypertension is largely linked to lifestyle changes, including increased salt intake, reduced physical activity, and urbanisation.

Electrolytes such as sodium, potassium, and calcium play an important role in the regulation of blood pressure and overall cardiovascular function. Sodium is closely related to fluid balance, and high levels are associated with increased blood pressure. Potassium helps to reduce blood pressure by promoting sodium excretion and relaxing blood vessels. Calcium is also involved in vascular contraction and influences the resistance of blood vessels. (Gallo & Savoia, 2024; Marican, 2024). When the levels of these electrolytes become abnormal, they can contribute to poor blood pressure control and increase the risk of complications in hypertensive patients.

In Africa, hypertension is a major public health concern, with an estimated prevalence of about 30% among adults. This high burden is attributed to rapid urbanisation, dietary changes, and limited access to healthcare services. (Ogah & Rayner, 2013). Studies in the region have shown that electrolyte imbalances, particularly high sodium and low potassium levels, are common among hypertensive patients and may worsen disease outcomes. (Mills, Stefanescu, & He, 2020).

In Uganda, hypertension affects approximately 26% of adults, and the prevalence is higher among individuals aged 30 years and above. (Guwatudde, Nankya-Mutyoba, et al., 2015). Although antihypertensive medications are available, control of the condition remains low. One of the challenges is the limited routine assessment of serum electrolytes, which are important in monitoring patient status and guiding treatment. Some antihypertensive drugs can also alter electrolyte levels, making regular monitoring necessary.

At Bombo Military Hospital in Luweero District, hypertension is commonly seen among adult patients attending outpatient services. However, there is limited information on the prevalence of serum sodium, potassium, and calcium abnormalities among these patients. Without such data, it becomes difficult to guide clinical management and prevent complications related to electrolyte imbalance.

This study aims to determine the prevalence of serum sodium, potassium, and calcium abnormalities among hypertensive patients aged 30 years and above attending Bombo Military Hospital in Luweero District.

Methodology

Study design and rationale.

The study adopted a retrospective cross-sectional study design. This design was appropriate because it enabled the researcher to determine the prevalence of serum sodium, potassium, and calcium abnormalities among hypertensive patients using existing clinical and laboratory records. The retrospective approach allowed the use of previously recorded data without direct patient follow-up, making it cost-effective and time-efficient. In addition, the cross-sectional nature of the study made it suitable for estimating the magnitude of electrolyte abnormalities at a specific period among the study population. Therefore, this design was appropriate for addressing the objectives of the study.

Study area

The study was conducted at Bombo Military Hospital located in Bombo Town, Luweero District in Central Uganda, at approximately 0.5847° North and 32.5350° East. Bombo Town is situated about 32 kilometres north of Kampala along the Kampala–Gulu highway, making the facility accessible to both military personnel and the surrounding civilian population.

Bombo Military Hospital is a government-owned health facility that provides a range of healthcare services including outpatient care, inpatient management, and laboratory diagnostic services. The hospital primarily serves military personnel, their families, and civilians from nearby communities, and manages a considerable number of hypertensive patients aged 30 years and above through its outpatient clinics.

The hospital has a functional clinical laboratory capable of conducting routine biochemical investigations, including serum electrolyte analysis such as sodium, potassium, and calcium. The availability of clinical and laboratory records from these services made the facility suitable for this study, as it provided reliable secondary data for determining the prevalence of serum electrolyte abnormalities among hypertensive patients.

Study population

The study population consisted of hypertensive patients aged 30 years and above who attended Bombo Military Hospital and had documented clinical and laboratory records. Only patients with recorded serum sodium, potassium, and calcium results were included. This population was selected because their records provided the necessary data to determine the prevalence of electrolyte abnormalities.

Inclusion criteria

Records of patients aged 30 years and above with a documented diagnosis of hypertension were included. Only records with complete laboratory results for serum sodium, potassium, and calcium within the study period were considered.

Exclusion criteria

Records of patients below 30 years of age or without a documented diagnosis of hypertension were excluded. Records with incomplete or missing laboratory results for serum sodium, potassium, and calcium were also excluded.

Sample size determination

The sample size for this study was determined based on the number of available and complete clinical and laboratory records of hypertensive patients aged 30 years and above at Bombo Military Hospital during the study period. Since this was a retrospective study using secondary data, all records that met the inclusion criteria were considered.

A total of 150 patient records with complete information on serum sodium, potassium, and calcium results were included in the study. The use of available records was appropriate because it allowed the researcher to utilise existing data to determine the prevalence of electrolyte abnormalities without the need for participant recruitment.

