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Research Article

Pattern of Kidney Disease among Hypertensive Patient Attending Cardiac Clinics in Dar-Es Salaam

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ABSTRACT

Background: Hypertension is a public health challenge and has become one of the leading causes of kidney disease over the years.

Objective: The aim of this study was to determine the patterns of kidney disease among adults with hypertension in Dar Es Salaam.

Method: A descriptive cross-sectional study was employed. Social-demographic data were collected from the participants. Blood pressure, body weight and height were measured using a standardized method. Blood samples were collected to measure serum creatinine and the estimated eGFR using Chronic Kidney Disease Epidemiology Collaboration (CKD EPI 2021), while urine was collected for biochemical analysis, the dipstick method and determination of the albumin–creatinine ratio.

Results: A total of 400 hypertensive patients were enrolled. In this study, 287 (72%) were females, and the mean and standard deviation of age were 59.9 and 15 years, respectively. A total of 249 (62%) had a primary education, 232 (58%) were unemployed, 240 (60%) had a history of hypertension for less than 10 years, 346 (86.5%) had no history of alcohol consumption, and 380 (95%) had no history of cigarette smoking. Furthermore, 240 (60%) and 211 (52.8%) had a blood pressure ≥ 140 mmHg for systolic and ≥ 90 mmHg for diastolic blood pressure, respectively. A BMI ≥ 25 kg/m^2 was found among 236 patients (59%). A reduced eGFR (<60 ml/min/1.73 m^2) and microalbuminuria were observed in 119 (30%) and 179 (61.5%) patients, respectively.

Conclusion: The clinical pattern of kidney disease was dominated by Acute Kidney Injury (AKI) (22.3%), nephrotic syndrome (12.8%) and end-stage renal disease (2.8%). Higher systolic blood pressure, advanced age, long-term hypertension and unemployment were significantly associated with a decrease in the eGFR. An increase in body mass index was significantly associated with an increase in albuminuria.

Keywords: Hypertension; Cardiac; Kidney disease; Blood pressure; Albuminuria

INTRODUCTION

Hypertension is a public health challenge globally, in Africa and even in Tanzania. Globally, an estimated 1.28 billion adults aged 30-79 years have hypertension, and most of these adults live in developing countries. In Africa, the WHO estimates that the highest incidence of hypertension is 27% in adults aged 25 years and older, compared to 18% in America [1]. In Tanzania, previous studies reported an increasing prevalence of hypertension in different rural and urban populations of Tanzania, from 2%-10% in the 1960's to 13%-79% in 2016, where alcohol, obesity and cigarette smoking were the main risk factors. A study in Arusha and Morogoro Tanzania showed that 25.7% and 45% of adults, respectively, had hypertension, and the odds of having hypertension increased with male sex, old age >60 years, and obesity. A study at Muhimbili National Hospital reported a prevalence of hypertension of 68% and hypertension of 32% [2-5].

Over the years, hypertension has become one of the leading causes of kidney disease worldwide. For instance, disability-adjusted life years and the rate of CKD due to hypertension increased from 1990 to 2019, with Disability-Adjusted Life Years (DALY)

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numbers increasing by 125.2% and DALY rates increasing by 55.7%. In Tanzania, a study performed in Dodoma reported a CKD incidence of 43.8% among hypertensive patients. A study in northwestern Tanzania reported a prevalence of renal dysfunction of 53.9% among hypertensive patients, where older age, female sex, obesity, and high systolic blood pressure were predictors of renal dysfunction [6].

Despite the fact that hypertension is an important cause of kidney disease, there are currently limited data explaining the patterns of kidney disease due to hypertension in Tanzania. In addition, treating people with hypertension-related kidney diseases imposes a heavy financial burden on healthcare budgets worldwide and even in Tanzania. Therefore, this study emphasizes early kidney disease screening and comprehensive care at cardiac clinics, as it will have a beneficial impact on hypertension control and the management of kidney disease [7,8].

MATERIALS AND METHODS

Study design

A cross-sectional study was utilized: 400 study subjects were recruited over a period of 6 months [9].

Sampling procedure

Multistage cluster sampling was utilized for selecting cardiac clinics. In Stage 1, all cardiac clinics found in Dar-Es-Salaam were listed; one group comprised public cardiac clinics, and the other group comprised private cardiac clinics. Public hospitals were selected by simple random sampling. Stage 2 involved the formation of three subgroups based on the level of health care provided by public hospitals, which included tertiary hospitals (Muhimbili National Hospital), regional referral hospitals and district hospitals. From these subgroups, the regional referral hospital was selected by simple random sampling. Study participants were selected from selected cardiac clinics using simple random sampling [10,11].

Data collection

Questionnaires were administered, and social demographic and anthropometric parameters were obtained. Serum creatinine levels were measured, and the GFR was estimated using the CKD EPI 2021 equation. Urinary creatinine levels were measured using dipstick analysis and a Mindray BS 240 chemical analyzer.

Clinical measurements

Blood pressure was measured using an aneroid sphygmomanometer (China). Two consecutive readings were taken from each patient at 5 min intervals, and the average was taken as the mean BP. Hypertension was defined as a Systolic Blood Pressure (SBP) ≥ 140 mmHg and Diastolic Blood Pressure (DBP) ≥ 90 mmHg (WHO guidelines 2021). Weight (to the nearest 0.5 kg) and height (to the nearest 0.5 cm) were measured using a standardized weighing scale (RGZ-160 from Changzhou, China), and Body Mass Index (BMI) was calculated using the formula weight (kg)/height (m^2) (WHO Recommendation of Adult BMI) [12-14].

Laboratory measurements

Blood test: Venous blood (3 ml) was taken from the cubital vein into a test tube and allowed to stand undisturbed for 10 min. Then, the tube was centrifuged at 2000 rpm for 15 min to remove clots. The resulting serum was transferred to a clean polypropylene tube. Serum creatinine was determined using a Mindray BS-240 clinical chemistry analyzer (Guangdong, China). Glomerular filtration rate calculation: The CKD-EPI formula (2021 update) was used to calculate the estimated Glomerular Filtration Rate (eGFR):

GFR=141* min (SC r/κ,1) α* max (SC r/κ, 1)-1.209* 0.993 Age*1.018 (if female)* 1.159 (if black)

According to the National Kidney Foundation guidelines (2013), kidney disease was defined as an eGFR <60 ml/min/1.73 m^2, mild impairment of kidney function was defined as an eGFR ≥ 60 ml/ml/1.73 m^2, and no kidney disease was defined as an eGFR>90 ml/min/1.73 m^2. Renal function was staged as follows: Stage 1 (normal) = GFR>90; stage 2 (mild to moderate renal impairment, GFR 60-89); and stage 3-5 (kidney disease, GFR<60 ml/ml/1.73 m^2) [15,16].

Urine test: Each patient was also given a sterile container to collect a urine sample, and a dipstick urinalysis was performed within ten minutes of sample collection using a urine dipstick Multistix. Urinary dipstick results were reported as negative to 1+, classified as normal to mildly increased albuminuria; 2+, classified as severely increased albuminuria; and 3+ to 4+, classified as nephrotic syndrome. Any patient whose urine dipstick was negative for protein underwent further testing of urine for microalbuminuria using a Mindray BS-240 clinical chemistry analyzer (Guangdong, China). The Urine Albumin-to-Creatinine Ratio (UACR) is a method of choice for detecting microalbuminuria, and a UACR <30 mg/g indicates normal ALB, a UACR ranging from 30-300 mg/g indicates that the patient has microalbuminuria, while an Albumin-to-Creatinine Ratio (ACR) >300 mg/g indicates that the patient has macroalbuminuria [17].

The kidney disease pattern: KDIGO guidelines were used to determine the proportion of patients with AKI. The criteria were based on a comparison with a known baseline Serum Creatinine (SCr) to determine AKI. This baseline SCr was obtained from previous patient medical records. For study participants for whom previous serum creatinine data were missing, an estimation of a reference baseline SCr was used. This information is provided by the KDIGO guidelines, where an estimated baseline is obtained through a back-calculation using the CKD-EPI equation and a Glomerular Filtration Rate (GFR) of 75 mL/min/1.73 m^2. This method was used for approximately 12% of the patients. End-stage renal failure and nephrotic syndrome were diagnosed based on KIDGO criteria with an estimated glomerular filtration rate.

Data analysis

SPSS version 20 was used for data entry, cleaning, and analysis. T tests and chi-squared tests were used for categorical and continuous variables, respectively. A P-value <0.05 was considered to indicate statistical significance [18].