Sampling technique

The study employed a purposive sampling technique to select medical records for 150 patients. Only clinical records

of hypertensive patients aged 30 years and above with complete laboratory results for serum sodium, potassium, and calcium were included in the study.

This technique was appropriate because the study relied on existing records, and only those that met the inclusion criteria were considered suitable for determining the prevalence of electrolyte abnormalities. Records with incomplete or missing data were excluded to ensure accuracy and reliability of the findings.

Sampling procedure

The researcher first obtained ethical clearance from the Hospital Research Ethics Committee to access and review patient records. Permission was also sought from the hospital administration to use clinical and laboratory records for the study.

A list of records of hypertensive patients aged 30 years and above within the study period was then identified from the hospital registers. Each record was screened to ensure it contained complete clinical information and laboratory results for serum sodium, potassium, and calcium. Records that met the inclusion criteria were selected, while those with incomplete or missing data were excluded.

The selected records were then assigned unique identification numbers to conceal patient identities and maintain confidentiality. Data were extracted using a structured data extraction form, and the process continued until the required number of 150 complete records was obtained for analysis.

Study variables

The study variables included dependent and independent variables obtained from clinical and laboratory records.

Dependent variables

The dependent variables were abnormalities in serum sodium, potassium, and calcium among hypertensive patients. These were determined from recorded laboratory values and classified as abnormal if they fell outside the standard reference ranges: sodium (135–145 mmol/L), potassium (3.5–5.0 mmol/L), and calcium (2.1–2.6 mmol/L)(Yadav, Yadav, Kumar, & Singh, 2024). Values below the lower limit were categorised as low (hyponatremia, hypokalemia, hypocalcemia), while values above the upper limit were categorised as high (hypernatremia, hyperkalemia, hypercalcemia). Each electrolyte was therefore recorded as either normal or abnormal to allow determination of prevalence.

Independent variables

The independent variables included demographic characteristics such as age and sex of the patients as obtained from clinical records. Age was recorded in years and grouped into categories, while sex was recorded as male or female. Hypertension was considered the defining clinical condition for inclusion in the study, since only records of patients diagnosed with hypertension were reviewed.

Data collection tools

A structured data extraction form was developed by the researcher to systematically capture relevant information from clinical records and laboratory registers. The form included sections for demographic characteristics such as age and sex, confirmation of hypertension from clinical records, and documented serum electrolyte results for sodium, potassium, and calcium. It also provided space to record the actual laboratory values, which were later categorised as normal or abnormal based on standard reference ranges.

Quality control

The data extraction tool was pre-tested to ensure clarity and completeness, and necessary adjustments were made before actual data collection.

To reduce errors, only records that met the inclusion criteria were used, and records with incomplete data were excluded. To ensure consistency, standard reference ranges were applied, and this enabled uniform classification of electrolyte values.

All extracted data were checked for accuracy and completeness, and this improved the reliability of the study findings.

Data Collection procedure

Data were collected from January to March, 2026 through a systematic review of 150 clinical records and laboratory registers at Bombo Military Hospital after obtaining ethical clearance and administrative permission. The researcher first accessed outpatient and inpatient registers to identify patients aged 30 years and above who had a documented diagnosis of hypertension within the study period. Each identified record was then retrieved and reviewed to confirm the diagnosis based on recorded blood pressure readings or clinician notes.

For each confirmed hypertensive patient, the researcher traced the corresponding laboratory register or file section to obtain serum sodium, potassium, and calcium results. The actual electrolyte values were recorded and then compared against standard reference ranges (sodium: 135–145 mmol/L, potassium: 3.5–5.0 mmol/L, calcium: 2.1–2.6 mmol/L) to classify them as normal, low, or high. This step was critical in generating the outcome variables required to determine the prevalence of abnormalities for each electrolyte as outlined in the research questions.

All relevant data, including age, sex, and electrolyte values, were entered into a structured data extraction form using unique identification numbers assigned to each record to maintain confidentiality. The process was conducted consecutively for all eligible records until a total of 150 complete records were obtained.

Piloting the study.

The data extraction tool was pre-tested on approximately 10 clinical records outside the study sample by reviewing selected patient files and laboratory registers to assess whether all required information on hypertension status and serum electrolyte results could be captured effectively and whether any unclear sections of the tool were identified and corrected to improve clarity and completeness. This was done to ensure that the tool was suitable for extracting consistent and accurate data from records and to minimise errors during actual data collection.