Ethical clearance

Permission to conduct the study was obtained from the Institutional Research Ethics Committee of Hubert Kairuki Memorial University, and permission to conduct the study was obtained from the authorities of the selected hospitals.

RESULTS

Socio-demographic status of the study participants

In this study, 400 study participants were enrolled, for a response rate of 100% of these, 287 (72%) were female, and the mean and standard deviation of age were 59.9 and 15 years, respectively. The

study participants, the majority had a primary education 249 (62%), and 232 (58%) had no employment. The majority of participants 240 (60%) had a history of hypertension for less than 10 years. Furthermore, 54 (13.5%) and 20 (5%) patients had a history of alcohol consumption and cigarette smoking, respectively (Table 1).

Clinical characteristics

The 400 study participants, 240 (60%) and 211 (52.8%) had uncontrolled systolic and diastolic blood pressure, respectively, while 204 (51%) had excess body weight (BMI ≥ 25 kg/m^2). Furthermore, 119 (30%) study participants had reduced eGFR, while 179 (61.5%) had microalbuminuria (Table 2).

Distribution of eGFR and albuminuria in relation to age, sex, duration of hypertension and stages of hypertension

Advanced age >65 years, long-standing hypertension and higher systolic blood pressure were significantly associated with a decrease in the eGFR. Seventy-five percent of the participants in the young age category in this study (18-39 years) had an eGFR of ≥ 60 and only 25% had an eGFR<60, while 57.5% of participants in the older age ≥ 65 years category had an eGFR of ≥ 60 and 42.5% had an eGFR<60 eGFR with a p-value of 0.0, indicating that the eGFR tends to decrease as age increases. Furthermore, long-standing hypertension was associated with a lower eGFR, as 36.6% of participants who had hypertension for more than 10 years had a lower eGFR, while 25.8% of participants who had hypertension for <10 years had a lower eGFR, with a p value of 0.038. In addition, an increase in systolic blood pressure was significantly associated with a decrease in the eGFR (P-value of 0.004). Albuminuria was significantly associated with aging (p-value of 0.034) (Tables 3-5).

Distribution of albuminuria with eGFR among hypertensive patients attending cardiac clinics at Dar-Es-Salaam (n=400).

The serum creatinine ratio and eGFR were significantly (p=0.00) and linearly negatively correlated in the present study, indicating that the higher the ACR was, the lower the eGFR, as 21% of participants in the ACR 0-29.9 category had an eGFR <60 ml/min/1.73 m^2 compared to 53% of participants in the ACR>300 category with an eGFR<60 ml/min/1.73 m^2 (Table 6).

Correlations between eGFR, albuminuria and socioeconomic factors and BMI among hypertensive patients attending cardiac clinics at Dar-Es-Salaam (n=400)

In this study low socioeconomic status was associated with a decrease in the eGFR, and nonemployment status was associated with a decrease in the eGFR, as 35% of the study participants in the nonemployment category had an eGFR<60, while 22% of the study participants in the self-employment category had an eGFR<60. This association was statistically significant, as the p-value was 0.001. Furthermore, an increase in BMI was significantly associated with an increase in albuminuria (p-value 0.0120) (Tables 7 and 8).

Table 1: Social demographic characteristics of hypertensive patients attending cardiac clinics in Dar Es Salaam (n=400).

Variables	Categories	Frequency	Percentages
Age groups (years)	18-39	24	6
	40-64	223	55
	65+	153	38.3
Gender	Male	113	28.2
	Female	287	71.8
Duration since diagnosis of hypertension (months)	11-Jan	77	19.3
	12-119	240	60
	≥ 120	83	20.8
Occupation	Permanent employed	13	3.3
	Non-employed	232	58
	Self employed	155	38.8
Level of education	Informal education	73	18
	Primary	249	62
	Secondary	59	14.8
	College	15	3.8
	University	4	1
History of alcohol use	-	54	13.5
History of cigarettes smoking	-	20	5

Table 2: Shows the distribution of clinical parameters for hypertensive patients attending cardiac clinics in Dar Es Salaam (n=400).

Variables	Category	Frequency	Percentages
Blood pressure (mm/Hg)	Systolic BP>140	240	60
	Diastolic BP>90	211	52.8
BMI (kg/m^2)	Under weight (15-18.4)	32	8
	Normal weight (18.5-24.9)	164	41
	Over weight (25-29.9)	111	27.8
	Obesity (30+)	93	23.3
eGFR (ml/min/1.73 m^2)	0-14.9	11	2.8
	15-29.9	19	4.8
	30-44.9	34	8.5
	45-59.9	55	13.8
	60-89.9	182	45.5
	90+	99	24.8
Dip stick urinalysis	Normal/mild increase albuminuria (negative)	291	72.8
	Severely increased albuminuria (2+)	96	24
	Albuminuria (3+)	13	3.3
Urine ACR(mg/L)	Normal albumin (0-29.9) albuminuria (negative to+1)	61	21
	Micro albuminuria (30-300)	179	61.5
	Macro albuminuria (>300)/Nephrotic range	51	17.5

Table 3: Shows the distribution of the estimated Glomerular Filtration Rate (eGFR) in relation to age, sex, duration of HTN and stages of HTN among hypertensive patients attending cardiac clinics in Dar Es Salaam (n=400).

Variables		eGFR categories (ml/min/1.73 m^2)							
		0-14.9	15-29.9	30-44.9	45-59.9	60-89.9	90-160	Total	P-Value
Age group (years)	18-39	2	1	1	2	6	12	24	0
		(8.3%)	(4.2%)	(4.2%)	(8.3%)	(25%)	(50%)	(100%)	
	40-64	3	6	17	22	102	73	223	
		(1.3%)	(2.7%)	(7.6%)	(9.9%)	(45.7%)	(32.7%)	(100%)	
	≥ 65	6	12	16	31	74	14	153	
		(3.9%)	(7.8%)	(10.5%)	(20.3%)	(48.4%)	(9.2%)	(100%)	
Gender	Male	2	7	13	18	55	18	113	0.119
		(1.8%)	(6.2%)	(11.5%)	(15.9%)	(48.7%)	(15.9%)	(100%)	
	Female	9	12	21	37	127	81	287	
		-3.10%	-4.20%	-7.30%	-12.90%	(44.350	-28.20%	-100%	

Duration since diagnosis of hypertension (Months)	11-Jan	2	4	6	8	32	25	77	0.038
		(2.6%)	(5%)	(7.8%)	(10.4%)	(41.6%)	(32.5%)	-	
	12-119	6	10	21	31	113	59	240	
		(2.5%)	(4.2%)	(8.8%)	(12.9%)	(47%)	(24.6%)	-	
	120-160	3	5	7	16	37	15	83	
		(3.6%)	(6%)	(8%)	(19%)	(44.6%)	(18%)	-	

Table 4: Analysis of Systolic HTN and Category of HTN.

Category of HTN (mmHg)	Systolic HTN							
Optimal 0-119	0	0	6	6	18	19	49	0.004
	-	-	(12%)	(12%)	(36.7%)	(38.8%)	0.04	
120-129	2	3	1	5	23	9	43	
	(4.70%)	(7%)	(2%)	(11.6%)	(53.5%)	(20.9%)		
130-139	0	4	5	7	34	17	67	
	-	(5.9%)	(7.5%)	(10%)	(50.7%)	(25%)		
Grade 1 (140-159)	4	6	15	24	78	43	170	
	(2%)	(3.5%)	(8.8%)	(14%)	(45.9%)	(25%)		
Grade2 (160-179)	5	6	7	11	26	8	63	
	(7.9%)	(9.5%)	(11%)	(17.5%)	(41%)	(12.7%)		
Grade3 (>180+)	0	0	0	2	3	3	8	
	-	-	-	(25%)	(37.5%)	(37.5%)		

Table 5: Breakdown of age groups in years and their respective percentages.

Variable		ACR (mg/g)			Total	P-value
		0-29.9	30-300	>300		
Age groups (years)	18-39	2	16	6	24	0.034
		(8.3%)	(66.8%)	(25%)	(100%)	
	40-64	44	159	20	223	
		(19.7%)	(71.3%)	(9%)	(100%)	
	≥ 65	15	113	25	153	
		(9.80%)	(73.9%)	(16.3%)	(100%)	

Table 6: Shows the distribution of albuminuria with eGFR among hypertensive patients attending cardiac clinics at Dar-Es-Salaam (n=400).