Data analysis and presentation

Extracted data were cross-checked for completeness and accuracy before being entered into Microsoft Excel, where cleaning was performed by identifying and correcting inconsistencies and missing values.

The cleaned data were exported to Stata version 14, where descriptive statistics were used to generate frequencies and percentages for demographic characteristics and to determine the prevalence of serum sodium, potassium, and calcium abnormalities based on standard reference ranges in line with the study objectives.

Results were presented using tables, bar graphs, and pie charts to illustrate the distribution of demographic characteristics and electrolyte abnormalities among hypertensive patients.

Ethical consideration

Ethical approval for the study was first obtained from the School Institutional Research Committee, after which permission to conduct the study was granted by the Hospital Research Ethics Committee and the administration of Bombo Military Hospital. Since the study involved retrospective review of clinical records, no direct contact with patients was required and informed consent was waived.

Confidentiality of patient information was strictly maintained throughout the study. No names or personal identifiers were recorded, and each patient record was assigned a unique code to ensure anonymity. The data collected were used strictly for academic purposes.

All data were handled securely and accessed only by the researcher. The study adhered to ethical principles of confidentiality, respect for patient information, and responsible use of clinical records in accordance with institutional guidelines.

Results

Sociodemographic characteristics of patients.

Table 1: sociodemographic characteristics of patients (n = 150)

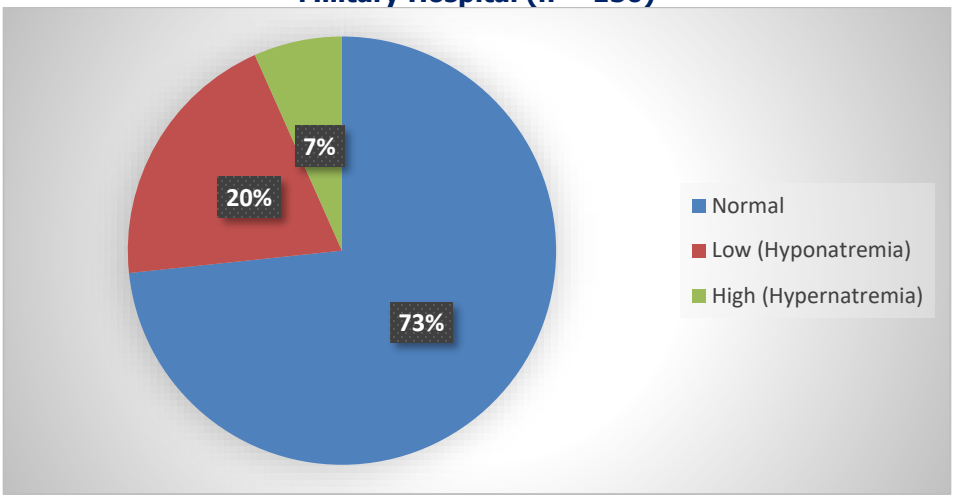
Variable	Category	Frequency (n)	Percentage (%)
Age Group	30–39	34	22.7
	40–49	36	24
	50–59	34	22.7
	≥60	46	30.7
Sex	Male	83	55.3
	Female	67	44.7
Hypertension Category	Stage 1	68	45.3
	Stage 2	82	54.7
Residence	Urban	50	33.3
	Peri-urban	55	36.7
	Rural	45	30
Duration on Treatment	<1 year	62	41.3
	1–3 years	44	29.3
	>3 years	44	29.3

A total of 150 patient records of hypertensive patients aged 30 years and above were reviewed. The largest proportion of patients were aged 60 years and above, 46(30.7%), followed by those aged 40–49 years, 36(24.0%), while those aged 30–39 and 50–59 years each accounted for 34(22.7%). More than half of the patients were male, 83(55.3%), while females constituted 67(44.7%). In terms of hypertension category, the majority of patients had Stage 2 hypertension, 82(54.7%), while 68(45.3%) had Stage 1 hypertension. By location, most of the patients were from peri-urban areas 55(36.7%), followed by urban 50(33.3%) and rural areas 45(30.0%). Regarding duration of treatment, the majority had been on treatment for less than one year, 62(41.3%),

while those on treatment for 1–3 years and more than three years each accounted for 44(29.3%).