ACR categories (mg/g)	eGFR Category (ml/min/1.73)						Total	P-value
	0-14.9	15-29.9	30-44.9	45-59.9	60-89.9	90+		
0-29.9	0	2	3	8	28	20	61	0
	-	(3.3%)	(4.9%)	(13.1%)	(45.9%)	(32.8%)		
30-300	7	8	22	42	138	71	288	
	(2.4%)	(2.8%)	(7.6%)	(14.6%)	(47.9%)	(24.7%)		
>300	4	9	9	5	16	8	51	
	(7.8%)	(17.6%)	(17.6%)	(9.8%)	(31.4%)	(15.7%)		

Table 7: The distributions of eGFR, albuminuria and socioeconomic factors and BMI among hypertensive patients admitted to cardiac clinics at Dar-Es-Salaam Hospital (n=400) are shown.

Social-economic factors		eGFR Categories (ml/min/1.73 m^2)						Total	P-value
		0-14.9	15-29.9	30-44.9	45-59.9	60-89.9	90+		
History of alcohol use		2	4	6	8	24	10	54	0.245
		(3.7%)	(7.4%)	(11.1%)	(14.8%)	(44.4%)	(18.5%)		
History of cigarette smoking		0	1	2	5	9	3	20	0.306
		-	(5%)	(10%)	(25%)	(45%)	(15%)		
Level of education	Informal education	4	3	4	11	43	8	73	0.882
		(5.5%)	(4.1%)	(5.5%)	(15.1%)	(58.9%)	(11%)		
	Primary education	5	13	22	27	109	73	249	
		(2.1%)	(5.2%)	(8.8%)	(10.8%)	(43.8%)	(29.3%)		
	Secondary	1	2	7	14	22	13	59	
		(1.7%)	(3.4%)	(11.9%)	(23.7%)	(37.3%)	(22%)		
	College	0	0	1	2	7	5	15	
		(0.0%)	(0.0%)	(6.7%)	(13.3%)	(46.7%)	(33.3%)		
	University	1	1	0	1	1	0	4	
		(1.2%)	(25%)	(0.0%)	(25%)	(25%)	(0.0%)		
Occupation	Permanent employment	0	1	2	1	6	3	130.001	0.001
		(0%)	(7.7%)	(15.4%)	(7.7%)	(46.2%)	(23%)		
	Self-employment	2	4	10	17	73	49	155	
		(1.3%)	(2.6%)	(6.5%)	(11%)	(47.1%)	(31.6%)		
	Non -employment	9	14	22	37	103	47	232	
		(3.9%)	(6%)	(9.5%)	(15.9%)	(44.4%)	(20.3%)		

Table 8: Comprehensive examination of BMI and corresponding weight.

Variable	Category	BMI (kg/m²)				P-Value
		Under weight(<18.5)	Normal weight(18.5-24.9)	Overweight (25-29.9)	Obese (>30)	
ACR (mg/g)	0-29.9	6 (9.8%)	31 (50.8%)	14 (22.9%)	10 (16.4%)	0.012
	30-300	18 (6%)	106 (36.8%)	92 (31.9%)	72 (25%)	
	>300+	8 (15.7%)	27 (52.9%)	5 (9.8%)	11 (21.6%)	

DISCUSSION

Clinical patterns of renal disease among adult hypertensive patients were explored in this study and were dominated by AKI 89 (22.3%), nephrotic syndrome (12.8%) and end-stage renal failure (2.8%). This finding was in contrast with the findings of studies performed in Cameron and Ghana, where the clinical pattern of renal diseases was dominated by advanced CKD (61.8% and 70.8%, respectively). This difference can be explained by the use of different study settings. In previous studies in Cameroon and Ghana, a retrospective study design was used, while in the present study, a descriptive cross-sectional study design was employed [19,20].

According to this study, seventy-five percent of the hypertensive patients had a decreased glomerular filtration rate (eGFR<90 ml/min/1.73 m^3), with at least 30% recording <60 ml/min/1.73 m^3. This finding was similar to that of a study performed in Cameroon, in which 80% of the participants reported an eGFR<90 ml/min/1.73 m^3 and 36% reported an eGFR<60 ml/min/1.73 m^2. However, in contrast to a study performed in Mwanza, which reported that 5% of patients had an eGFR<60 ml/min/1.73 m^2.

Microalbuminuria was detected in 61.5% of the adult hypertensive patients in the current study, which was lower than that reported in Muhimbili National Hospital Tanzania (82.8%) and higher than that reported in Mwanza and Cameroon (23.3% and 15%, respectively). This difference might be due to differences in the study settings and methods used for the diagnosis of microalbuminuria and eGFR.