Prevalence of serum sodium abnormalities among hypertensive patients

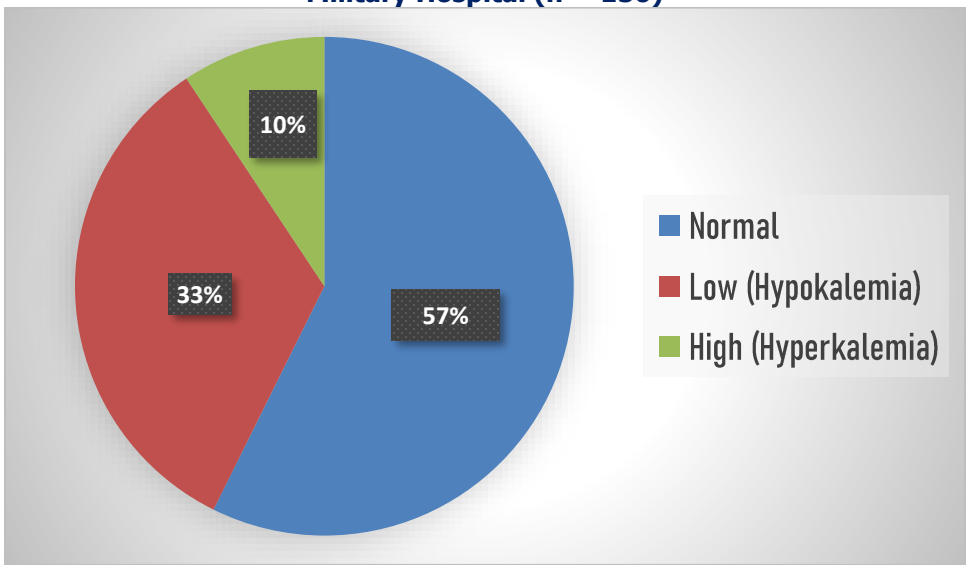
Figure 1: Prevalence of Serum Sodium Abnormalities among Hypertensive Patients at Bombo Military Hospital (n = 150)



Out of the 150 patient records reviewed, the majority, 110(73%), had normal serum sodium levels, while 40(27%) had sodium abnormalities. Among those with abnormalities, 30(20.0%) had low serum sodium levels (hyponatremia), while 10(7%) had elevated serum sodium levels (hypernatremia).

Prevalence of serum Potassium abnormalities among patients

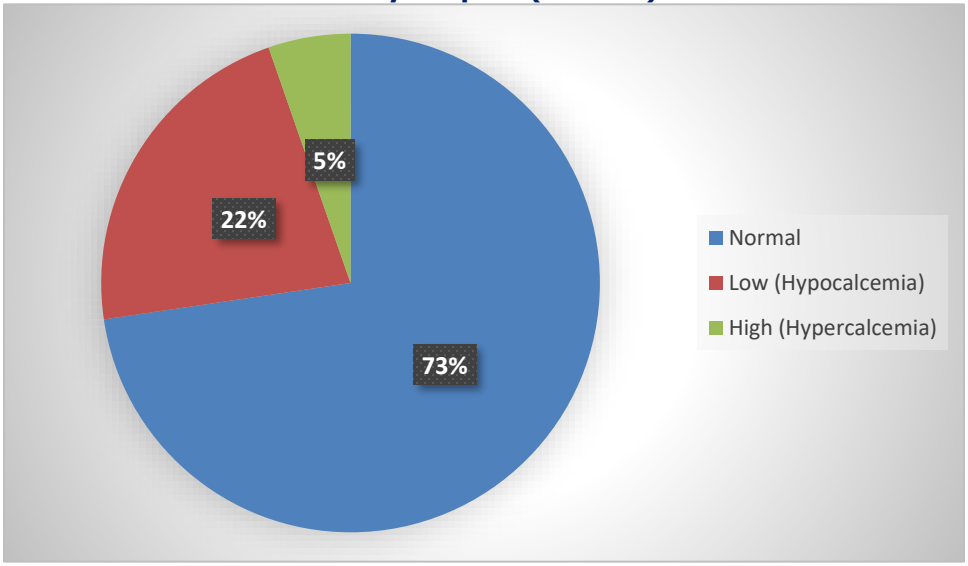
Fig.2: Prevalence of Serum Potassium Abnormalities among Hypertensive Patients at Bombo Military Hospital (n = 150)



Out of the 150 patient records reviewed, 86(57%) had normal serum potassium levels, while 64(43%) had potassium abnormalities. Among those with abnormalities, 50(33%) had low potassium levels (hypokalemia), while 14(10%) had high potassium levels (hyperkalemia)

Prevalence of serum calcium abnormalities among hypotensive patients.

Fig 3: Prevalence of Serum Calcium Abnormalities among Hypertensive Patients at Bombo Military Hospital (n = 150).



Out of the 150 patient records reviewed, the majority had normal serum calcium levels 109(73%), while 41(27%) had calcium abnormalities. Among those with abnormalities, 33(22.0%) had low calcium levels (hypocalcemia), while 8(5%) had high calcium levels (hypercalcemia).

Discussion

This study aimed to determine the prevalence of serum sodium, potassium, and calcium abnormalities among hypertensive patients aged 30 years and above attending Bombo Military Hospital. The findings showed that electrolyte abnormalities were present among a considerable proportion of patients, with variations observed across sodium, potassium, and calcium levels.

Regarding the sociodemographic characteristics, the study found that the majority of patients were aged 60 years and above (30.7%), and more than half were male (55.3%). This is consistent with previous studies, which have shown that hypertension is more prevalent among older adults due to age-related vascular changes and increased arterial stiffness.(Sun, 2015). The higher proportion of males may be attributed to health-seeking behaviour differences and occupational exposure to risk factors, although some studies report a more balanced distribution between sexes. (Guwatudde, Mutungi, *et a*l., 2015)The finding that most patients had Stage 2 hypertension (54.7%) suggests late diagnosis or poor control, which has also been reported in other studies in sub-Saharan Africa where access to early screening is limited.

With regard to serum sodium, the study found that 27% of patients had sodium abnormalities, with hyponatremia (20%) being more common than hypernatremia (7%). This finding is in agreement with previous studies that report hyponatremia as a common electrolyte imbalance among hypertensive patients, particularly those on diuretic therapy. (Adamczak, Surma, & Więcek, 2023). The higher prevalence of hyponatremia may be due to the widespread use of thiazide diuretics, which promote sodium loss. The relatively lower prevalence of hypernatremia may be explained by adequate fluid intake or preserved renal function in most patients. Compared to some global studies, the prevalence observed in this study is moderate, which may reflect differences in treatment practices and patient monitoring.

For serum potassium, the study showed that 43% of patients had potassium abnormalities, with hypokalemia (33%) being more common than hyperkalemia (10%). This finding is consistent with studies conducted in similar settings, where hypokalemia has been reported as a frequent complication among hypertensive patients, especially those on long-term diuretic therapy. (Barche *et al.,* 2020). The high prevalence of hypokalemia in this study may be attributed to increased renal potassium loss induced by antihypertensive medications. On the other hand,

hyperkalemia was less common, which may be due to limited use of potassium-sparing drugs or absence of significant renal impairment in the study population. The relatively high overall prevalence of potassium abnormalities highlights the importance of routine monitoring in hypertensive care.

Regarding serum calcium, the study found that 27% of patients had calcium abnormalities, with hypocalcemia (22%) being more common than hypercalcemia (5%). This finding aligns with previous research suggesting that calcium imbalances, though less emphasised, are present among hypertensive patients and may influence vascular function. (Gallo, Nalli, Baratta, Desideri, & Savoia, 2025). The predominance of hypocalcemia may be linked to dietary deficiencies, low vitamin D levels, or underlying metabolic conditions. Differences between this study and others may be due to variations in nutritional status, environmental factors, and laboratory assessment methods**.**

Conclusion

Serum sodium abnormalities existed among hypertensive patients, with hyponatremia being the most common sodium abnormality identified. Serum potassium abnormalities were the most prevalent electrolyte abnormalities among hypertensive patients, with hypokalemia being the most commonly identified potassium abnormality. Serum calcium abnormalities were also present among hypertensive patients, with hypocalcemia being more common than hypercalcemia.

Study limitations

Being conducted at a single facility, the findings may not be generalizable to other settings.

The use of secondary data limited verification of accuracy and control over how data were originally recorded

The study did not determine other influencing factors such as diet, medication use, or renal function.

Recommendations

Clinicians at Bombo Military Hospital should routinely monitor serum sodium levels among hypertensive patients, especially those on diuretic therapy, in order to detect and manage hyponatremia early and prevent complications.

Healthcare providers should regularly assess serum potassium levels and review antihypertensive medications, particularly diuretics, to minimise the risk of hypokalemia and associated complications such as cardiac arrhythmias.

Routine screening for serum calcium levels should be incorporated into the management of hypertensive patients, and nutritional counseling should be provided to address possible deficiencies contributing to hypocalcemia.