In this study, higher systolic blood pressure was significantly associated with a decrease in the eGFR. Among adult hypertensive patients, patients with systolic blood pressure greater than 140 mmHg (stage I, II and III systolic HTN) were more likely to have a decrease in the eGFR of 46% than patients with other stages (P=0.004). This finding was in line with studies conducted in Northern Tanzania, Ghana, Cameroon and Norway. However, contrary to studies performed in Ethiopia, which showed that diastolic BP greater than 90 mmHg was more likely to lead to kidney disease. In addition, increased systolic and diastolic blood pressures were associated with increased albuminuria. This might be due to uncontrolled Hypertension (HTN) causing blood vessels around the kidney to narrow, weaken or harden, and as a result, these patients were not able to supply enough blood to the kidney; hence, this impairment led to glomerular HTN and increased proteinuria.

Advanced age was significantly associated with decreased eGFR (P=0.000) and increased Albuminuria (ACR) (P=0.034) among adult hypertensive patients in the current study. This finding was similar to those of studies performed in Mwanza, Ethiopia, Northern Cameroon, and Muhimbili National Hospital. This might be due to normal physiology, whereby the decline in the eGFR with aging is accompanied by changes in renal structure and the percentage of glomeruli affected by glomerulosclerosis increases with advancing age even in the absence of any other conditions, such as diabetes and hypertension.

Long-standing hypertension was significantly associated with a decrease in the eGFR among adult hypertensive patients (P=0.038), which showed that patients who experienced hypertension for more than 10 years had a greater percentage of decline in the eGFR (37%) than did those who experienced hypertension for less than 10 years (28%). This finding was in agreement with the findings of a study conducted in Ethiopia. This might be because over time, high blood pressure may damage blood vessels throughout the kidney and reduce the blood supply to the kidney, leading to renal vascular nephropathy, which slowly leads to a decrease in the glomerular filtration rate.

In this study, an increase in albuminuria was significantly associated with a decrease in the eGFR (P=0.000) among adult hypertensive patients and an increase in the risk of kidney disease. This finding was in line with studies performed by Levey et al., and Melsom et al., [21,22]. This might be because a minimal increase in the Albumin-to-Creatinine Ratio (ACR) predicts cardiovascular disease and mortality.

A low socioeconomic status was associated with a decrease in the eGFR and increased albuminuria among adult hypertensive patients, which showed that the percentage of patients with a lower occupation (unemployed) and education level and an eGFR <60 ml/min/1.73 m^2 (35%) were significantly greater than those with a higher occupation level (31%) and education level (p=0.001). This result was similar to those of studies performed in the Netherlands and Northern Tanzania/Kilimanjaro. This might be because people with low education levels are unaware of behavioral factors that cause hypertension, and unemployment causes access to quality care/treatment difficulties.

An increase in body mass index was significantly associated with an increase in Albuminuria (ACR) (p-value=0.012). This finding was in line with a study performed in Mwanza and China. This might be because obesity is associated with increased fat-free mass with vasodilatation of the afferent arteriole, resulting in increased renal plasma flow, eGFR and filtration fraction, and increased intraglomerular pressure drives glomerular filtration barrier injury.

CONCLUSION

The clinical pattern of kidney disease was dominated by AKI,

nephrotic syndrome and end-stage renal disease. Increased systolic blood pressure, advanced age, long-term hypertension, and unemployment were significantly associated with a decrease in the eGFR. Furthermore, an increase in body mass index was significantly associated with an increase in the albumin-creatinine ratio among hypertensive patients. Effective hypertension management and early kidney disease screening are essential for mitigating the progression of kidney disease. This study underscores the need for comprehensive care at cardiac clinics to improve outcomes for hypertensive patients and reduce the healthcare burden in Tanzania.

ETHICAL ISSUES

The ethical clearance and permission to conduct this study were issued by Hubert Kairuki Memorial University (HKMU) and Medical Office are in charge of the Amana, Mwananyamala and Temeke hospitals, respectively. Consent was obtained from the study participants.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

The datasets analyzed during the current study are available from the corresponding author upon reasonable request.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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Data collection and analysis were funded by TPDF. Authors' contributions: All authors contributed equally to the study conception and research development and study design. AM contributed to the data collection and entry. YM was instrumental in statistical analysis. All the authors have read and gave final approval for the submission of the manuscript and publication.

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