Acknowledgement

I appreciate my family for supporting and encouraging me throughout this journey, most especially my mother and sponsor, who believed in me and strengthened me through it all.

Furthermore, I acknowledge the laboratory in charge, Bombo Military Hospital, and my supervisor for the guidance, time, and continuous supervision that they exhibited to enable me to complete this study successfully.

List of abbreviations and acronyms

SPSS: Statistical Package for the Social Sciences

Source of funding

The study was not funded.

Conflict of interest

The author did not declare any conflict of interest.

Data availability

Data are available upon request.

Author contribution

Patrick Abaho collected data and drafted the manuscript of the study.

Anthony Ssekitoleko supervised the study

Francisco Semuwemba supervised the study

Hasifa Nansereko supervised the study

Jane Frank Nalubega supervised the study

Author biography

Patric Abaho is a student of a Diploma in Medical Laboratory Technology at Mildmay Institute of Health Sciences.

Anthony Ssekitoleko is a supervisor at Mildmay Institute of Health Sciences.

Francisco Semuwemba is a supervisor at Mildmay Institute of Health Sciences.

Hasifa Nansereko is a supervisor at Mildmay Institute of Health Sciences.

Jane Frank Nalubega is a supervisor at Mildmay Institute of Health Sciences.

References

1. Adamczak, M., Surma, S., & Więcek, A. (2023). Hyponatremia in patients with arterial hypertension: pathophysiology and management. Archives of Medical Science: AMS, 19(6), 1630. https://doi.org/10.5114/aoms/161578
2. Barche, B., Dzudie, A., Moor, V. A., Azabji, M. K., Stanis, F., Messaline, F., . . . Halle, M. P. (2020). Prevalence and associated factors of hypokalemia in hypertension: the perspective in a low- to middle-income setting. Journal of Xiangya Medicine, 5. https://doi.org/10.21037/jxym.2020.03.02
3. Gallo, G., & Savoia, C. (2024). Hypertension and heart failure: from pathophysiology to treatment.

International Journal of Molecular Sciences, 25(12), 6661. https://doi.org/10.3390/ijms25126661
4. Gallo, G., Nalli, G., Baratta, F., Desideri, G., & Savoia, C. (2025). Metabolic Dysfunction-Associated Steatotic Liver Disease: A Silent Driver of Cardiovascular Risk and a New Target for Intervention. International Journal of Molecular Sciences, 26(16), 8081. https://doi.org/10.3390/ijms26168081
5. Guwatudde, D., Mutungi, G., Wesonga, R., Kajjura, R., Kasule, H., Muwonge, J., . . . Bahendeka, S. K. (2015). The epidemiology of hypertension in Uganda: findings from the national non-communicable diseases risk factor survey. PloS one, 10(9), e0138991. https://doi.org/10.1371/journal.pone.0138991
6. Guwatudde, D., Nankya-Mutyoba, J., Kalyesubula, R., Laurence, C., Adebamowo, C., Ajayi, I., . . . Reid, T. (2015). The burden of hypertension in sub-Saharan Africa: a four-country cross-sectional study. BMC Public Health, 15(1), 1211. https://doi.org/10.1186/s12889-015-2546-z
7. Marican, D. E. E. (2024). Impact of Dietary Salt on Blood Vessel Health and the Role of Exercise and Immune System Activation. Thompson Rivers University,
8. Mills, K. T., Stefanescu, A., & He, J. (2020). The global epidemiology of hypertension. Nature Reviews Nephrology, 16(4), 223-237. https://doi.org/10.1038/s41581-019-0244-2
9. Ogah, O. S., & Rayner, B. L. (2013). Recent advances in hypertension in sub-Saharan Africa. Heart, 99(19), 1390-1397. https://doi.org/10.1136/heartjnl-2012-303227
10. Organization, W. H. (2023). Global report on hypertension: the race against a silent killer. World Health Organization.
11. Sun, Z. (2015). Aging, arterial stiffness, and hypertension. Hypertension, 65(2), 252-256. https://doi.org/10.1161/HYPERTENSIONAHA.114.03617

PUBLISHER DETAILS:

SJC PUBLISHERS COMPANY LIMITED

SJC Publishers Company Limited
TODAY AND TOMORROW

Catergory: Non Government & Non profit Organisation
Contact: +256 775 434 261 (WhatsApp)
Email:info@sjpublisher.org or studentsjournal2020@gmail.com
Website: https://sjpublisher.org
Location: Scholar's Summit Nakigalala, P. O. Box 701432,Entebbe Uganda, East Africa